



**GEOGRAPHIC VARIATION SERIES.** This Close-Up is part of a comprehensive set of reports that examine the rates at which certain procedures are delivered in different communities across the state. These procedures may be considered elective. They include cardiac procedures, carotid endarterectomy, hip and knee replacement, cancer and spinal procedures, hysterectomy, childbirth procedures, and gallbladder surgery. A research summary, “All Over the Map: Elective Procedure Rates in California Vary Widely,” provides additional information on regional variation and a complete methodology for the study.<sup>1</sup>

Based on patients’ place of residence, the data are from 2005 through 2012, and have been divided into two time periods for purposes of comparison over time. Rates can vary widely, even in contiguous communities. The data account for age, income, education, insurance status, and race. The data are adjusted at the Zip code level for rates of AMI (heart attack) hospitalization and rates of hospitalizations in which the patient had a diabetes diagnosis.

## Childbirth Procedures in California: A Close-Up of Geographic Variation

**W**omen in their childbearing years face a number of decisions during pregnancy. Each of these decisions should be informed by the woman’s personal health status and the conversations she has with her health professionals about the unique benefits and risks of each treatment decision.

An elective induction occurs when childbirth is artificially induced without medical necessity. Labor is induced with the drug Pitocin, a synthetic version of the natural hormone that triggers normal labor. Early induction of labor may be medically necessary in some situations, such as when the mother has a condition, such as diabetes or high blood pressure, that could harm the health of the baby. Early induction that is not done for a medical reason is called elective induction.

Elective induction can be a convenient choice for both the mother and the clinician, as the birth can easily be scheduled. But the American College of Obstetricians and Gynecologists recommends that early induction be performed only when medically necessary, and not before full term, to reduce the risk for such complications as hematoma, anemia,

urinary tract infection, and emergency C-section for the mother. If elective induction is performed before full term, babies are more likely to have significant respiratory problems that can require stays in the neonatal intensive care unit, and they are at a higher risk for death.

A cesarean section (or C-section) is a surgical procedure whereby a baby is delivered through an incision in the belly and uterus. The mother is generally given an epidural or spinal anesthesia to numb the belly and legs. An incision is made near the pubic area. The doctor takes the baby out, removes the placenta, and closes the incision. Most women go home after three to five days, and it may take them at least three to four weeks to recover.

C-sections can be a safer mode of delivery if the mother has a condition like heart disease or an infection that could be passed along to the baby during vaginal birth. Other benefits include the convenience of scheduling the surgery ahead of time and a lower risk of uterine rupture. Conversely, risks of C-section for the mother include genital or urinary problems, blood clots, and uterine scarring, which can make future births more risky. C-sections may place the

newborn at risk for fetal injury during surgery or respiratory problems if the due date is miscalculated.

A vaginal birth after cesarean (VBAC) means delivering a baby vaginally after a previous birth was delivered by cesarean section. Women who deliver vaginally usually go home in a day or two and resume regular activities in one to two weeks. VBACs carry less risk of infection and less pain than cesarean sections and require shorter recovery times. Chances of delivering vaginally are better if the patient's previous cesarean was not done for stalled labor, if the patient had a previously successful VBAC, or if the patient is under 35. Conversely, advisability of delivering vaginally is lower when a previous cesarean was done because of difficult labor, the patient is obese, the patient is older than 35, or the fetus is very large.

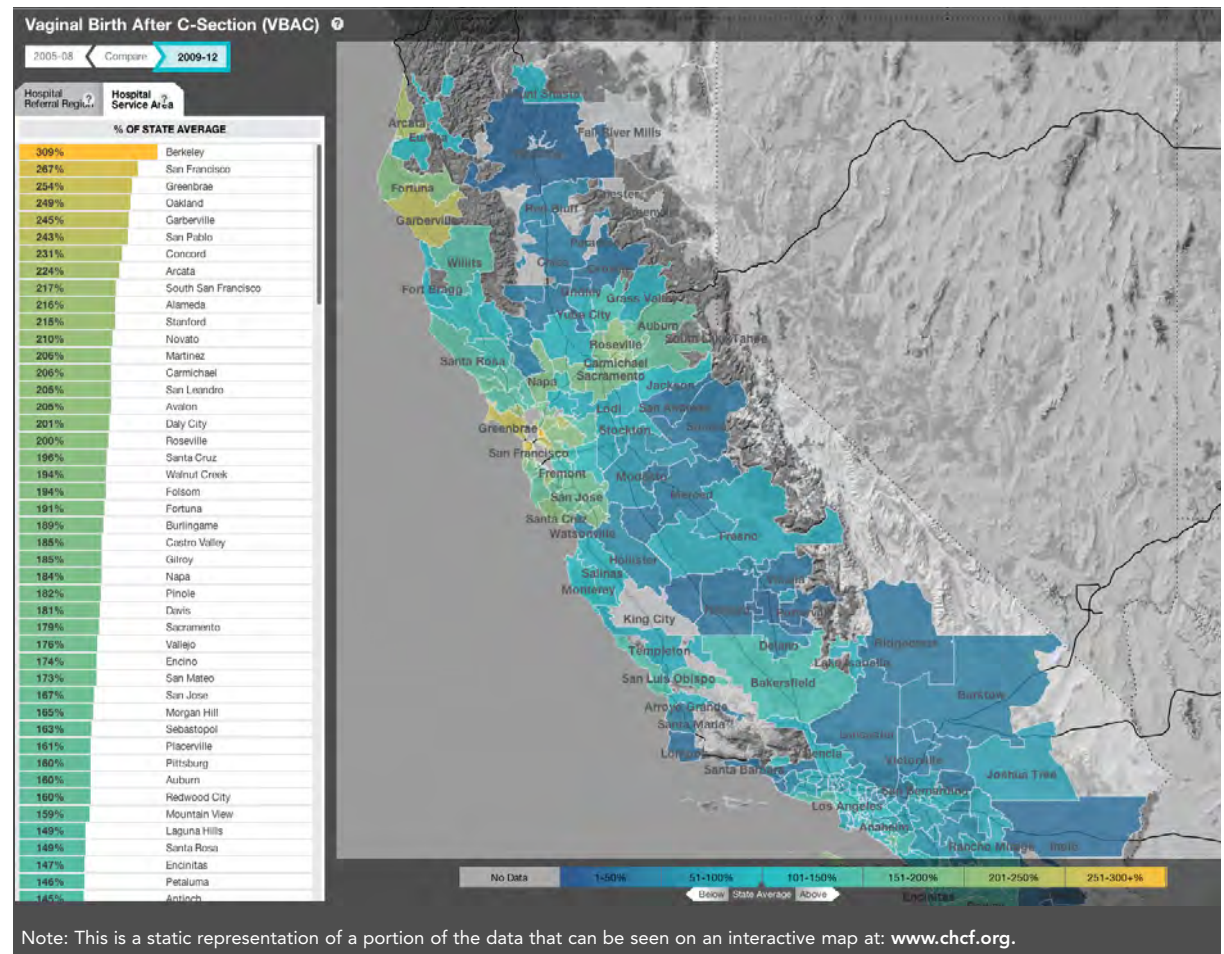
Among women who have had a previous C-section, about 4 in 10 attempt to deliver vaginally but ultimately need a C-section, in which case there is a slightly higher risk of infection than simply having a C-section. Yet another possible risk of VBAC is uterine rupture, in which the uterine scar from the previous C-section breaks open. About 5 out of every 1,000 women with horizontal incision, the typical type now used for C-sections, experience uterine rupture. Hysterectomy is required in 6% to 23% of uterine ruptures to manage bleeding. Uterine rupture accounts for about 5% of maternal deaths each year. According to one large study, neonatal mortality as a result of uterine rupture is 2.6%.<sup>2</sup>

Residents of some hospital service areas (HSAs) undergo various childbirth procedures at much higher or much lower rates than those in other HSAs.

State averages should not be taken as the correct or "right" rate for elective procedures; they are used only as the comparator for analysis, not as a

benchmark. There is no recommended baseline for elective procedures. See Figure 1.

Figure 1. Geographic Variation in VBAC, California, 2009-12



The high and low extremes for induction by HSA are shown in Figure 2 for both data-collection periods, 2005-08 and 2009-12.

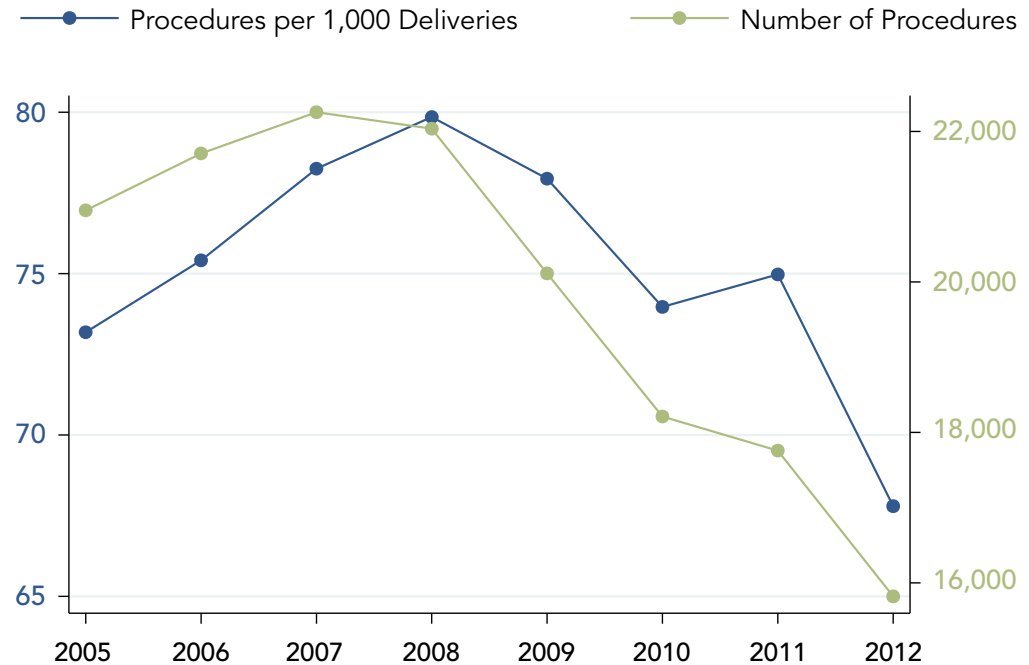
**Figure 2. Induction, 10 Lowest and Highest HSAs 2005-08 and 2009-12**

	2005-08		2009-12	
<b>10 Lowest HSAs, adjusted rate per 1,000</b>				
Red Bluff	15.95	Red Bluff	18.89	
Napa	25.51	Madera	20.60	
Encino	32.07	Coalinga	21.58	
Hanford	33.09	Napa	26.34	
Tulare	33.44	Davis	32.62	
King City	37.94	Tulare	33.29	
Deer Park	38.36	Lancaster	33.93	
Coalinga	39.55	Oakdale	34.45	
Sebastopol	40.03	Mount Shasta	37.53	
Canoga Park	40.56	Yuba City	39.88	
<b>10 Highest HSAs, adjusted rate per 1,000</b>				
Coronado	139.62	Tracy	126.06	
Glendale	146.96	La Mesa	126.95	
Pasadena	148.73	Selma	131.98	
Burbank	155.08	Glendale	136.85	
Indio	162.69	Indio	139.12	
Oroville	167.06	Hawthorne	139.33	
Watsonville	183.80	Ukiah	140.74	
Jackson	201.06	Fortuna	145.73	
Lindsay	292.42	Stockton	153.95	
Porterville	360.14	Gardena	166.40	

Statewide, the rate for elective induction peaked at just less than 73 procedures per 1,000 in 2008, and

then dropped to a rate of 68 per 1,000 by 2012. See Figure 3.

**Figure 3. Induction, Statewide Trends in the Number and Rate of Procedures, 2005 to 2012**



The high and low extremes for cesarean section by HSA are shown in Figure 4 for both data-collection periods, 2005-08 and 2009-12.

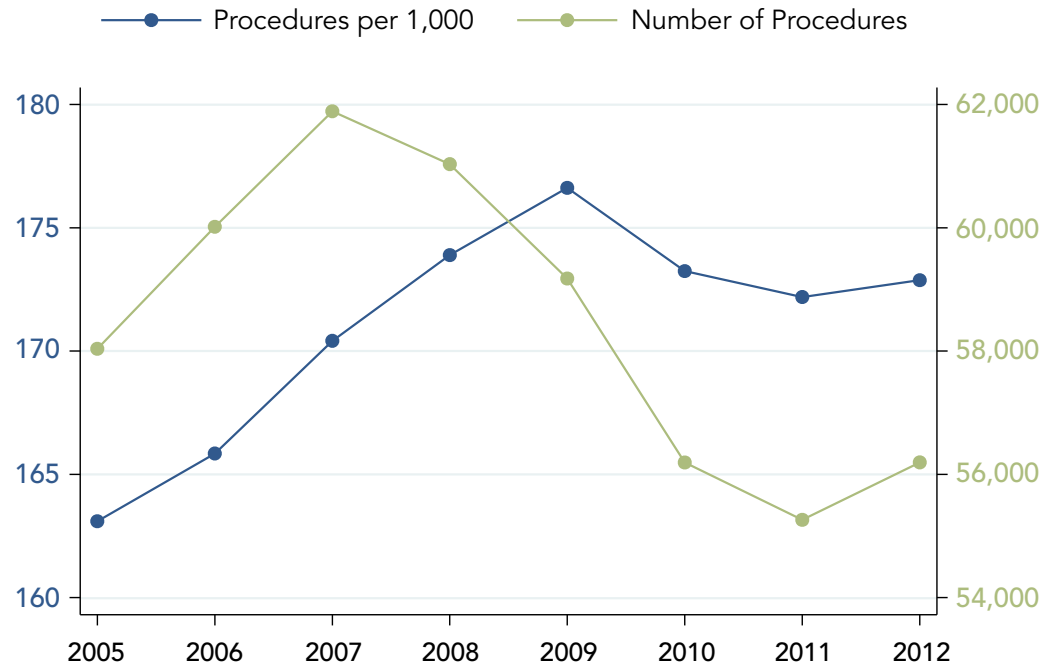
**Figure 4. Cesarean Section, 10 Lowest and Highest HSAs, 2005-08 and 2009-12**

2005-08		2009-12	
<b>10 Lowest HSAs, adjusted rate per 1,000</b>			
Lake Isabella	88.17	Woodland	104.39
Garberville	99.08	Fall River Mills	107.08
Woodland	108.63	Lake Isabella	109.08
Clearlake	108.77	Grass Valley	113.76
Fortuna	113.50	Davis	115.79
Sonoma	116.63	Sonoma	116.76
Davis	117.85	Big Bear Lake	116.87
Bakersfield	119.11	Clearlake	117.22
Healdsburg	119.45	Arcata	117.92
Weaverville	120.15	Healdsburg	121.35
<b>10 Highest HSAs, adjusted rate per 1,000</b>			
South El Monte	222.46	Inglewood	234.14
Downey	224.27	Glendora	234.14
Panorama City	229.22	Covina	234.54
Lynwood	234.11	El Centro	235.46
Coalinga	234.88	Downey	235.90
West Covina	235.25	Glendale	235.94
Covina	235.75	South El Monte	238.06
El Centro	243.88	Lynwood	239.06
Glendora	245.98	Paramount	253.88
Coronado	257.10	West Covina	257.14

Statewide rates for C-section peaked in 2009 at 163 procedures per 1,000, before stabilizing at an

average rate of 173 procedures per 1,000 between 2010 and 2012. See Figure 5.

**Figure 5. Cesarean Section, Statewide Trends in the Number and Rate of Procedures, 2005 to 2012**



The high and low extremes for VBAC by HSA are shown in Figure 6 for both data-collection periods, 2005-08 and 2009-12.

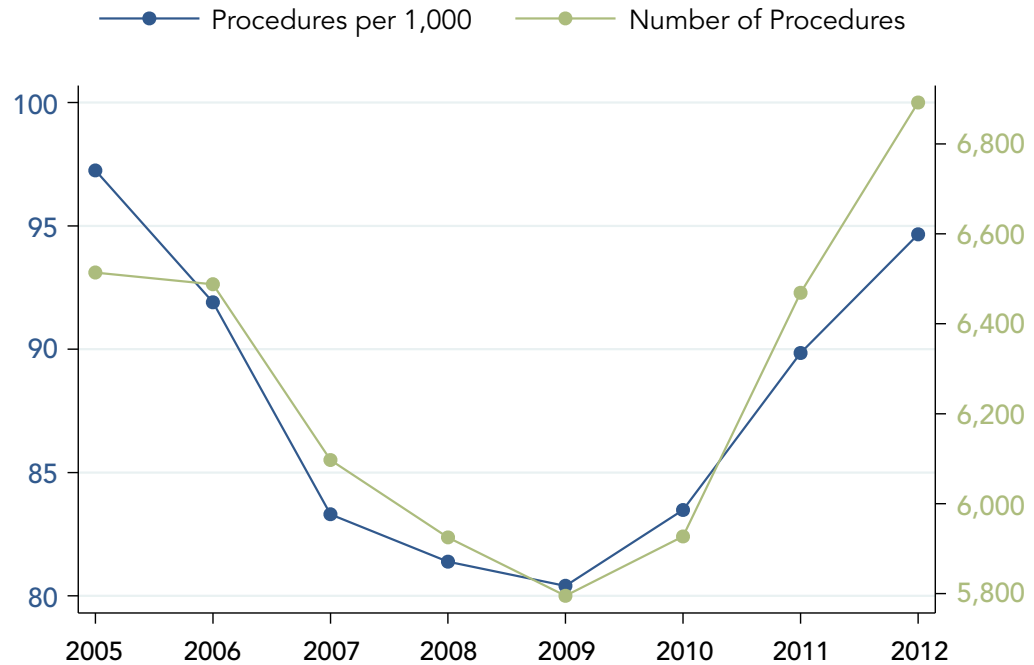
**Figure 6. VBAC, 10 Lowest and Highest HSAs 2005-08 and 2009-12**

	2005-08		2009-12	
<b>10 Lowest HSAs, adjusted rate per 1,000</b>				
El Centro	9.63	El Centro	4.64	
Brawley	10.06	Brawley	8.93	
Corcoran	10.20	Corcoran	12.34	
Dinuba	11.02	Redding	14.99	
Lompoc	11.85	Tulare	16.27	
Porterville	15.80	Lompoc	19.88	
Santa Barbara	16.47	Porterville	20.61	
Hanford	18.37	Santa Barbara	21.66	
Redding	18.78	Coalinga	21.96	
Red Bluff	18.85	Indio	22.94	
<b>10 Highest HSAs, adjusted rate per 1,000</b>				
Novato	184.27	Alameda	188.45	
Stanford	189.10	S. San Francisco	188.69	
San Pablo	189.77	Arcata	195.21	
Oakland	194.57	Concord	201.03	
Martinez	194.71	San Pablo	212.05	
Concord	205.22	Garberville	213.82	
Pittsburg	208.74	Oakland	216.91	
San Francisco	212.55	Greenbrae	221.62	
Greenbrae	222.45	San Francisco	232.24	
Berkeley	225.06	Berkeley	269.02	

In 2005 VBAC procedures were at a statewide average of 97 procedures per 1,000, and then fell to a

low of 80 procedures per 1,000 in 2009 before rebounding to 95 per 1,000 in 2012. See Figure 7.

**Figure 7. VBAC, Statewide Trends in the Number and Rate of Procedures, 2005 to 2012**



## Procedures Chosen for the Study

Procedures studied were based on patient discharge data for elective induction, cesarean, and VBAC. Certain cases were excluded. This analysis controlled for age, income, education, insurance status, and race, as well as rates of acute myocardial infarction (heart attack) and diabetes.

## Authors

The original content of this report, published in September 2011, was developed by Vanessa Hurley, MPH, and Shannon Brownlee, MS. It was updated in November 2014.

## About the Foundation

The California HealthCare Foundation works as a catalyst to fulfill the promise of better health care for all Californians. We support ideas and innovations that improve quality, increase efficiency, and lower the costs of care. For more information, visit us online at [www.chcf.org](http://www.chcf.org).

## Endnotes

1. The research for this report was developed by Laurence Baker, PhD, a consultant to this project and professor of health research and policy, and chief of health services research, Stanford University School of Medicine, in collaboration with Maryann O'Sullivan, JD, an independent health policy consultant. Analysis and interpretation of the estimates were performed by Frances Tompkins, data consultant. Lance Lang, MD, chaired an advisory committee of clinicians in various specialties, which was also consulted in the production of this report to review the analysis and to ensure the accuracy of medical content. For a complete list of advisory committee members, see the research summary "All Over the Map: Elective Procedure Rates in California Vary Widely," [www.chcf.org](http://www.chcf.org). Data were obtained from the Office of Statewide Health Planning and Development.
2. This section was written using the following sources:
  - "Inducing Labor: When to Wait, When to Induce," Mayo Clinic, [www.mayoclinic.com](http://www.mayoclinic.com).
  - "Factsheet: Early Elective Deliveries" (Washington, DC: The Leapfrog Group, 2011), [www.leapfroggroup.org](http://www.leapfroggroup.org).
  - Bryan Oshiro, "Decreasing Elective Deliveries Before 39 Weeks of Gestation in an Integrated Health Care System," *Obstetrics and Gynecology* 113, no. 4 (April 2009):804-811, doi:10.1097/AOG.0b013e31819b5c8c.
  - "Pregnancy: Should I Try Vaginal Birth After a Past C-Section? (VBAC)," Kaiser Permanente, accessed January 19, 2011, [members.kaiserpermanente.org](http://members.kaiserpermanente.org).
  - Kevin Toppenberg, "Uterine Rupture: What Family Physicians Need to Know," *American Family Physician* 66, no. 5 (September 1, 2002):823-829, [www.aafp.org](http://www.aafp.org).