



**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, sex, 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.

## Joint Replacement in California: A Close-Up of Geographic Variation

**A**s people age, their knee and hip joints may become stiff and sore due to osteoarthritis, and the joint cartilage may degenerate. Osteoarthritis of the hip or knee is usually diagnosed on the basis of a patient's symptoms, followed by an imaging test such as an x-ray or magnetic resonance imaging (MRI), which can show damage to the cartilage and bone in the joint. The worn cartilage becomes rough, causing friction and sometimes pain, stiffness, and limited motion. Arthritis is more common in older adults whose knees have experienced a lifetime of wear and tear. Women, people who are overweight, and those with a history of joint injury are also at increased risk for developing hip or knee arthritis.

An imaging test can show the extent of damage to the cartilage and bone of the joint from arthritis. But this information has limited usefulness in informing treatment choices because it often does not bear much relationship to the amount of pain the patient experiences.

Treatment choices for knee osteoarthritis include:

- ▶ Lifestyle changes such as weight loss and exercise
- ▶ Non-drug treatments including physical therapy, orthotics, ice, and heat
- ▶ Pain medications such as aspirin, ibuprofen, naproxen, and acetaminophen
- ▶ Injections of corticosteroids or hyaluronic acid
- ▶ Surgery, including total knee or hip replacement

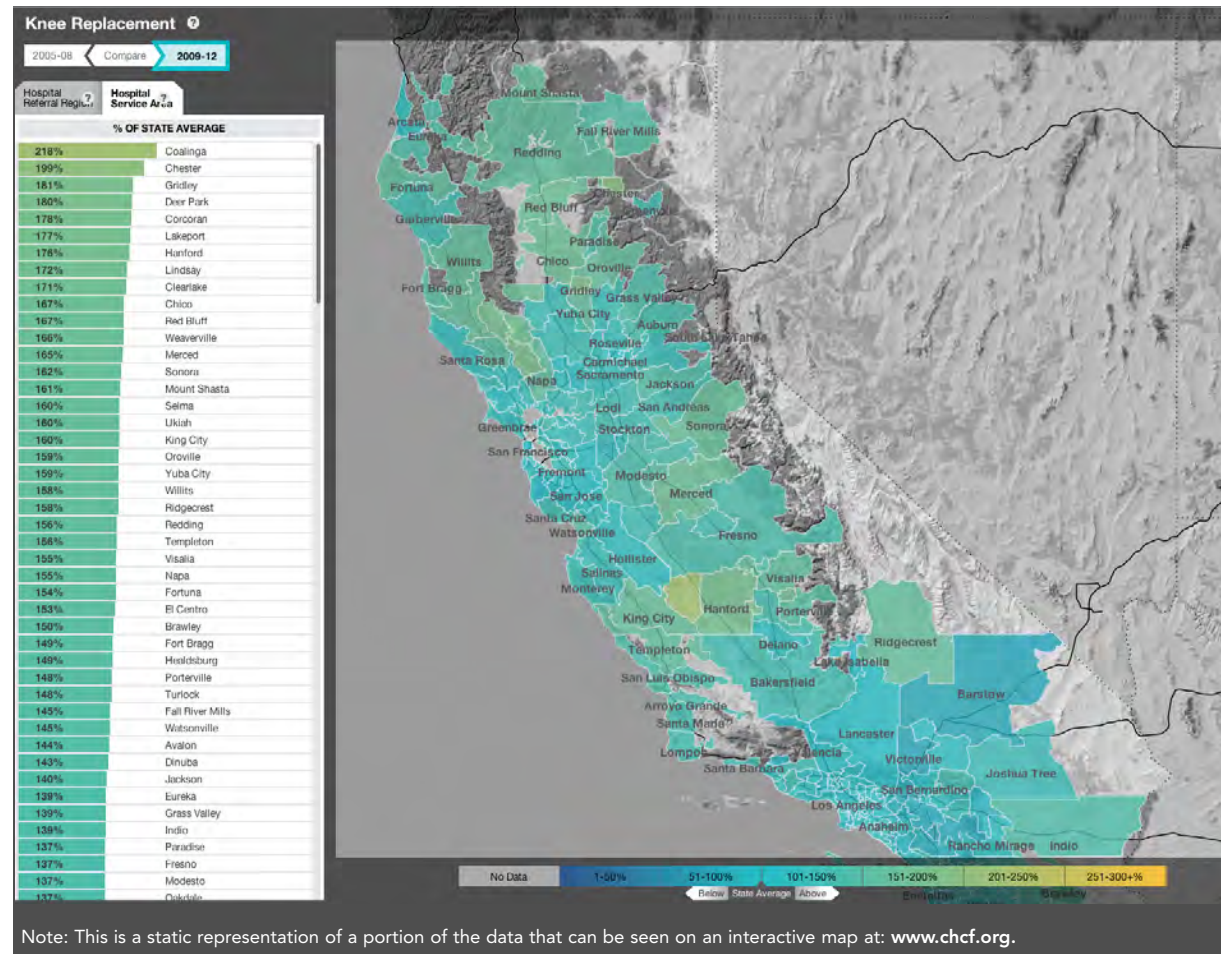
There are several ways to treat knee and hip pain, each of which has potential benefits and risks. Exercise can help reduce stiffness, strengthen supporting muscles, and boost energy level and mood. Clinicians may recommend that patients with knee osteoarthritis lose weight, which can relieve stress on the knees and poses very little risk (and may offer other health benefits). Pain medications such as aspirin, ibuprofen, naproxen, and acetaminophen may relieve pain, but many pain medications can

irritate the stomach when taken for long periods or in high doses. In rare cases, this irritation can cause life-threatening bleeding. Using a cane or walker can improve mobility but will not relieve pain.

For those suffering from severe osteoarthritis, total knee or hip replacement surgery usually relieves pain and improves mobility. The surgery eliminates or greatly reduces pain in most patients. But recovery takes several months, and there are possible serious harms, including infection or blood clots in the lungs. Although most artificial hips and knees last many years, some patients will end up needing the joints replaced again later in life when they are older and less able to undergo surgery safely.<sup>2</sup>

Residents of some hospital service areas (HSAs) undergo hip or knee replacement at rates notably higher or lower than the state rate. 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 Knee Replacement Surgery, California, 2009-12



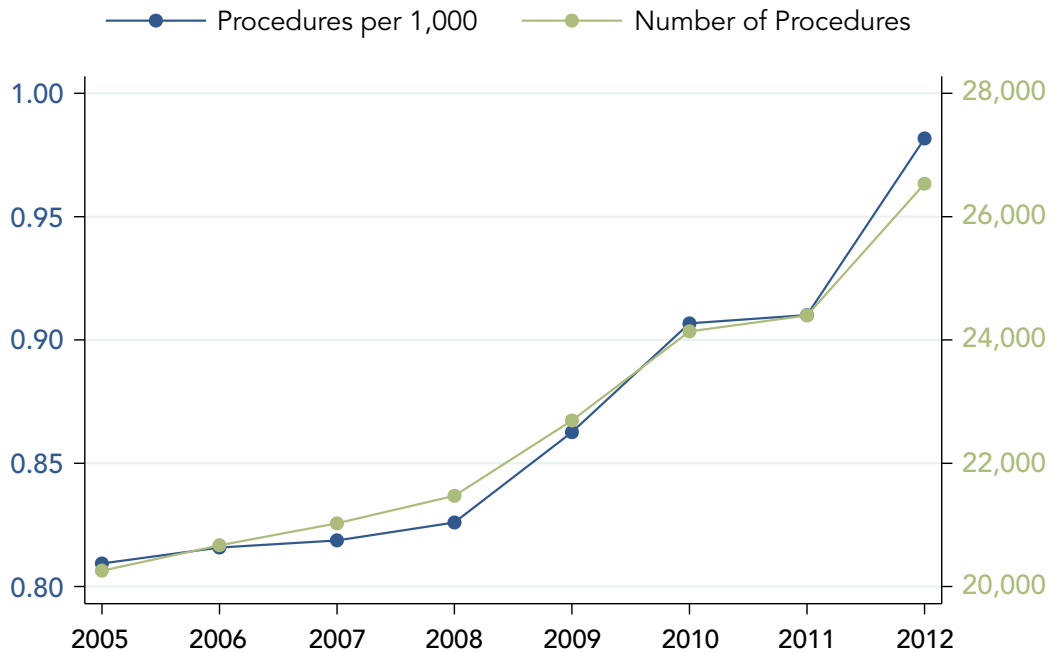
The high and low extremes for hip replacement by HSA are shown in Figure 2 for both data-collection periods, 2005-08 and 2009-12.

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

	2005-08		2009-12	
<b>10 Lowest HSAs, adjusted rate per 1,000</b>				
Norwalk	0.47	Downey	0.55	
Montebello	0.48	Delano	0.57	
Downey	0.51	Barstow	0.61	
Avalon	0.55	San Dimas	0.63	
El Centro	0.56	Montebello	0.64	
Delano	0.56	South El Monte	0.64	
Lynwood	0.57	Hawthorne	0.64	
National City	0.60	Fontana	0.64	
West Covina	0.60	San Gabriel	0.65	
Lake Isabella	0.61	Norwalk	0.65	
<b>10 Highest HSAs, adjusted rate per 1,000</b>				
Gridley	1.30	Gridley	1.41	
Lindsay	1.30	Gilroy	1.42	
Solvang	1.31	Oroville	1.47	
Fall River Mills	1.33	Willits	1.48	
Big Bear Lake	1.33	Healdsburg	1.52	
Sonora	1.35	Deer Park	1.65	
Fort Bragg	1.39	Avalon	1.70	
Weaverville	1.49	Coalinga	1.81	
Willits	1.51	King City	2.01	
King City	1.90	Greenville	2.13	

The statewide rate of hip replacement was slightly more than 0.8 procedures per 1,000 in 2005 and increased to just under 1.0 procedures per 1,000 by 2012. See Figure 3.

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



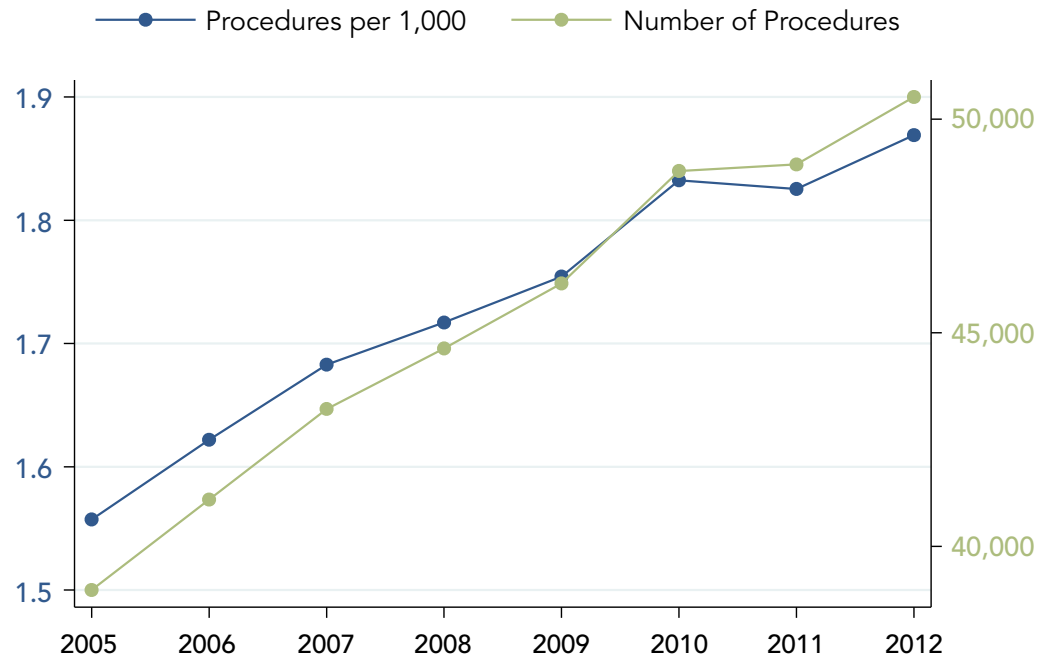
The high and low extremes for knee replacement by HSA are shown in Figure 4 for both data-collection periods, 2005-08 and 2009-12.

**Figure 4. Knee Replacement, Ten Lowest and Highest HSAs, 2005-08 and 2009-12**

2005-08		2009-12	
<b>10 Lowest HSAs, adjusted rate per 1,000</b>			
Hawthorne	1.09	Gardena	1.19
Gardena	1.14	Sun City	1.33
Sun City	1.28	Fontana	1.34
Lynwood	1.30	Lynwood	1.38
Encino	1.32	Victorville	1.40
Norwalk	1.32	National City	1.41
Garden Grove	1.33	Hawthorne	1.42
Hemet	1.34	Barstow	1.44
Riverside	1.35	Panorama City	1.47
Paramount	1.35	Paramount	1.48
<b>10 Highest HSAs, adjusted rate per 1,000</b>			
Hanford	3.03	Chico	3.04
Mount Shasta	3.05	Clearlake	3.12
Gridley	3.13	Lindsay	3.14
Sonora	3.13	Hanford	3.21
Willits	3.17	Lakeport	3.22
Fortuna	3.34	Corcoran	3.23
Weaverville	3.47	Deer Park	3.28
Redding	3.57	Gridley	3.30
Red Bluff	3.72	Chester	3.63
Fall River Mills	3.72	Coalinga	3.96

The knee replacement statewide rate increased from a low of 1.55 procedures per 1,000 in 2005 to a high of 1.85 by 2012. See Figure 5.

**Figure 5. Knee Replacement, 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 hip replacement and knee replacement. Certain cases were excluded. This analysis controlled for age, sex, 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:
  - Shannon Brownlee et al., *Improving Patient Decision-Making in Health Care: A 2011 Dartmouth Atlas Report Highlighting Minnesota* (Lebanon, NH: Dartmouth Atlas Project, 2011).
  - Treatment Choices for Knee Osteoarthritis (Boston: Health Dialog, 2009).
  - "Arthritis: Should I Have Knee Replacement Surgery?," Kaiser Permanente, accessed November 12, 2010, [members.kaiserpermanente.org](http://members.kaiserpermanente.org).
  - Hip Replacement Surgery, The University of Chicago Medicine, [www.uchospitals.edu](http://www.uchospitals.edu).
  - Knee Replacement Surgery, The University of Chicago Medicine, [www.uchospitals.edu](http://www.uchospitals.edu).