



## All Over the Map: Elective Procedure Rates in California Vary Widely

### Introduction

For patients considering elective surgery or tests, geography matters. The likelihood that an individual will undergo a particular medical service depends on several factors, including the severity of the patient's specific and overall condition and the facility where the care is provided.

But elective treatments and tests are often called "preference sensitive" because the decision about which treatment — or no treatment — is best also depends upon someone's preference. Often, it is the clinician's preference that determines the course of treatment, and clinicians' opinions about tests and treatments can vary widely from place to place.<sup>1</sup> As this study shows, one of the best predictors of undergoing many elective treatments and tests is the community in which a patient resides and the prevailing medical practices of clinicians in that community.

This research summary highlights geographic variation in the rates at which certain elective procedures and tests are performed in different communities in California. This research report — the third in a series

— examines the rates of procedures for several conditions: cardiovascular and other vascular disease, childbirth, arthritis of the hip and knee, gynecological conditions, and gall bladder disease.

The research examines and compares data from two time periods: 2005 through 2008 and 2009 through 2012. (The analysis and data used are explained in "Research Methodology," page 7.)

The rates at which these elective procedures are delivered have been shown by other studies to vary in different parts of the country.<sup>2</sup> However, those earlier studies focused primarily on Medicare patients, while this analysis is based on data not only from Medicare beneficiaries in California (both fee-for-service and managed care) but also on data for Californians who are enrolled in commercial plans and Medicaid, and the uninsured. This study's inclusion of all types of payers and of patients of different ages is a significant addition to the literature documenting geographic variation in medical practice.

This study also highlights a common problem in health care today. Input from patients themselves may not be sufficiently sought or considered when decisions about preference-sensitive treatments and tests are being made. When there is no single right answer as to which treatment (or no treatment) is best, as in the elective procedures discussed in this summary, the decision should be based to the extent possible on the preferences of well-informed patients.

All too often, unfortunately, patients' preferences are not sufficiently taken into account. The geographic variation in rates of preference-sensitive medical treatments in this study reflects the medical culture of the community in which the patient resides more than informed patient choice.<sup>3</sup>

Women with early-stage breast cancer provide the clearest example of the importance of patient preferences. Early-stage breast cancer can be treated either with mastectomy, which is surgical removal of the entire breast, or with lumpectomy, which is surgical removal of the tumor that leaves the rest of the breast largely intact. For the great majority of women, each treatment offers the same chance of a cure, but different women see the trade-offs involved in a different light. For mastectomy, the patient must weigh the physical and psychological cost of losing a breast, and also whether to undergo breast reconstruction, which may involve a second major surgery. A lumpectomy, on the other hand, involves less-invasive surgery, but the patient frequently undergoes radiation and may elect to receive chemotherapy as well. Also, for some women a lumpectomy does not provide the same sense of security about eradication of the cancer. With such highly personal

considerations at stake, the treatment chosen should reflect to the fullest extent possible the woman's values and preferences.<sup>4</sup>

Below are examples from the study's geographic variation findings. Where changes in the rates are mentioned, unless otherwise indicated, they refer to changes over the two time periods studied: 2005 through 2008 and 2009 through 2012.

### Angiography

- ▶ The rate of the use of angiography declined by 15% statewide.
- ▶ During the 2005-08 period, Clearlake had the highest rate of angiography in the state. With over 21 procedures per thousand residents, Clearlake was the most extreme outlier. By the 2009-12 period, Clearlake had dropped to the third highest rate in the state, down to 11 angiography procedures per thousand people. Residents of Clearlake (where the rate of angiography dropped by 47%) are more than four times as likely to undergo an angiography procedure as residents of Mountain View (where the rate of angiography dropped by 46%).

### PCI

- ▶ The rate of use of PCI declined by 30% statewide. In addition, PCI shows the strongest and most consistent evidence of declines in variation.
- ▶ Lindsay residents (where the rate of PCI dropped by 54%) are more than five and half times as likely to undergo a PCI as residents of Santa Rosa (where the rate of PCI dropped by 31%).

### CABG

- ▶ The rate of the use of CABG declined by 22% statewide.
- ▶ Lakewood residents (where the rate of CABG decreased 14%) are four and a half times as likely to undergo a CABG procedure as residents of Garberville (where the rate of CABG decreased by 63%).

### Cesarean Section

- ▶ The rate of cesarean section deliveries increased by 3% statewide. (This rate increased over time, peaked in 2009, and then declined.)
- ▶ Women living in Paramount (where the rate of cesarean section increased 25%) are more than twice as likely to have their children through cesarean section as women living in Grass Valley (where the rate of cesarean section dropped 24%).

### Elective Induction

- ▶ The rate of use of elective induction increased from 2005 to 2008 and then declined; the rate declined by 4% statewide.
- ▶ Women living in Gardena (where the elective induction rate increased by 95%) are six times as likely to have an electively induced birth as women living in Napa (where the elective induction rate increased by 3%).

### VBAC

- ▶ The rate of use of VBAC declined by 1% statewide. Use of VBAC declined through 2009 and then increased; by the end of 2012 the rate of

VBAC had almost reached the level it had been in 2005.

- ▶ Women living in San Francisco (where the VBAC rate increased by 9%) are 50 times as likely to have a VBAC as women living in El Centro (where the rate of the VBAC decreased by 52%).

### Hysterectomy

- ▶ The rate of use of hysterectomy declined by 9%.
- ▶ Women living in Weaverville (where the rate of hysterectomy increased by 55%) are more than three times as likely to undergo this procedure as women living in Santa Monica (where the rate decreased 15%).

### Joint Replacement

- ▶ The rate of use of hip replacement increased by 12% statewide, and knee replacement increased by 11%.
- ▶ Deer Park residents (where the rate of knee replacement increased by 62%) are more than twice as likely to undergo knee replacement surgery as residents of Hawthorne (where the rate of knee replacement surgery decreased by 30%).
- ▶ Coalinga residents (where the rate of hip replacement increased by 64%) are three times as likely to undergo hip replacement surgery as residents of Barstow (where the rate of hip replacement decreased by 13%).

### Cholecystectomy

- ▶ The rate of use of cholecystectomy increased by 6% statewide.

- ▶ Ridgecrest residents (where the rate of cholecystectomy increased by 2%) are two and one half times as likely to undergo a cholecystectomy as residents of San Luis Obispo (where the rate of cholecystectomy decreased by 21%).

### Carotid Endarterectomy

- ▶ The rate of use of carotid endarterectomy declined 20% statewide.
- ▶ Clearlake residents (where the rate of carotid endarterectomy increased by 14%) are six times as likely to undergo a carotid endarterectomy as residents of Alameda (where the rate of carotid endarterectomy decreased by 32%).

## Causes of Variation

While some geographic variation in rates of treatments and tests is expected due to differences in the prevalence of disease among different populations, such differences cannot explain much of the variation seen across California. For example, the research controlled for measures of the rate of acute myocardial infarction and the rate of diabetes in the analysis, but that did not account for much of the variation seen across California. Moreover, the degree of variation in cardiac procedures is notable: A number of communities were found to have procedure rates that were over 200% of the state average — far exceeding differences in health status.<sup>5</sup> Other communities have exceptionally low rates compared to state averages.

There are several possible factors underlying variation in the procedures and tests included in this report.

There may be unexplained differences among populations of patients due to severity of disease or other conditions patients have that can influence treatment choices.<sup>6</sup>

In some cases, patients in a specific geographic area may not have adequate access to a particular type of procedure, and thus the rate of that procedure may be low. For example, the study found an increase over time in the rate of hip (12% increase) and knee (11% increase) replacement surgeries. A number of factors may be contributing to these changes including an increased prevalence in osteoarthritis among a more active and aging population; patient interest in experiencing — sooner rather than later — the improved quality of life that a successful joint replacement procedure can provide; and better access to surgeons who have become proficient in performing the procedures.

### Lack of Clear Clinical Evidence

More often, the variation reflects the local practice of clinicians. For some procedures, clinicians do not have solid clinical evidence that points to the best treatment option for any individual patient. For example, the standard of care for non-symptomatic (“silent”) gallstones is not to remove the gallbladder surgically (cholecystectomy) unless symptoms develop, a standard supported by a 2007 review that found no randomized controlled trials on the benefits of cholecystectomy for silent gallstones.<sup>7</sup> Even so, some physicians recommend surgery, believing that symptoms will eventually develop and that it is unwise to wait until the patient is older and thus less likely to tolerate surgery well.<sup>8</sup>

The study identified communities where cholecystectomy rates were high relative to the statewide rate. For example, while the rate of cholecystectomy increased 6% statewide between the two time periods studied (2005-08 and 2009-12), the rate of cholecystectomy in Coalinga increased by 27%. During the second time period studied, cholecystectomies were being performed on residents of Coalinga at more than 150% of the state rate.

Different clinicians interpret the guidelines and existing evidence differently, and over time, the physicians in a given community develop their own local standard of care.

The presence of high-quality research and guidelines from respected physician organizations can lead to changes in practice and reductions in rates of elective procedures. This study found that hysterectomy rates dropped 9% between the two time periods studied. This change in the use of hysterectomy may reflect an increase in the availability and use of effective nonsurgical treatments for common gynecologic conditions such as hormonal treatment for endometriosis, endometrial ablation for abnormal uterine bleeding, and uterine artery embolization for women with leiomyoma.<sup>9</sup> Use of these hysterectomy alternatives have been bolstered by an increase in high-quality studies that demonstrate their safety and efficacy, as well as national guidelines from the American College of Obstetricians and Gynecologists that advocate their use.<sup>10</sup>

In recent years the California Maternal Quality Care Collaborative, the March of Dimes, and the California Department of Public Health coordinated an effort to reduce the rate of early (<39 weeks) elective

inductions. This effort, strengthened by data collected and synthesized by the California Maternity Data Center, educated physicians, hospitals, and other health care providers with evidence-based approaches to reducing the number of early elective inductions.<sup>11</sup> While elective inductions increased from 2005 through 2008, they then declined from 2009 through 2012. This focused education effort may have accounted for some of the decline in the rate of elective inductions this study identified.

## Physician Preferences

Even when unambiguous medical science exists, physicians may differ in their approach. In the case of cardiovascular disease, for instance, there is abundant evidence for the relative efficacy of specific treatments in certain circumstances, yet patients with heart disease are treated very differently in different places. In some cases, fee-for-service payment can influence clinical decisions:

Clinicians in some regions may be more inclined to recommend and perform more lucrative procedures. The declines this study found in the rates of elective cardiac procedures, carotid endarterectomy, hysterectomy, and elective induction may reflect the effects of physician employment and payment reforms in process, which are reducing clinician reliance on volume-based reimbursement, shifting toward value-based rewards.

A clinician's opinion about whether or not to advocate a particular procedure or test may also vary according to the clinician's medical training and relationship with and reliance upon peers.<sup>12</sup> For example, one study examining cardiologists' propensity to

recommend a variety of tests and procedures found that "cardiologists with high Cardiac Intensity Scores [those more likely than their peers to order tests and invasive treatments] were more likely to report recommending a cardiac catheterization that was not clinically indicated when they thought their peers would do so, than those with lower scores." This suggests that physicians who practice intensively "may be more likely than others to be influenced by peers — or that conformity to perceived practice norms is a potent influence on practice style."<sup>13</sup>

## Lack of Informed Patient Input

Patients are for the most part in the dark about differences of opinion among clinicians and in many cases about the lack of clear clinical evidence to support one decision or another. Thus they often defer treatment decisions to their clinicians in the belief that the "doctor knows best," not realizing that the clinicians may not actually know what is "best," and that a clinician's treatment preference may not be the same as the treatment the patient would choose if the patient had the information needed to understand the trade-offs involved with each option.<sup>14</sup>

A recent study on patient decisionmaking found that physicians readily offered their own opinions about which elective procedure was best for the nine medical decisions studied, but they were less likely to ask their patients what they wanted.<sup>15</sup> Another study found that only 34% of patients reported having had a physician discuss with them any insights from scientific research concerning their condition or treatment.<sup>16</sup>

Other studies show that many patients do not fully understand their treatment options and the pros and cons of each. This results in some patients overestimating the potential for harm and so refusing treatments that could be beneficial.<sup>17</sup> Other patients overestimate the likelihood or extent of the benefit of a procedure; for example, many patients who undergo PCI believe incorrectly that the procedure will reduce their risk of heart attack and death.<sup>18</sup>

On the other side of the equation, doctors are sometimes hampered by their patients' reluctance to provide relevant information and to ask pertinent questions. One study of this issue found that 41% of patients reported having withheld a relevant question or medical problem because they either did not know how to raise the concern or felt the doctor was rushed.<sup>19</sup> In sum, without full patient participation in the decisionmaking process, some patients may be getting care they do not want while others may not receive care they would prefer.

## Clinician Preferences Affect Rates Over Time

When patients are not well-informed about and involved in treatment decisions, clinicians' preferences and opinions can have a powerful effect on the rate of elective tests and procedures in a given community. In some communities, a single group of physicians can strongly affect the rate of a particular procedure, thereby contributing to a significant variation.<sup>20</sup> Variation in rates of preference-sensitive care that is not due to prevalence of disease or patient preferences is considered unwarranted.

Patterns of unwarranted variation tend to persist over time. This study found that within each California hospital referral region (HRR), certain procedures were performed more often and others less often over the eight-year period. Other studies have found that such patterns can persist over decades.<sup>21</sup> Moreover, in any given community, the rate of one procedure does not predict the rate of any other. In the Bakersfield HSA, for example, the rate of angiography is high — 223% of the state rate — while the rate of elective induction is average — 100% of the state rate.

Meanwhile, in Indio HSA, the reverse is true. The rate of elective induction is high — 189% of the state rate — while the rate of angiography is average — 109% of the state rate.

This phenomenon — the “surgical signature” — was first observed by John E. Wennberg, founder of the *Dartmouth Atlas*. He and other researchers have noted that because “regions with high rates of surgery in the 1990s still tend to have high rates today, the cumulative effect is to expose large numbers of patients to surgical interventions that they may or may not have wanted.”<sup>22</sup>

## Potential Remedies

### Better Use of Evidence

Better clinical guidelines can help reduce unwarranted variation. This is especially the case if those guidelines are developed from systematic reviews or comprehensive summaries of the evidence from multiple studies, preferably randomized controlled

clinical trials. Greater dissemination of results from comparative effectiveness research could help clinicians distinguish the relative benefits and harms of treatment options, and in the process help them offer better advice to patients and thereby reduce rates of inappropriate utilization.

This study found declines in the rates of elective cardiac procedures over time: angiography declined 15%; PCI declined 30%; and CABG declined 22%. These declines may be a reflection of the impact of the growing use of updated clinical guidelines from the American Heart Association/American College of Cardiology,<sup>23</sup> as well as the American College of Cardiology Appropriate Use Criteria.<sup>24</sup>

While the study found declines in the statewide rate at which PCI is performed and in the geographic variation associated with this procedure statewide, a considerable amount of geographic variation persists for this procedure. The continued variability in rates of PCI highlights the important distinction between appropriateness and patient choice. The clinical guidelines are intended to ensure that only appropriate candidates undergo the procedure, because inappropriate patients are more likely to be harmed than helped by it. Yet one recent study found that only about half of elective PCIs were done on clearly appropriate patients and about 12% of PCIs were clearly inappropriate.<sup>25</sup>

Other studies suggest that even if only appropriate patients are offered PCI, patients still need to be fully informed and their treatment preferences honored, since it is perfectly reasonable for an appropriate patient to choose not to undergo the procedure.<sup>26</sup>

## Increased Transparency

Increasing transparency among providers regarding the rate of certain procedures is another potential means of curbing unwarranted variation. When physicians and other clinicians are made aware of variation, they may examine their own practice patterns in relation to others and make an effort to adjust overuse or underuse of certain treatments or procedures.

In an example of this, noted by J. Wennberg, “Over one four-year period in the 1970s, hysterectomy rates in Lewiston [Maine] were such that over 800 more women were operated on than would have experienced surgery had the average rate for the state applied.” Upon learning of these data, the leadership of the hospital for the Lewiston area imposed a quota to bring the rate of hysterectomies down to the state average. By 1981, the rate at which women in Lewiston had undergone a hysterectomy declined by 45%, and this rate remained stable over time.<sup>27</sup>

It should be noted, however, that increased transparency does not necessarily mean that patients receive the care they prefer. Studies suggest that a high rate of a procedure in a community does not necessarily mean that all patients who are appropriate candidates and who want the procedure are getting it, and a low rate does not mean that patients who are inappropriate candidates, or who do not want the procedure, are avoiding it.<sup>28</sup>

## Greater Use of Shared Decisionmaking

There is growing agreement among clinicians that patient preferences should be central to decisions about elective care.<sup>29</sup> Patients should be well-informed and engaged as much as possible in the decisionmaking process. This engagement should recognize the patient’s particular values and preferences, including the level of willingness to accept uncertainty in outcomes. One way to help ensure that patients are informed and engaged in decisions around preference-sensitive treatments is through shared decisionmaking, a formal process to encourage patient and clinician to reach a treatment decision jointly. This process may be enhanced by the use of patient decision aids, which can include printed documents, DVDs, and interactive web-based programs that offer patients balanced, evidence-based information about their medical condition, treatment options, and the trade-offs involved in each choice.

A recent systematic review, which examined more than 80 randomized controlled trials comparing patients who had access to decision aids versus patients who did not, found that decision aids:

- ▶ Helped patients better understand their treatment options
- ▶ Gave patients a more realistic perception of their chances of benefits and harms
- ▶ Left patients feeling more satisfied with the decision they made and less conflicted about that decision
- ▶ Helped patients take a more active role in their medical care

- ▶ Reduced the percentage of patients who remained undecided after counseling
- ▶ Improved agreement between a patient’s values and the option the patient actually chose<sup>30</sup>

Significantly for both patients and the health care system, studies have also found that when patients are part of the medical decisionmaking process, they often opt for more conservative, and less expensive, treatment options without compromising their health.<sup>31</sup>

## Conclusion

Reducing the problem of unwarranted variation in elective procedures will require strong efforts on the part of providers, patients, and those who pay for care (health plans and government). Greater sharing of knowledge among the stakeholders — through better understanding of clinical evidence, transparency concerning local differences in rates of various procedures, and shared decisionmaking — can help reduce unwarranted variation. Clinical decisionmaking tools, such as patient decision aids, can also make a difference by offering balanced, evidence-based information about medical conditions, treatment options, and the trade-offs involved in each choice.

These findings about rate variation have significant implications for health care policy. Patients who were fully informed were on average 20% less likely to choose invasive treatment options, which are generally more costly than noninvasive options, with no adverse effects on health outcomes or on satisfaction with care.<sup>32</sup> Wennberg and his colleagues estimated

that approximately 25% of Medicare spending goes toward preference-sensitive treatments, mostly elective surgeries.<sup>33</sup> This suggests that addressing the problem of unwarranted variation in rates of elective procedures, and involving patients more fully in treatment decisions, could not only help ensure that patients get the care they prefer but also have a significant impact on overall health care spending.

## Research Methodology

**R**esearch for the 2011 series of Close-Up reports in this project examined the rate of variation for procedures for several conditions: cardiovascular disease, childbirth, arthritis of the hip and knee, gynecological conditions, breast cancer, gall bladder disease, and obesity. Data for that earlier series incorporated hospitalizations and ambulatory surgery center visits that took place between January 1, 2005, and December 31, 2009, using data collected by the California Office of Statewide Health Planning and Development (OSHPD).

The 2013 series of Close-Up reports covered spine surgeries, prostate cancer testing and treatment, and breast cancer treatment using data from January 1, 2005, through December 31, 2010. For analysis of spine surgeries, the research used OSHPD data. For analysis of prostate cancer treatment, the project used data from Medicare claims and the California Cancer Registry. Analysis of breast cancer treatment variation was derived from data from the California Cancer Registry.

The 2014 series of Close-Up reports examines the rates of procedures and changes in the amount of variation over two time periods (2005 through

2008 and 2009 through 2012) using data collected by OSHPD for procedures for these conditions: cardiovascular and other vascular disease, childbirth, arthritis of the hip and knee, and gall bladder disease.

The researchers for this project classified each hospitalization or visit according to the hospital service area (HSA) and hospital referral region (HRR) in which the patient resided, using data on the patient's residence zip code and definitions of HSAs and HRRs developed by the Dartmouth Atlas Project. The total number of procedures was computed for each service of interest in each area; rates of use were created by dividing by the population of each area.<sup>34</sup>

The rates of use were adjusted to account for variations in age, sex, race/ethnicity, income, education, and insurance status of people in each area. Data for procedures to treat cancer were also adjusted for variations in disease severity, including clinical stage and cancer incidence rate. For some procedures, rates were also adjusted for the number of hospitalizations for acute myocardial infarction at the population level and the number of hospitalizations in which patients had a diabetes diagnosis code at the population level, which are thought to capture variations in important aspects of health status.

Statistical techniques were used to “hold constant” these factors across areas so that the rates reported did not vary geographically because of variations in these characteristics. As a result, the differences in procedure frequencies reported were most plausibly caused by factors other than those for which adjustments were made.

### HSAs and HRRs

A hospital service area (HSA) represents a local health care market for community-based inpatient care. Usually, Medicare beneficiaries in the service area receive the majority of their inpatient care within the HSA, which can include more than one community. A hospital referral region (HRR) represents a health care market for tertiary medical care. (A tertiary designation is based on where patients receive major cardiovascular surgical procedures and neurosurgery.) Each HRR includes at least one HSA that has a hospital or hospitals that perform major cardiovascular procedures or neurosurgery. The Medicare beneficiaries who live in an HRR get the majority of their tertiary inpatient care within the HRR.

Of interest in the current project was how often a patient received hospital treatment in the HSA or HRR where they lived. These “locality rates” were calculated for all measures based on OSHPD patient discharge data, at both the HRR and HSA levels. Locality rates for HRRs were 70% or higher in most cases. Rates for HSAs were often lower, as might be expected, as patients are more willing to travel for certain types of procedures. For HSAs where locality rates were zero, this indicates that no patients sought care in their own HSA. One common reason for this was that hospitals in the HSA did not provide that particular service.

Because there is no recommended “right” rate for elective procedures, state averages are used in these Close-Up reports only as comparators for analysis, not as benchmarks. The rates of procedures per 1,000 or 100,000 people are compared to statewide averages per 1,000 or 100,000 people. Particular attention is paid to those areas where the rate of a procedure was at least 20% more or at least 50% less than the statewide average.

### Acknowledgments

This report is based on estimates of area-level utilization developed by Laurence Baker, PhD, a consultant to this project, who is 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. Further analyses of the estimates were performed by Frances Tompkins, data consultant. Interpretation of the data was performed by Maryann O’Sullivan and Laurence Baker in consultation with members of the project’s Advisory Committee and committee chair Lance Lang, MD.

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.

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### About the Foundation

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### More Information

For more information on this research and its findings, and to use the interactive data map, visit [www.chcf.org/variation](http://www.chcf.org/variation).



## Advisory Committee

The following health care leaders were extraordinarily generous with their time and thoughtful input during the process of creating these reports. Not all of the advisers listed below participated in all of the analyses and reports in this series; advisers with (\*) after their names below provided input on this third in a series. Since input was sought from a broad spectrum of experts, no individual member of the committee should be considered as endorsing all the conclusions contained in the reports.

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## Endnotes

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