THE IMPACT OF MANDATORY PUBLIC REPORTING ON CORONARY ARTERY BYPASS GRAFT (CABG) CASE SELECTION AND OUTCOMES IN CALIFORNIA

Prepared for the Office of Statewide Health Planning and Development, California CABG Outcomes Reporting Program

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Public reporting of coronary artery bypass graft (CABG) surgery performance data has been described as a means of empowering the public, health care purchasers, and health care providers to make informed decisions when selecting hospitals and surgeons for CABG surgery.[1] Public reports of CABG performance data have also been credited with stimulating quality improvement both at the hospital and physician level.[2,3] However, there have been some concerns that public reporting of CABG performance data may lead to hospitals and surgeons either selecting low risk patients or avoiding high risk patients as a way of achieving low mortality rates. Whether these public reports of performance data result in changes in market share, mortality, and patient selection remains controversial.

Studies of hospital choice suggest that consumers, even in the absence of public information, tend to prefer hospitals with low risk-adjusted CABG death rates.[4] Previous studies of New York data found that public reporting of CABG performance data resulted in minimal or inconsistent changes in market share among hospitals labeled as high CABG mortality outliers, [5,6,7,8] (although larger effects on surgeon volume were reported[5]). Furthermore, report cards may have unintended negative consequences, such as reducing access to surgery for high-risk patients[9,10] and decreasing surgeons' willingness to offer CABG surgery to high risk patients. However, most of these data come from New York, and the impact of California's reports on hospital market share and mortality is unknown.

A previous, unpublished analysis of the impact of voluntary public reporting in 2001-2005 on hospital mortality for CABG surgery in California found:

- small, but statistically significant increases in market share for low mortality outliers (at 3, 6, and 12 months after publication of a report);
- no trend in market share for high-mortality outliers, non-outliers, or hospitals not participating in the voluntary program;
- no changes within or across strata in risk-adjusted mortality using administrative data, and inconsistent changes in risk-adjusted mortality using clinical data from hospitals voluntarily reporting to the registry; and
- no evidence of risk selection by high-mortality outlier or non-outlier hospitals, but limited evidence of slight risk selection by low-mortality outlier hospitals.

Impact of Publicly Reporting CABG Hospital Mortality Rates In California

We performed a series of analyses to answer the following three questions about the impact of the public release of CCORP (mandatory) reports on hospital mortality for CABG surgery in California:

- Did CCORP reports lead to volume changes, either overall or at outlier hospitals?

- Did CCORP reports lead to different patient selection for surgery, either overall or at outlier hospitals?
- Did CCORP reports lead to lower risk-adjusted mortality, either overall or at outlier hospitals?

Methodology

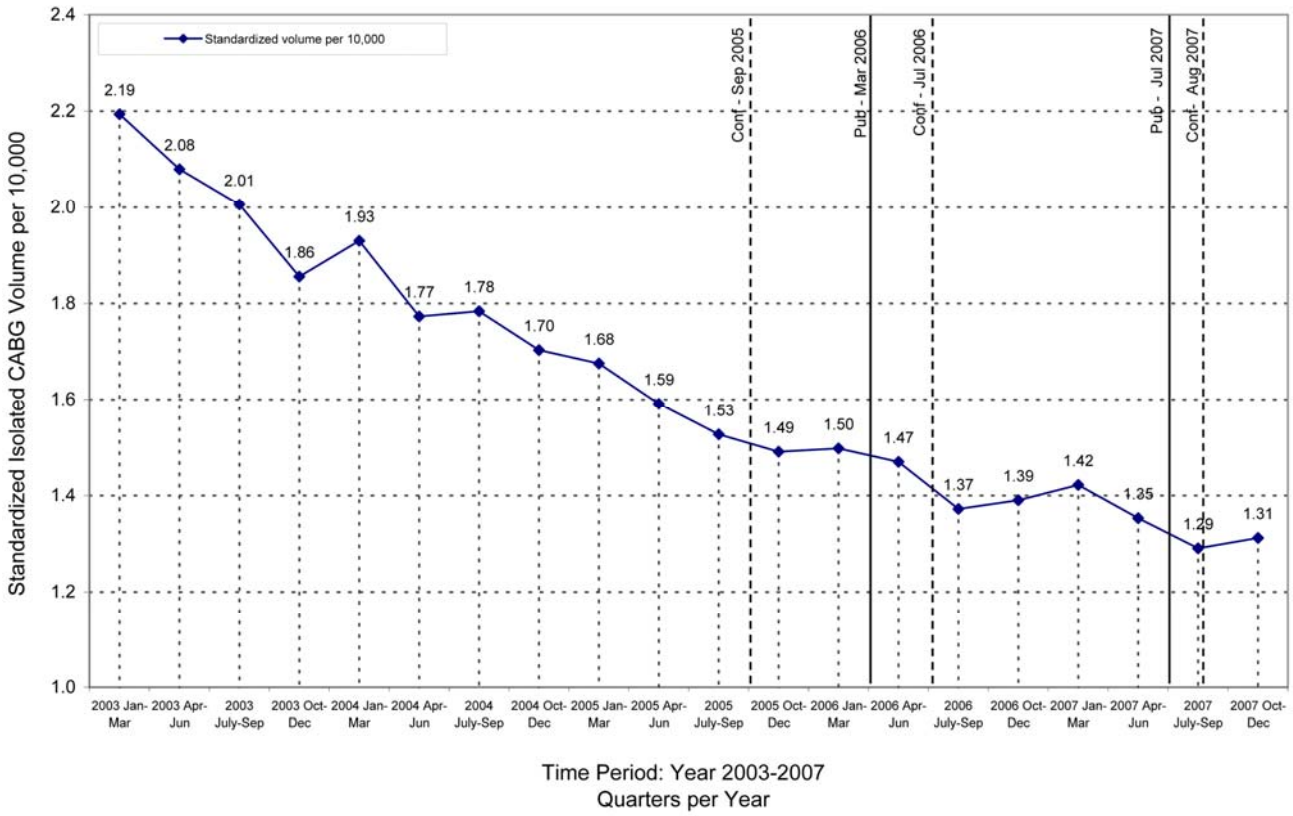
These analyses were performed using CCORP data from 2003 through 2007 and are limited to isolated CABG procedures. Three CCORP reports were released during this period: (1) a report based on 2003 hospital data was shared with hospitals in September 2005 and publicly released in March 2006; (2) a report based on 2003-2004 data (for both hospitals and surgeons) was shared with hospitals in July 2006 and publicly released in July 2007; and (3) a report based on 2005 hospital data was shared with hospitals in August 2007 and publicly released in January 2008.

A multivariable logistic risk-adjustment model was estimated on 2003-04 data, using risk factors from the current model that were ascertainable in the data from 2003-04. The estimated parameters from this model were then used to estimate the probability of operative mortality (i.e., in-hospital death at any time or post-discharge death within 30 days after the operation) for all patients in all years, to ensure stability of the risk-adjustment procedure across the period before and after publication of the first CCORP report. Isolated statewide CABG volume per 10,000 resident adults (based on mid-year population estimates from the California Department of Finance) was graphed by quarter to identify any effect of CCORP reporting on utilization of CABG surgery. Expected operative mortality was graphed by quarter to identify any effect of CCORP reporting on selection of high-risk patients. Risk-adjusted operative mortality was graphed by quarter to identify any effect of CCORP reporting on overall quality of care, as measured by patient outcomes. These analyses were then stratified by hospital and surgeon mortality classification to identify any differential effects on hospitals or surgeons that were labeled as either high-mortality or low-mortality outliers. Surgeons who entered or left the market after publication of the first CCORP report were assigned to separate strata so that the impact on surgeons who performed CABG surgery throughout this period could be isolated.

Findings

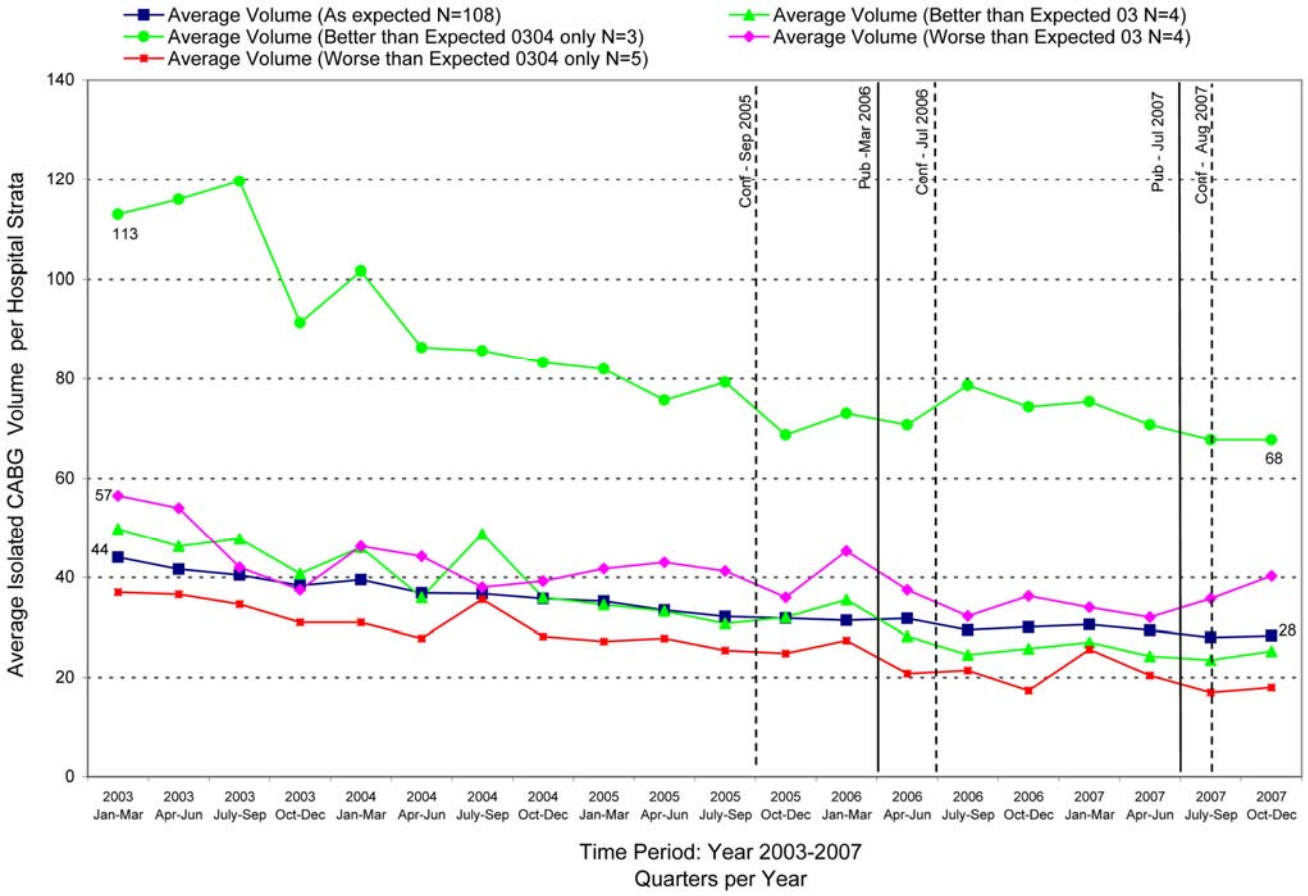
Key findings from these analyses are shown in the following eight graphs. Figure 1 shows that the rate of isolated CABG surgery volume in California fell about 40% from 2.19 per 10,000 resident adults in the first quarter of 2003 to 1.29-1.31 per 10,000 resident adults in the last two quarters of 2007. However, nearly 75% of this decrease occurred before the first CCORP report was even confidentially released to hospitals in September 2005.

Figure 1: Statewide Volume Trend (Isolated CABG per 10,000 Adults)



A stratified analysis by hospital mortality classification (Figure 2) shows no evidence of differential loss of volume by outlier hospitals. Of 12 surgeons rated as high-mortality outliers in the July 2007 report on surgeon-specific outcomes, 4 (33%) discontinued doing CABG surgery in California. This percentage compares with 0 of 4 (0%) surgeons rated as low-mortality outliers, and 85 of 332 (26%) surgeons rated as non-outliers, who left the California market.

Figure 2: Mean Quarterly Volume by Hospital Mortality Classification



A stratified analysis by surgeon mortality classification (Figure 3) suggests a steeper downward slope in mean quarterly CABG volume for high-mortality surgeons than for non-outlier surgeons.

Figure 3: Mean Quarterly Volume by Surgeon Mortality Classification

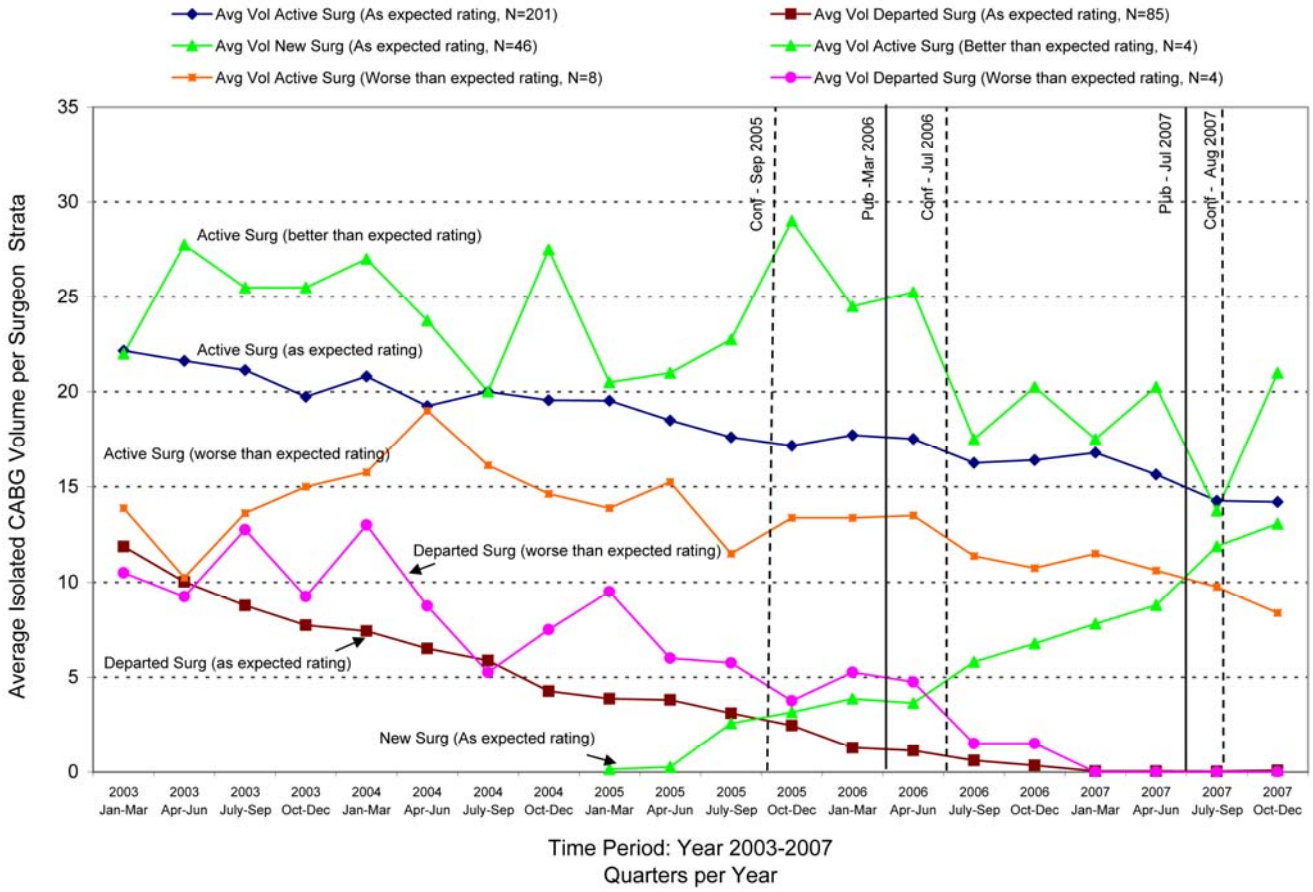
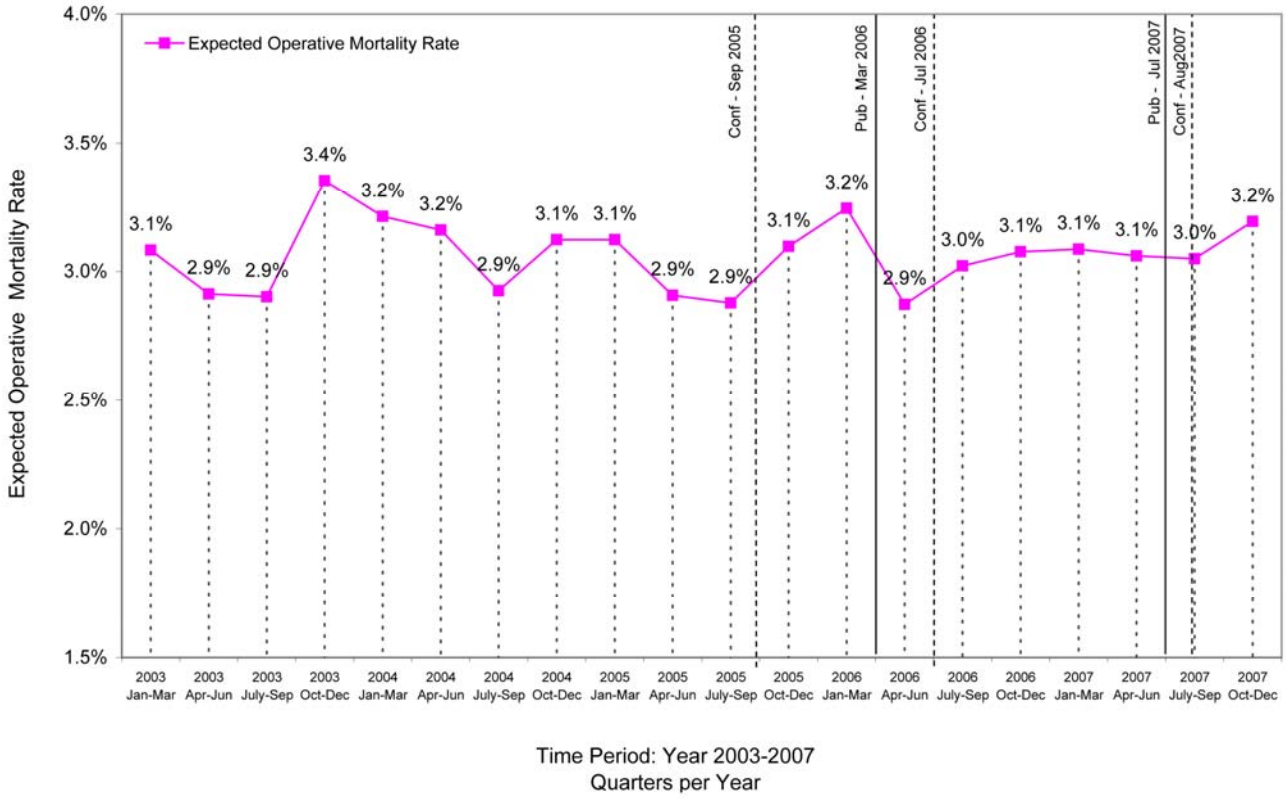


Figure 4 shows that expected operative mortality has varied within a range of 2.87% to 3.35% across this five-year period. A modest decrease in expected operative mortality right after the first public release of a CCORP report, from 3.25% to 2.87%, was followed by a slow but steady increase in expected operative mortality to 3.18% in the last quarter of 2007.

Figure 4: Expected Operative Mortality by Quarter



Stratified analyses by hospital mortality classification (Figure 5) and surgeon mortality classification (Figure 6) show no evidence of differential patient selection by outlier hospitals and surgeons.

Figure 5: Expected Mortality by Hospital Mortality Classification

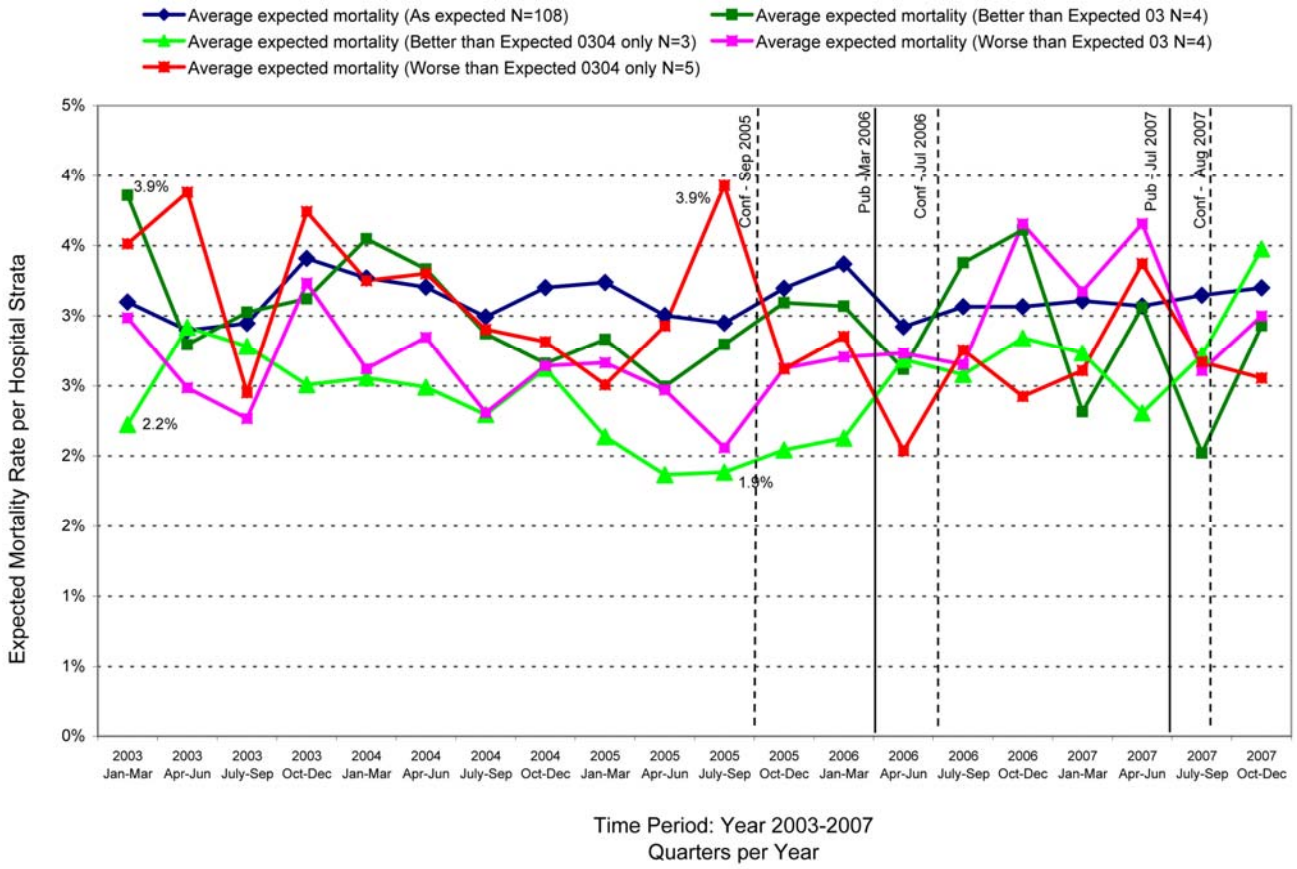


Figure 6: Expected Mortality by Surgeon Mortality Classification

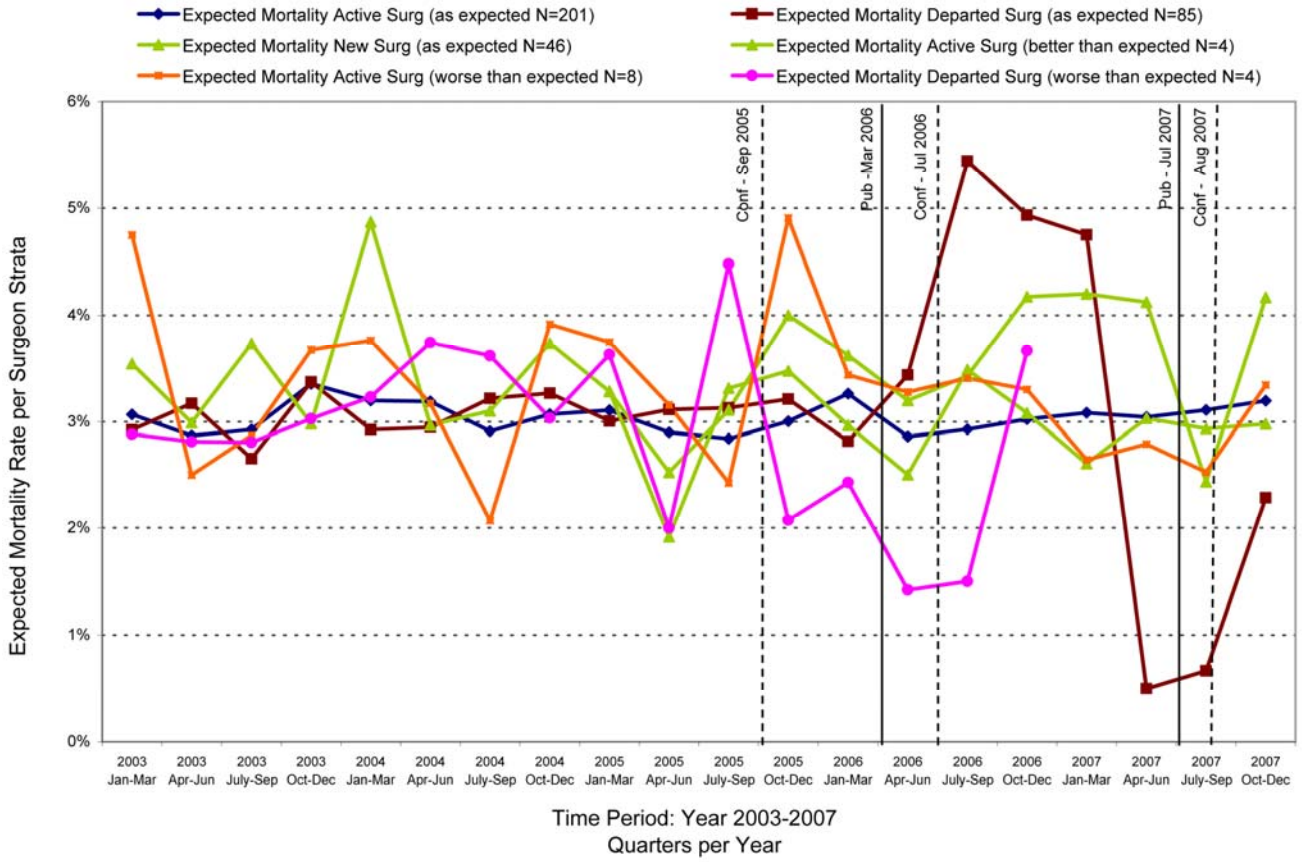
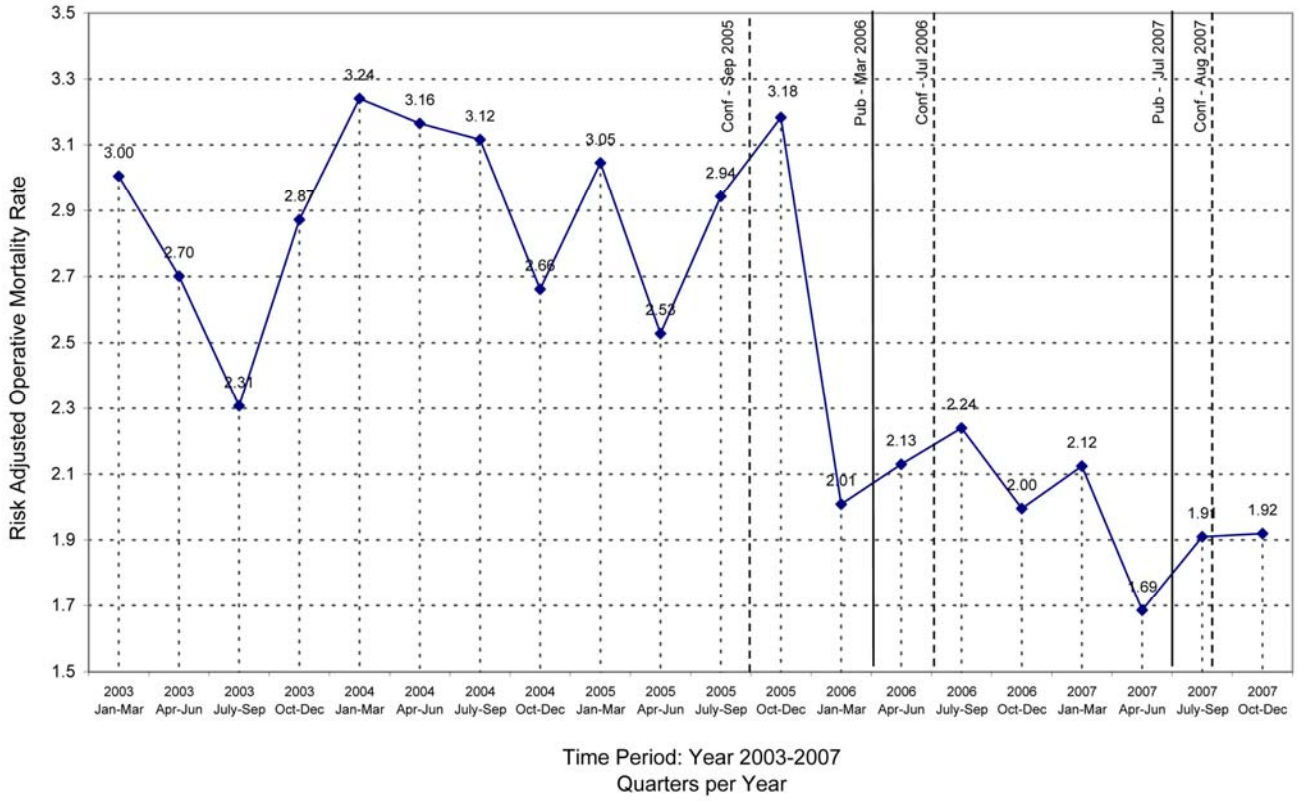


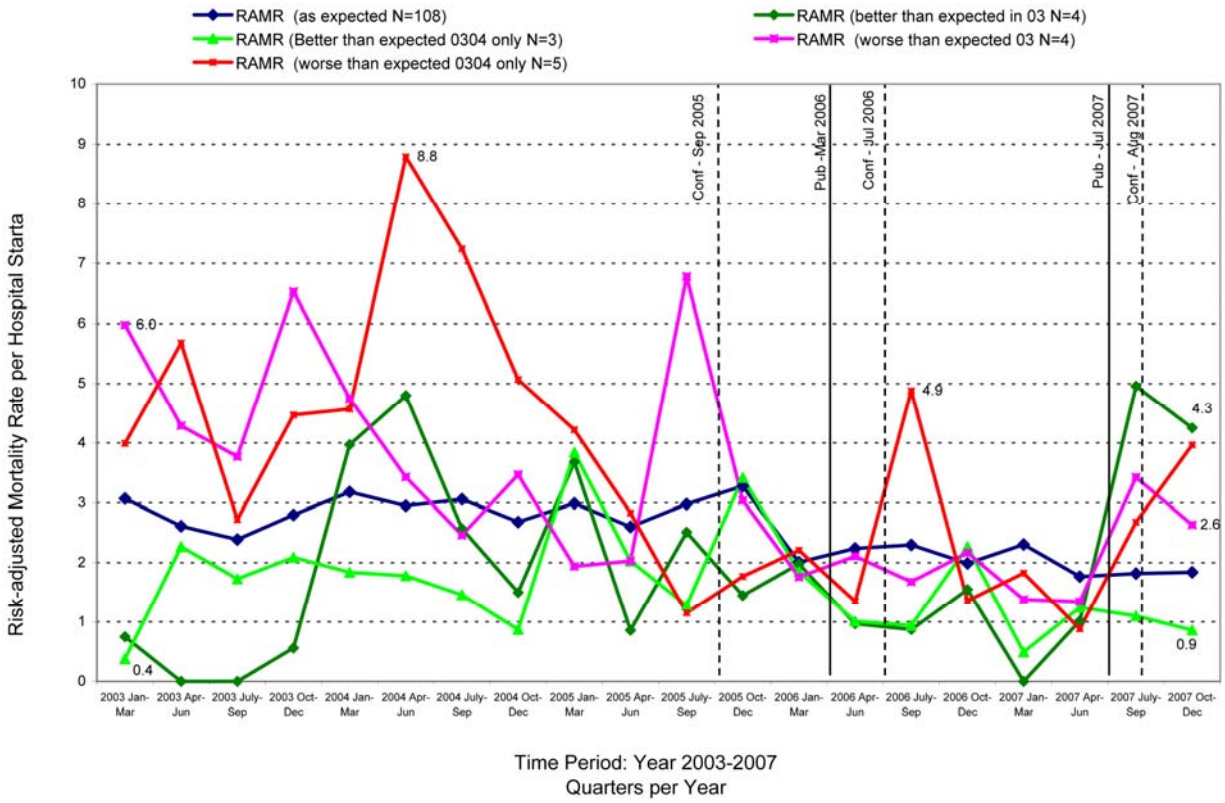
Figure 7 shows that risk-adjusted operative mortality decreased by 27% from an average of 2.79% in the seven quarters before public release of the first CCORP report in March 2006 to an average of 2.03% in the seven quarters thereafter. The most dramatic decrease occurred between the fourth quarter of 2005 (3.18%) and the first quarter of 2006 (2.01%), but the risk-adjusted operative mortality rate has remained consistently below 2.24% since then.

Figure 7: Risk-adjusted Operative Mortality by Quarter



Stratified analyses by hospital mortality classification (Figure 8) show that the decrease in risk-adjusted operative mortality was driven largely by non-outlier hospitals (which comprise 108 of the 124 included facilities), although hospitals labeled as high-mortality outliers experienced greater relative improvement in risk-adjusted mortality.

Figure 8: Risk-adjusted Mortality by Hospital Mortality Classification



In conclusion, there is no clear effect of CCORP reporting on the overall utilization of CABG surgery in California. Mean quarterly volume has declined similarly at high-mortality outlier hospitals, non-outlier hospitals, and low-mortality outlier hospitals. However, surgeons labeled as having high risk-adjusted mortality in the 2007 report appear to have lost more volume than surgeons labeled as non-outliers. Although some surgeons discontinued performing CABG surgery in California during this period, only 4 of the 89 surgeons who did so were labeled as having high risk-adjusted mortality, and these 4 surgeons represented only one-third of the 12 surgeons who were so labeled. There was no apparent trend in patient selection for CABG surgery, which was measured by expected mortality, either overall or among hospitals and surgeons labeled as high-mortality outliers. Finally, there was a substantial and sustained statewide reduction in risk-adjusted mortality, which was not explained by volume shifts among different types of providers. This drop in mortality took place soon after confidential release of the first CCORP report to hospitals.

Limitations

These analyses have several limitations. No formal hypothesis testing has been performed, because sophisticated statistical modeling is required to account for the clustering of patients within surgeons and hospitals, as well as potential autocorrelation over time. There are no parallel data on trends in states without public reporting programs, so the possibility of a simultaneous drop in risk-adjusted mortality nationwide cannot be excluded. Although it is conceivable that hospitals began over-reporting risk factors (or stopped underreporting risk factors) concurrent with public release of the first CCORP report, annual hospital medical chart audits have found no evidence of such a sudden and pervasive change in risk factor reporting. A voluntary reporting program (CCMRP) began several years before CCORP, so there may have been important effects on patient selection before the period of these analyses. No information is available on the patients who would have received CABG if they had presented for treatment in 2003-2004, but who presumably did not later receive CABG. An indeterminate percentage of these patients may have received a percutaneous coronary intervention instead, which may have led to either better or worse outcomes than if they had received CABG. Finally, the mechanism for the observed drop in risk-adjusted mortality is unclear, though it did occur shortly after release of the first confidential CCORP report to hospitals. Possibilities include increased use of cardioprotective medications during the perioperative period, better operative techniques, earlier identification or more aggressive treatment of postoperative complications, or better selection of patients for surgery in ways that cannot be captured by risk-adjustment modeling (i.e., operating on the same patient at a lower risk time in the course of their illness). Future studies should explore these questions, so that similar improvements in patient outcomes can be achieved for other surgical procedures and in other settings.

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