

# Variations in Procedure Use in California

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# Study Goal

- Identify variations in key procedures across geographic areas in California
  - Focus on elective treatments and treatments sensitive to patient information
  - Target situations where “shared decisionmaking” could be useful



# Methodology Highlights

- Population-level rates of use of a range of procedures for all of California
- Includes both hospital and, where appropriate, ambulatory surgery center (ASC) procedures
- All-payer data
- Includes patients under age 65
- Risk adjusted



# Data

- OSHPD hospital discharge data
- OSHPD ASC encounter data

## ➔ Study data (2005-2009)

- Generally focusing on patients age 20 and over, treated in acute care hospitals or ASCs



# Finding Procedures

- Identify procedures of interest that meet identified specifications
  - Based on ICD-9 or CPT procedure codes
- In some cases, focus on patients with specific diagnoses
  - e.g., patients with diagnoses for which a treatment is likely to be “elective”



# Study Treatments

## Heart Procedures

- Elective coronary angiography
- Elective angioplasty (PCI)
- Elective coronary artery bypass graft (CABG)

## Childbirth Procedures

- Elective cesarean section
- Elective induction
- Vaginal birth after cesarean

## Joint Replacement

- Hip replacement
- Knee replacement

## Women's Health

- Hysterectomy
- Mastectomy

## Other

- Carotid endarterectomy
- Cholecystectomy (gallbladder removal)
- Weight loss surgery



# Geographic Areas

- Assign each procedure to the geographic area in which the patient resides
  - Hospital Referral Region (HRR) – 22 in CA
  - Hospital Service Area (HSA) – 209 in CA

Note: Area of residence is not necessarily the geographic area in which treatment is given but is often closely related



# Area Measures

- Create rates of procedure use per population of the area
  - For birth measures, per delivery
- Rates only computed for areas where 15 or more procedures are observed
- Risk adjust for a range of characteristics
  - Variations across areas should not be due to factors included in the risk adjustment





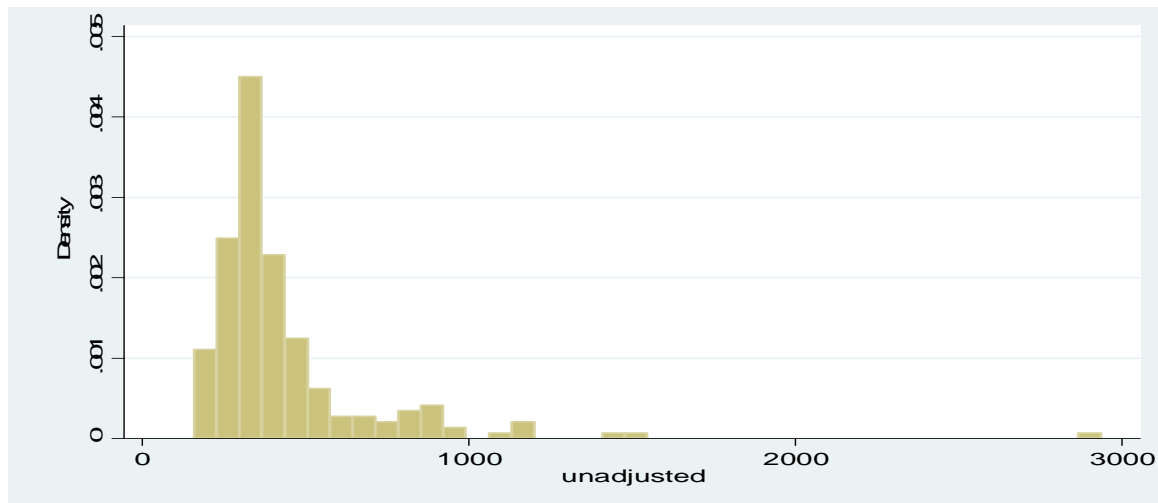
# Risk Adjustment

- Regression-based risk adjustment
- Risk adjusters
  - Age
  - Sex
  - Race/ethnicity
  - Education
  - Income
  - Insurance coverage
  - AMI hospitalization rate\*
  - Rate of hospitalization with diabetes diagnosis\*

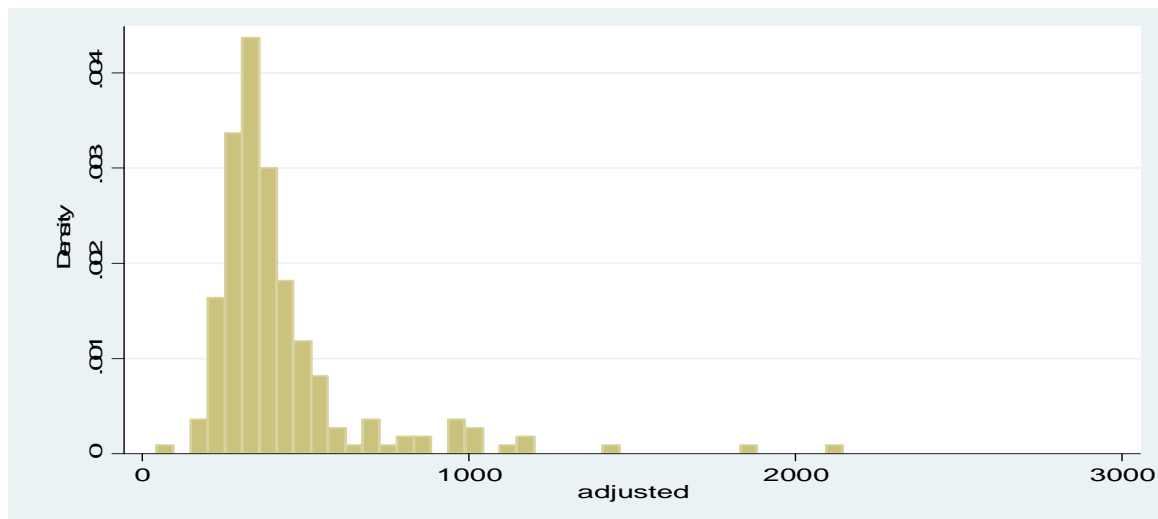
\*Used with treatments for which these are relevant risk adjusters



# Effects of Risk Adjustment



standard deviation  
= 281



standard deviation  
= 255



# Presentation and Precision

- Rates often expressed relative to the state average
  - e.g., an area may be 200% of the state average – twice as high
  - e.g., an area may be 50% of the state average – half as high
- Statistical precision information available online
  - 95% confidence intervals for risk adjusted rates



# Elective Coronary Angiography <sup>?</sup>

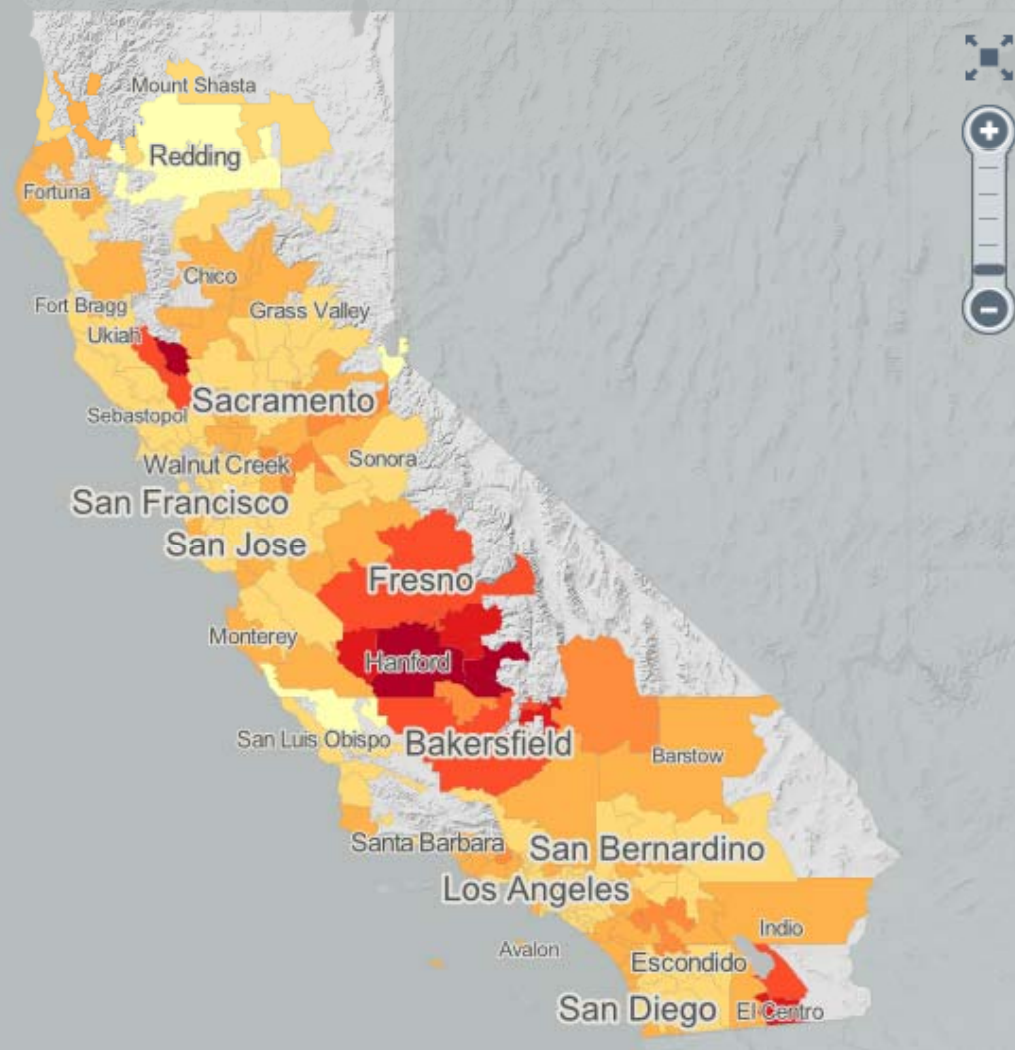
Hospital Referral Regions <sup>?</sup>

Hospital Service Areas <sup>?</sup>

## Adjusted rates for Hospital Service Areas



## Compared to state average



Screenshot from: <http://www.chcf.org/publications/2011/09/medical-variation-rates-california>

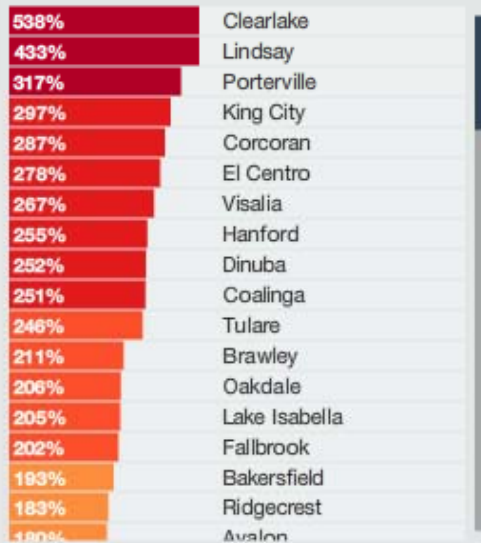


# Elective Angioplasty (PCI) ?

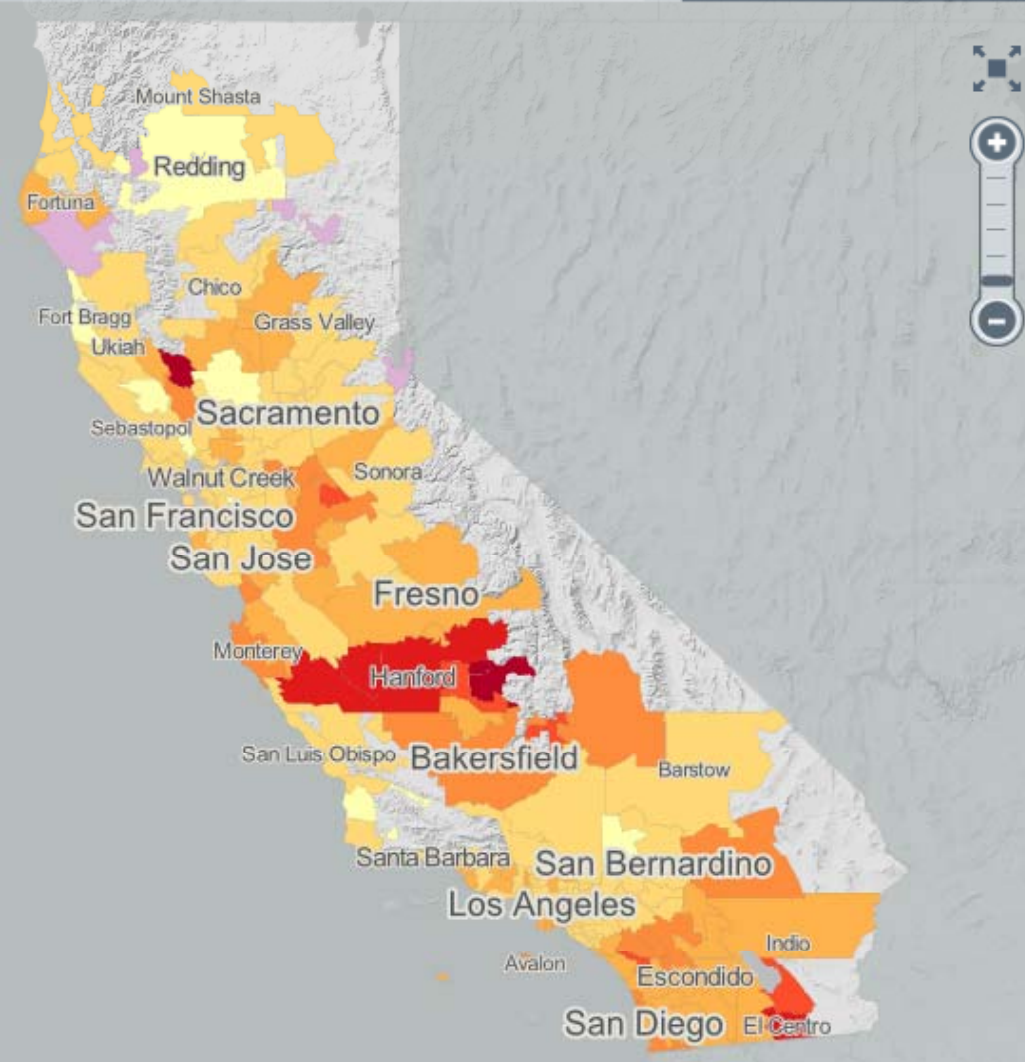
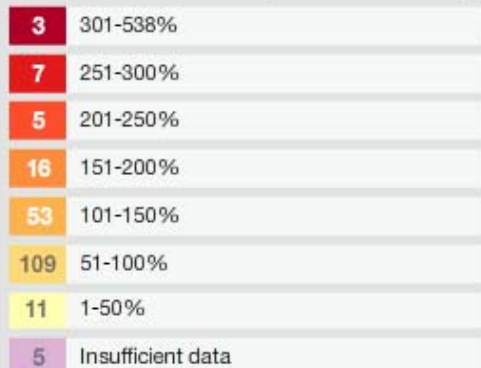
Hospital Referral Regions ?

Hospital Service Areas ?

## Adjusted rates for Hospital Service Areas



## Compared to state average



# Elective Coronary Artery Bypass Graft (CABG) ?

Hospital Referral Regions ?

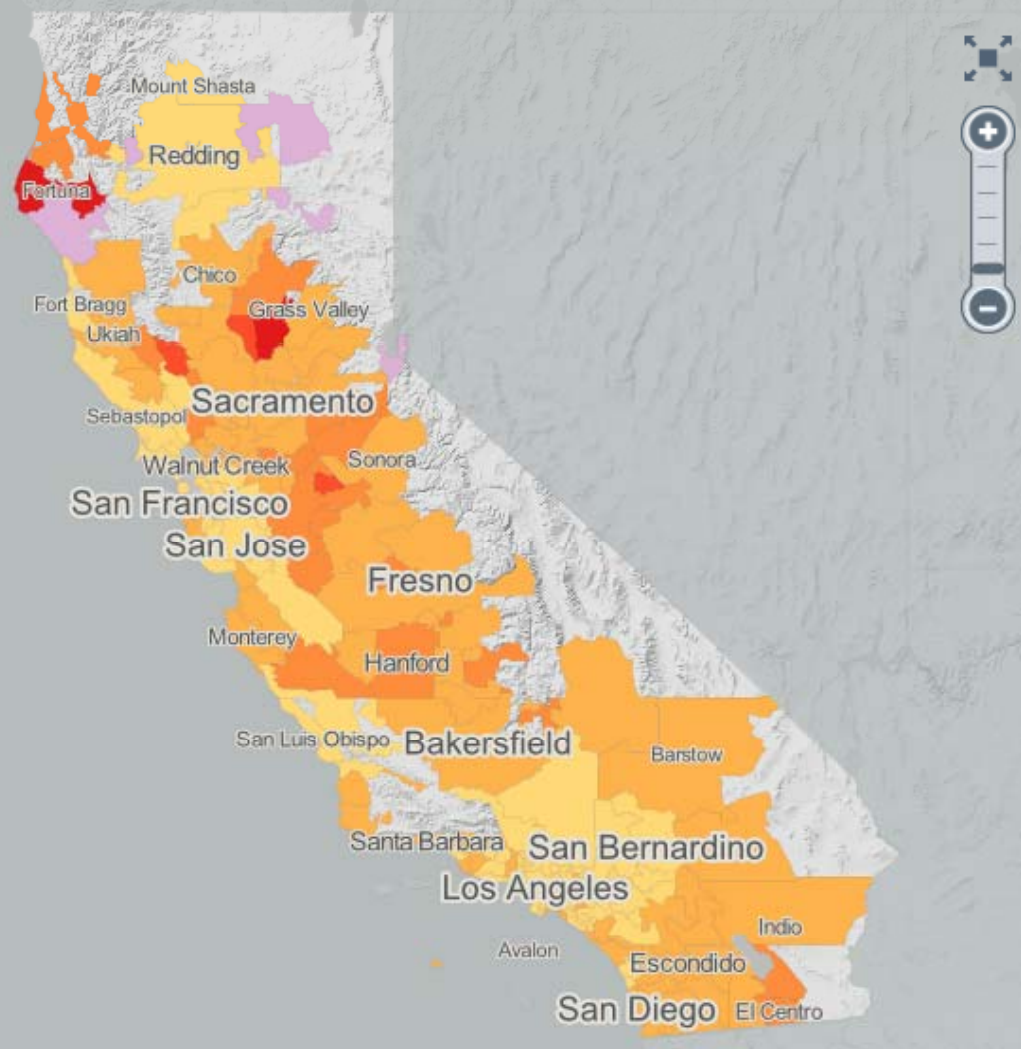
Hospital Service Areas ?

## Adjusted rates for Hospital Service Areas

264%	Marysville
261%	Fortuna
244%	Yuba City
236%	Clearlake
216%	Oakdale
196%	Gridley
194%	Modesto
193%	Madera
192%	El Centro
180%	Brawley
176%	King City
174%	Hanford
168%	Napa
160%	Stockton
160%	Arcata
159%	Turlock
158%	Jackson
157%	Orville

## Compared to state average

0	301-350%
2	251-300%
3	201-250%
21	151-200%
78	101-150%
98	51-100%
0	1-50%
7	Insufficient data



Screenshot from: <http://www.chcf.org/publications/2011/09/medical-variation-rates-california>



# Vaginal Birth After Cesarean (VBAC) ?

Hospital Referral Regions ?

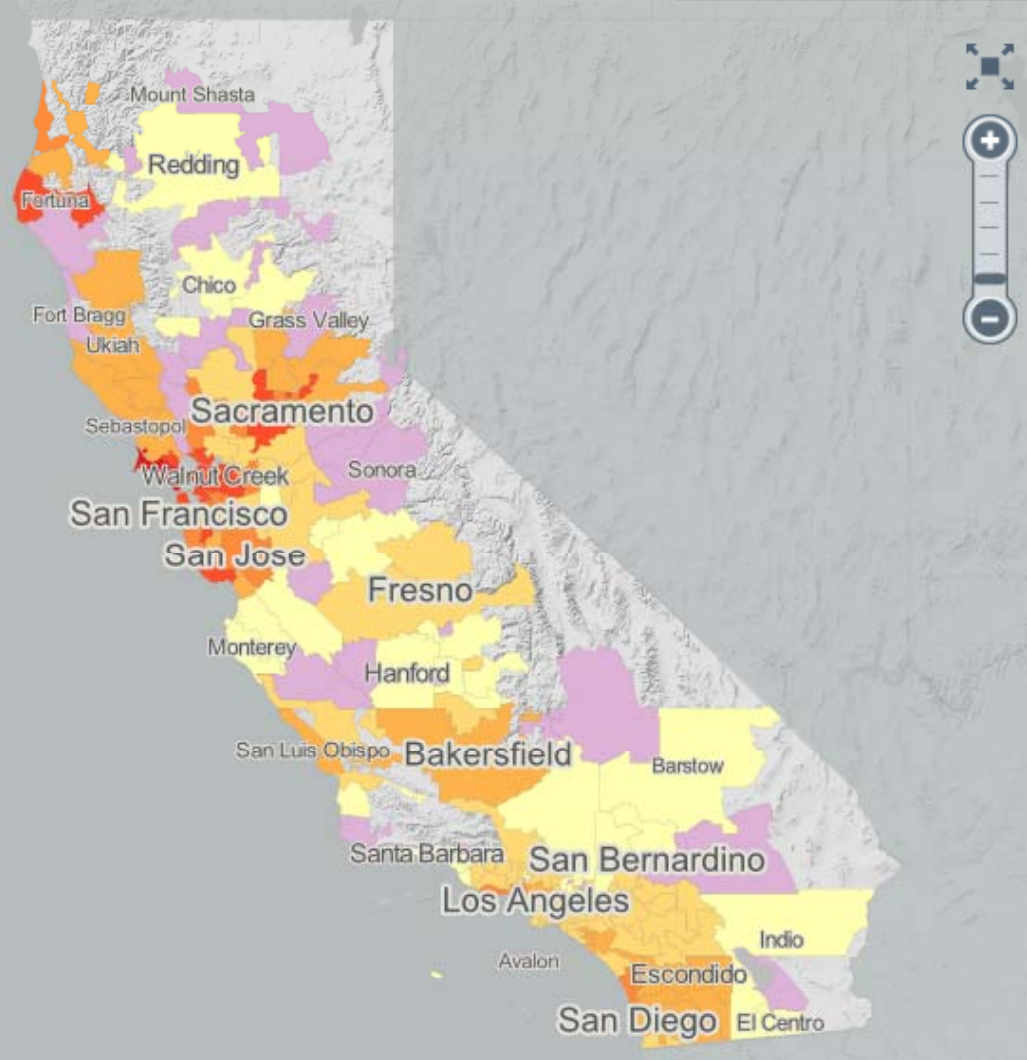
Hospital Service Areas ?

## Adjusted rates for Hospital Service Areas

301%	Berkeley
295%	Greenbrae
248%	San Francisco
242%	Vallejo
236%	Pittsburg
232%	Oakland
224%	Concord
222%	Martinez
217%	Walnut Creek
215%	Santa Cruz
215%	Daly City
213%	Stanford
213%	San Pablo
209%	Novato
204%	Pinole
203%	Sacramento
202%	Fortuna
199%	South San Francisco

## Compared to state average

1	301-350%
1	251-300%
15	201-250%
23	151-200%
27	101-150%
72	51-100%
31	1-50%
39	Insufficient data



Screenshot from: <http://www.chcf.org/publications/2011/09/medical-variation-rates-california>



# Knee Replacement ?

## Hospital Referral Regions ?

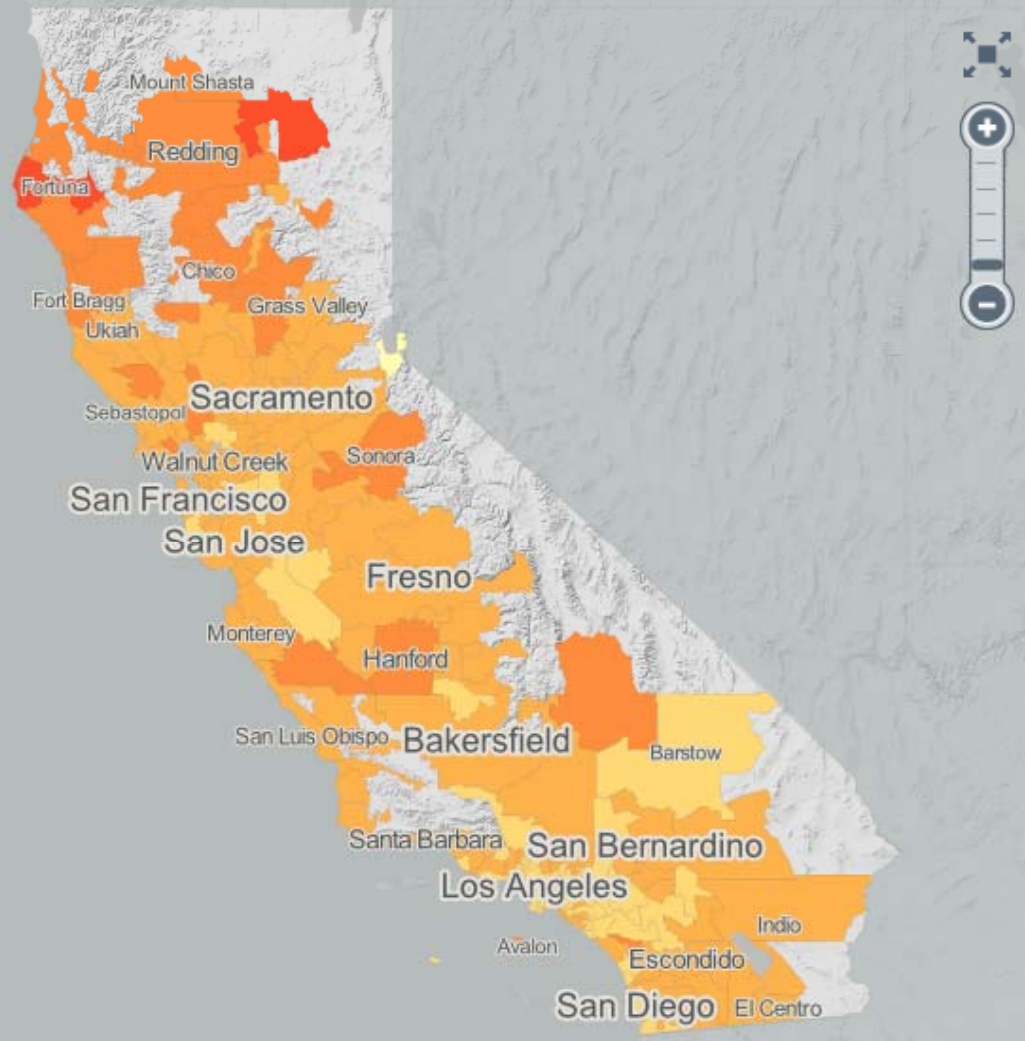
## Hospital Service Areas ?

### Adjusted rates for Hospital Service Areas

209%	Fall River Mills
204%	Fortuna
200%	Red Bluff
190%	Weaverville
187%	Redding
184%	Oroville
178%	Sonora
175%	Fort Bragg
174%	Healdsburg
172%	Mount Shasta
172%	Willits
171%	Hanford
170%	Garberville
165%	Chico
163%	Avalon
163%	Greenville
162%	King City
162%	Firelake

### Compared to state average

0	301-350%
0	251-300%
2	201-250%
24	151-200%
115	101-150%
67	51-100%
1	1-50%
0	Insufficient data





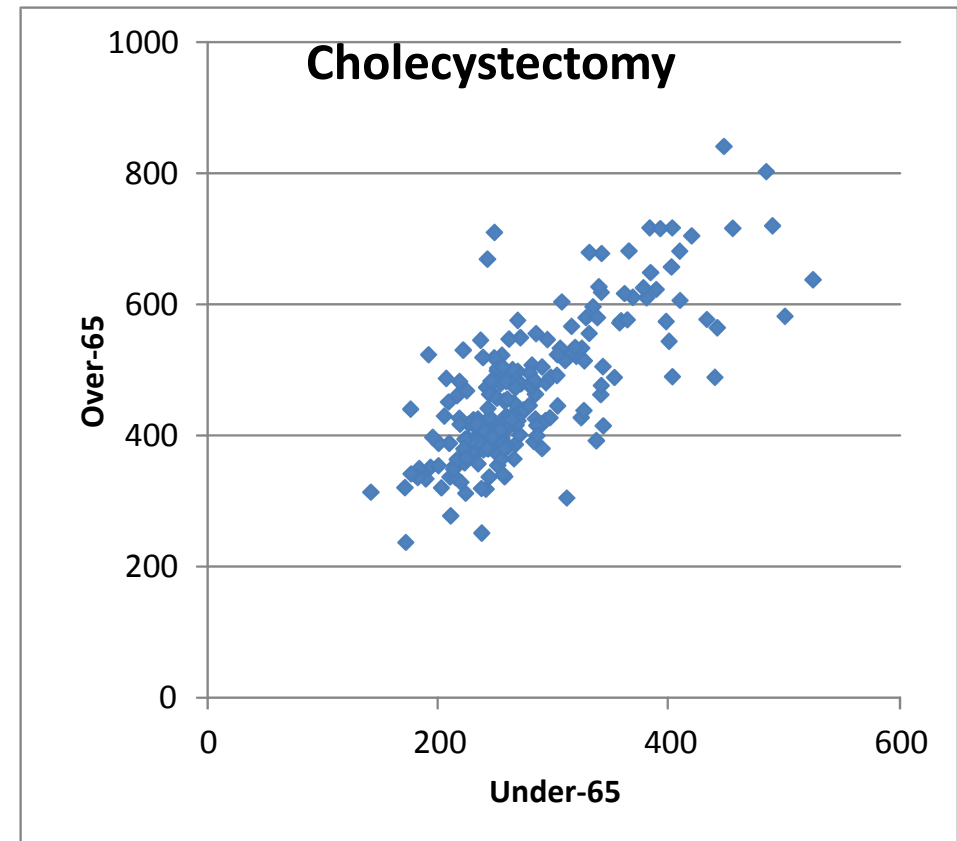
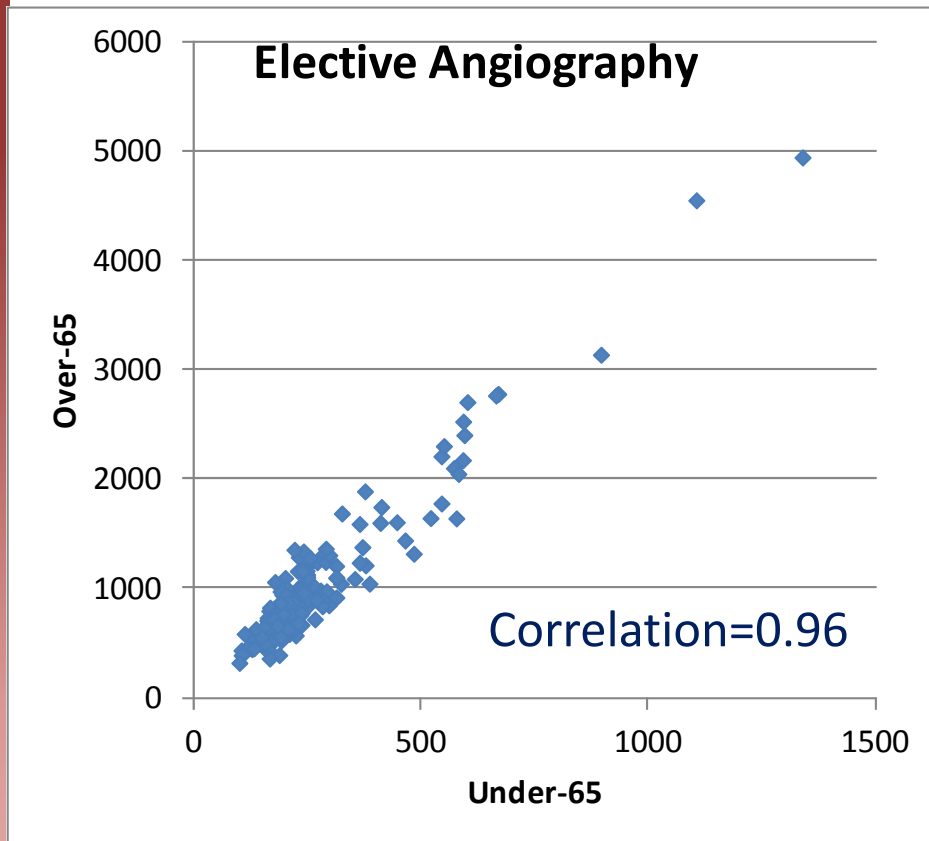
## Variation in Procedure Rates Across 209 California HSAs (Rates per 100,000)

Measure	Median	10th Percentile	90th Percentile	Ratio
Elective angiography*	354	251	690	2.75
Elective PCI*	93	59	174	2.96
Elective CABG	40	30	62	2.09
Cesarean	16263	13217	21331	1.61
Elective Induction	8262	5108	12359	2.42
VBAC	7390	3037	17476	5.75
Total hip replacement	87	63	111	1.76
Total knee replacement	179	133	246	1.85
Cholecystectomy*	293	239	414	1.73
Carotid Endarterectomy	33	22	51	2.32
Hysterectomy	316	238	490	2.06
Unilateral mastectomy	41	28	55	1.96
Weight loss surgery*	13	7	25	3.50
Hospitalization with hip fracture	105	89	126	1.41

\*Combines hospital and ASC data



# Variation in Patterns for <65 and >65 Populations



# Variation in Patterns for <65 and >65 Populations (2)

Measure	Under-65 Median	Over-65 Median	Correlation
Elective angiography*	207	796	0.96
Elective PCI*	52	213	0.93
Elective CABG	18	106	0.71
Total hip replacement	49	283	0.57
Total knee replacement	81	674	0.73
Cholecystectomy*	259	446	0.75
Carotid Endarterectomy	8	162	0.64
Hysterectomy	356	139	0.68
Unilateral mastectomy	29	92	0.65

\*Combines hospital and ASC data

Note: Insufficient data to compute correlations for c-section, induction, VBAC, and weight loss surgery



# Conclusions

- Significant variation across areas in CA observed in a range of procedures
- Variation more in some procedures than others
- Under and over-65 rates are often correlated



# Interpretation

- What rate is right?
  - We are often concerned about overutilization
  - But, underutilization is also possible
- Actions: Many possible approaches to reducing variation

