

# Measuring Hospital Surge Capacity

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Derek DeLia, Ph.D.  
Rutgers Center for State Health Policy



**Rutgers** Center for  
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# Hospital Surge Capacity

- Ability to respond to mass casualty event  
Bioterrorist attack, Natural disaster
- Patient flow through ED & inpatient units is critical
- Recently, conditions of ED overcrowding & ambulance diversion have occurred across the nation ==> surge capacity may be limited

# Measuring Surge Capacity

- Hospital planning requires detailed facility-specific measures
- Policy & research rely on broader/readily available system-wide measures
- Inpatient occupancy rates (OR's) most commonly used for policy & research
- High OR ==> limited surge capacity

# Problems with Standard Occupancy Rate (OR) as a Measure of Surge Capacity

- Annual/quarterly OR's ignore seasonal variation in demand
- OR ignores other sources of stress on hospital resources – e.g., ambulatory surgery
- More information can be gained by looking deeper into administrative data

# Research Questions

1. How can existing administrative databases be used to improve measures of surge capacity?
2. What effect does seasonal variation in demand have on surge capacity?
3. What effect do non-inpatient services such as ambulatory surgery have on surge capacity?

# Study Design I

- Hospitals in NJ in 2003 (N=78)
- Calculate daily OR for each hospital
- OR numerator: Daily inpatient census from uniform billing records (UB-92)
- OR denominator: Quarterly bed counts (B-2 utilization report)

Daily bed data are unavailable.

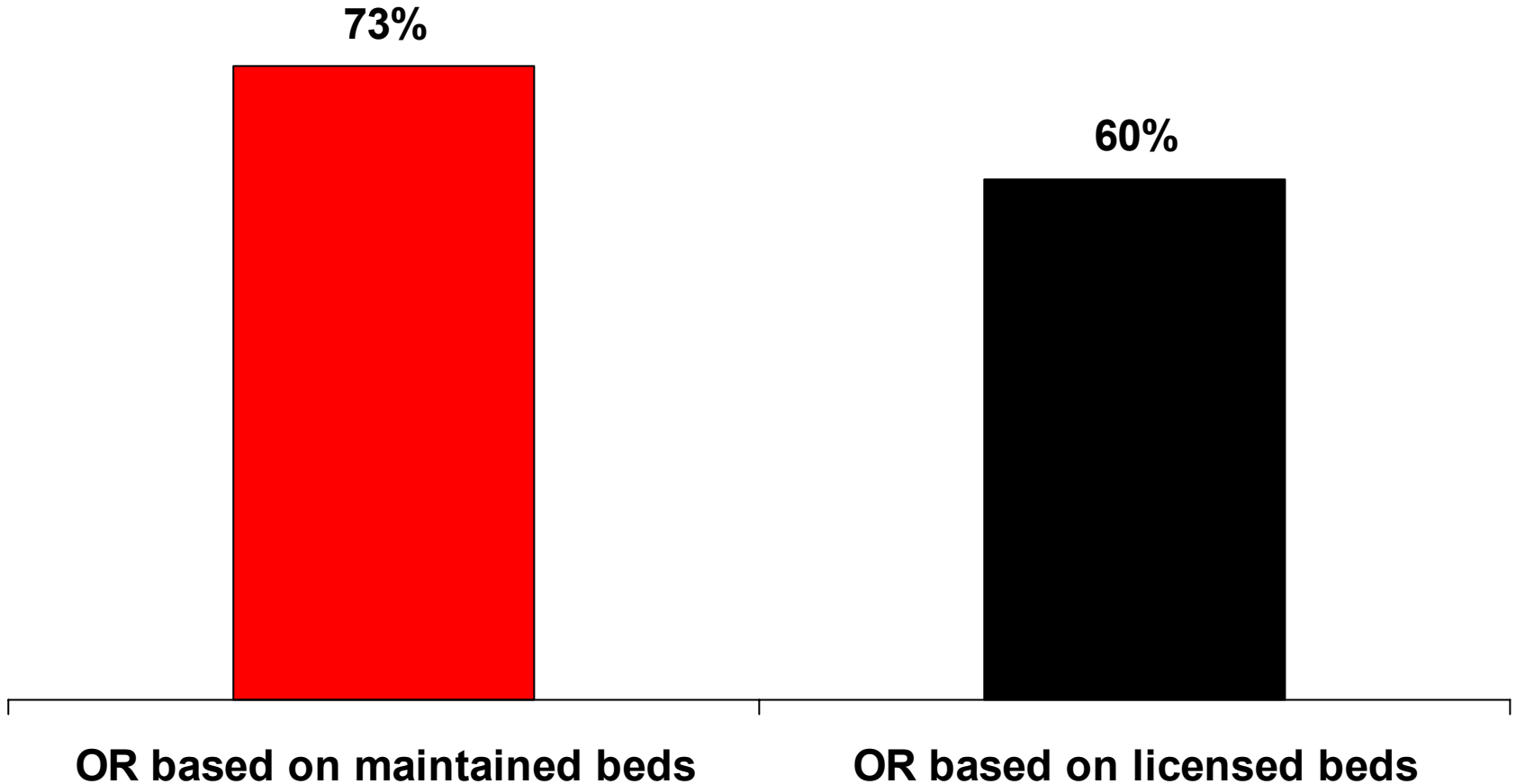
Daily variation in beds is very small.

# Study Design II

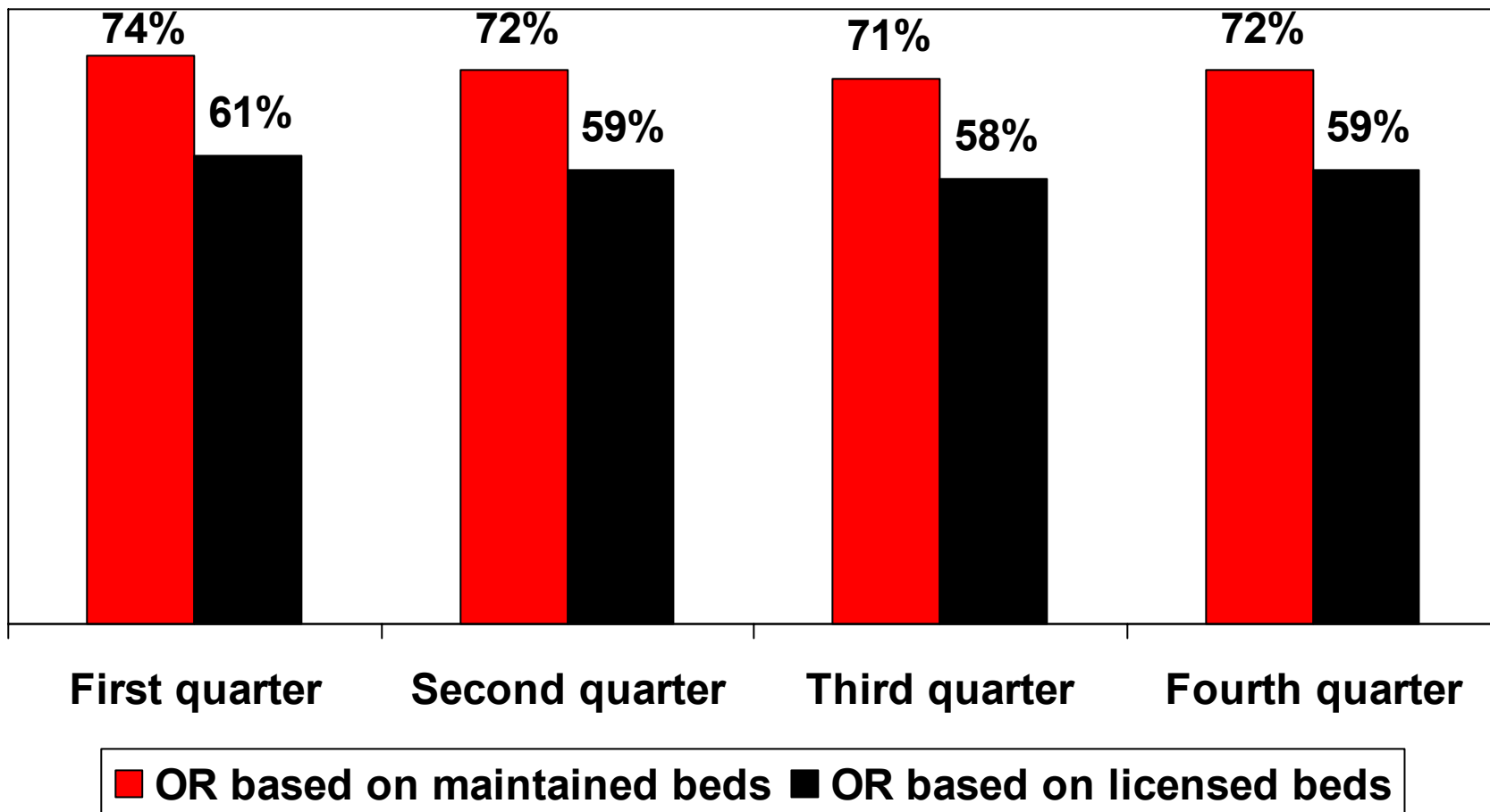
- Licensed beds in OR denominator to give a conservative measure of unavailable capacity
- Licensed beds > staffed beds ==> OR is lower using licensed beds
- Recalculate OR's with amb surg included in numerator ==> "upper bound" on unavailable capacity  
i.e., amb surg utilizes surgical staff & sometimes PACU capacity



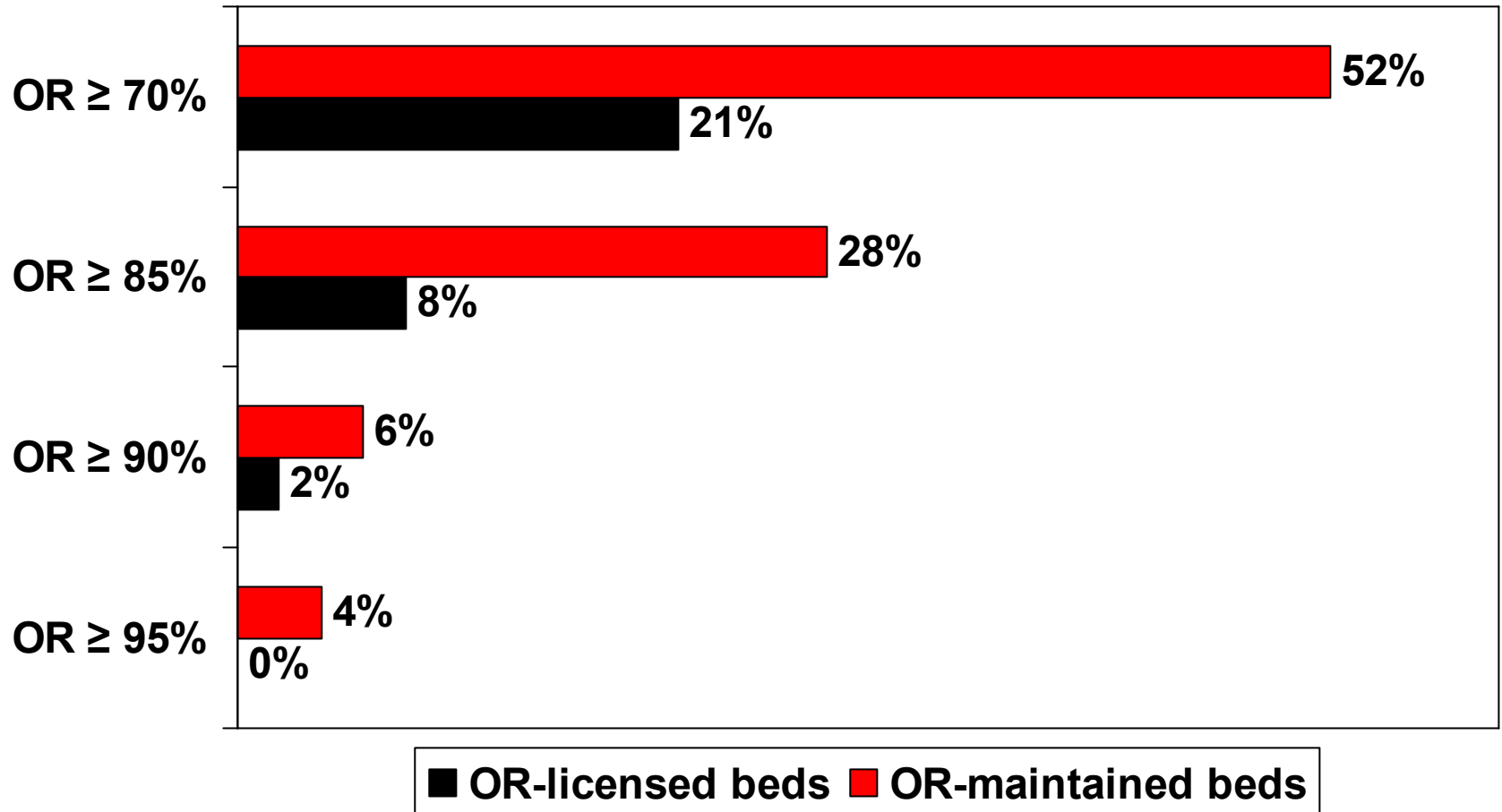
# Statewide Hospital Occupancy Rate (OR) in NJ, 2003



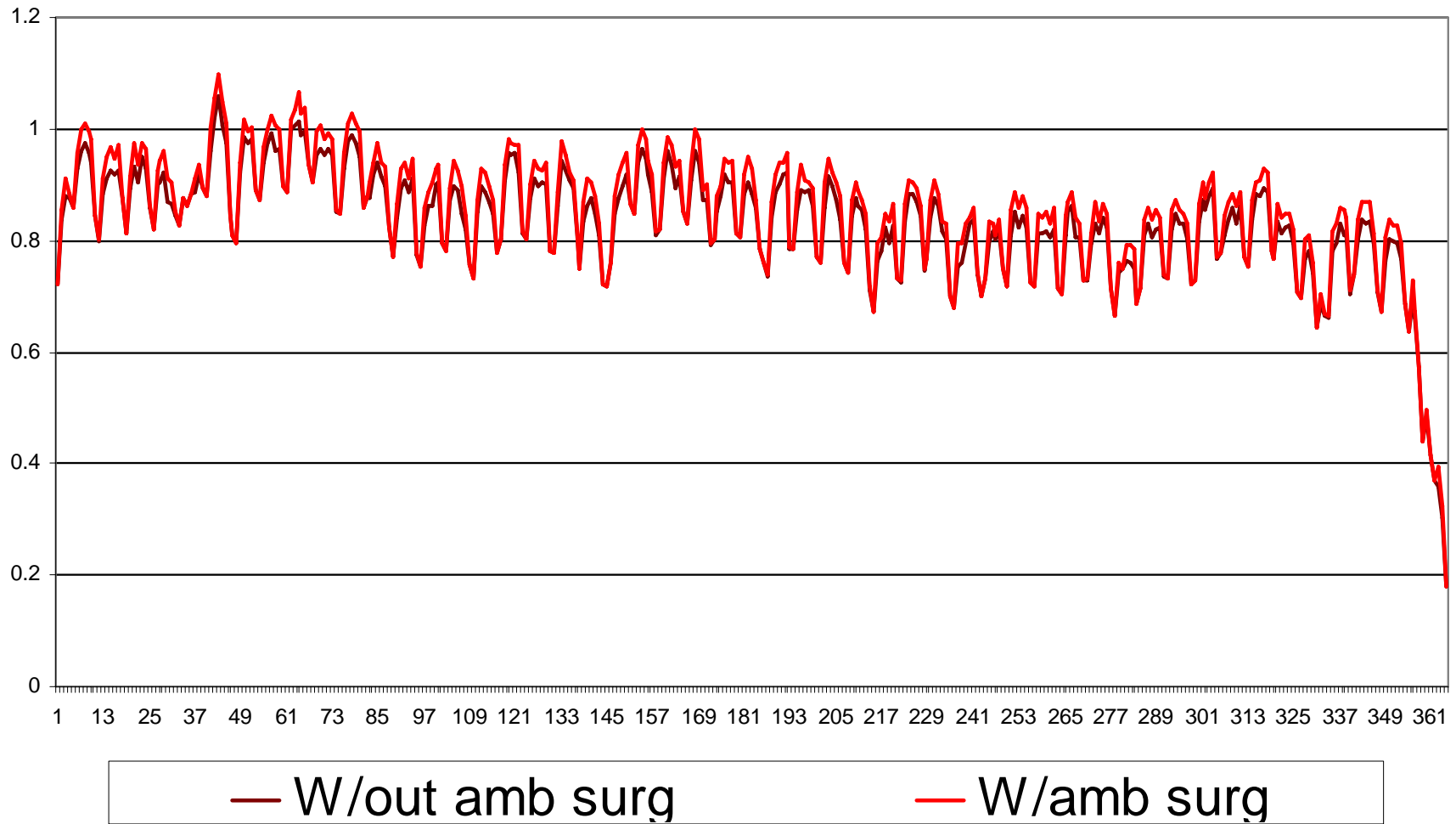
# Statewide Quarterly Occupancy Rate (OR) in NJ, 2003-Q1 to 2003-Q4



# Percentage of Hospitals w/High Annual Occupancy Rates (OR's) in 2003

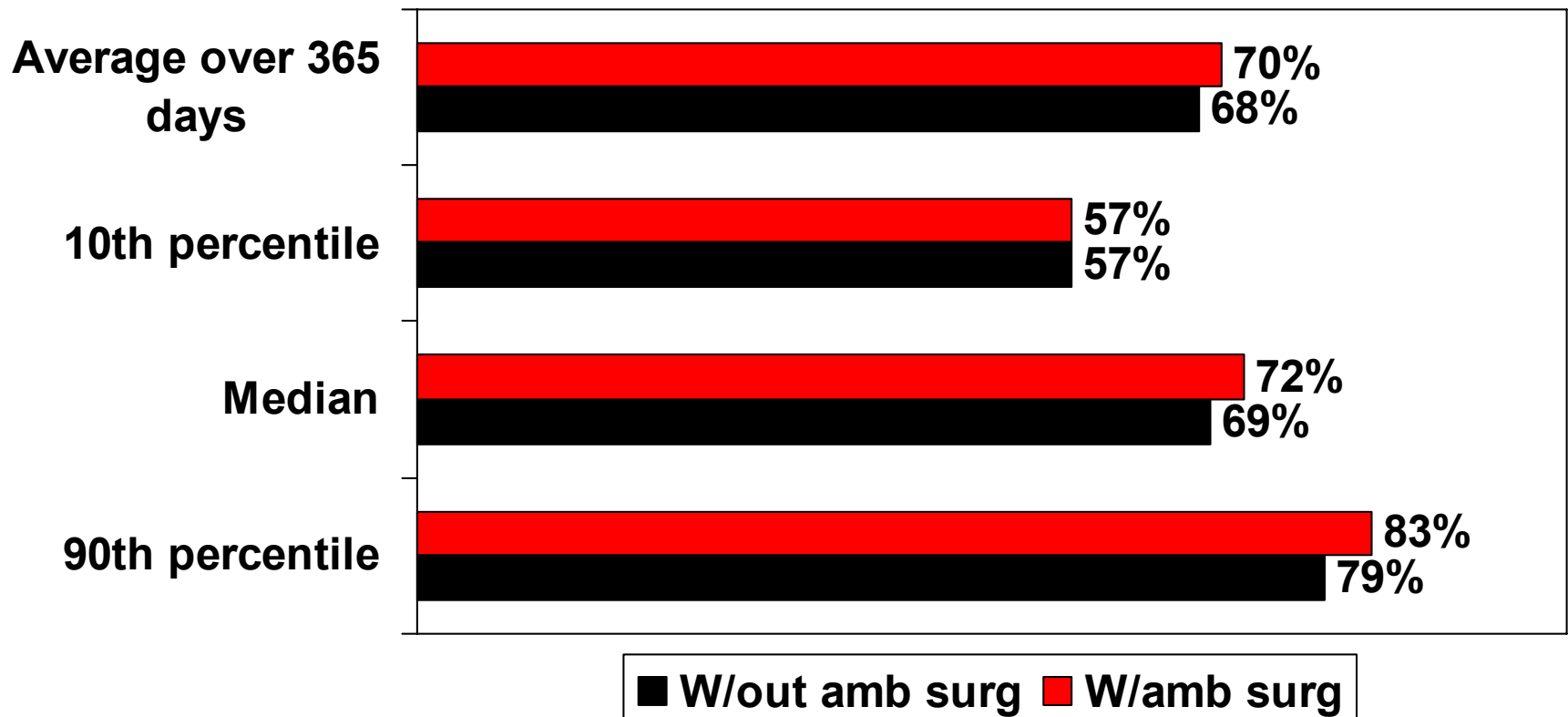


# Daily variation in Occupancy Rate for a "Typical" Hospital, 2003

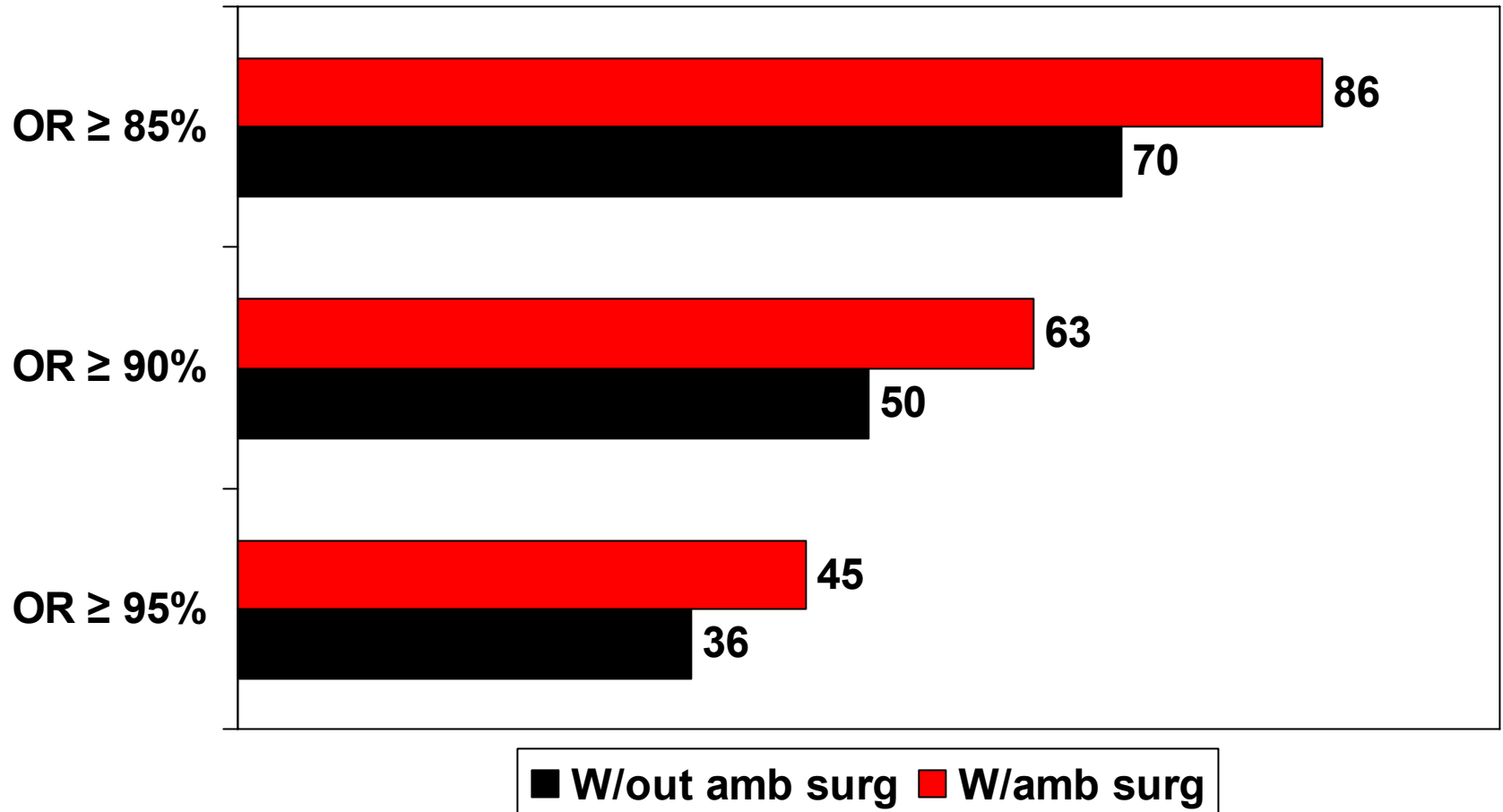


# Variation in Daily Occupancy Rate for the “Average Hospital” in 2003

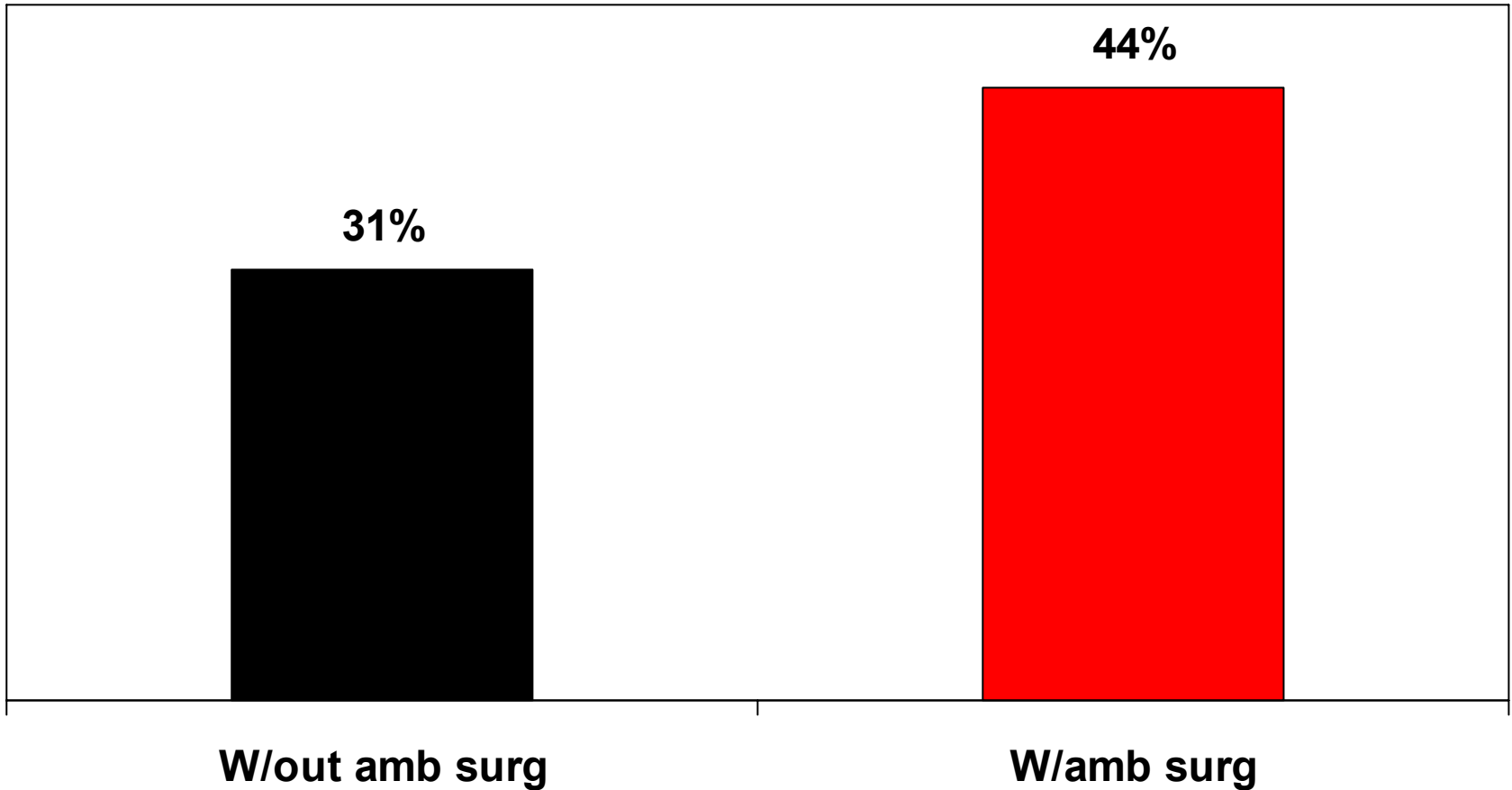
Statistics summarizing 365 day experience



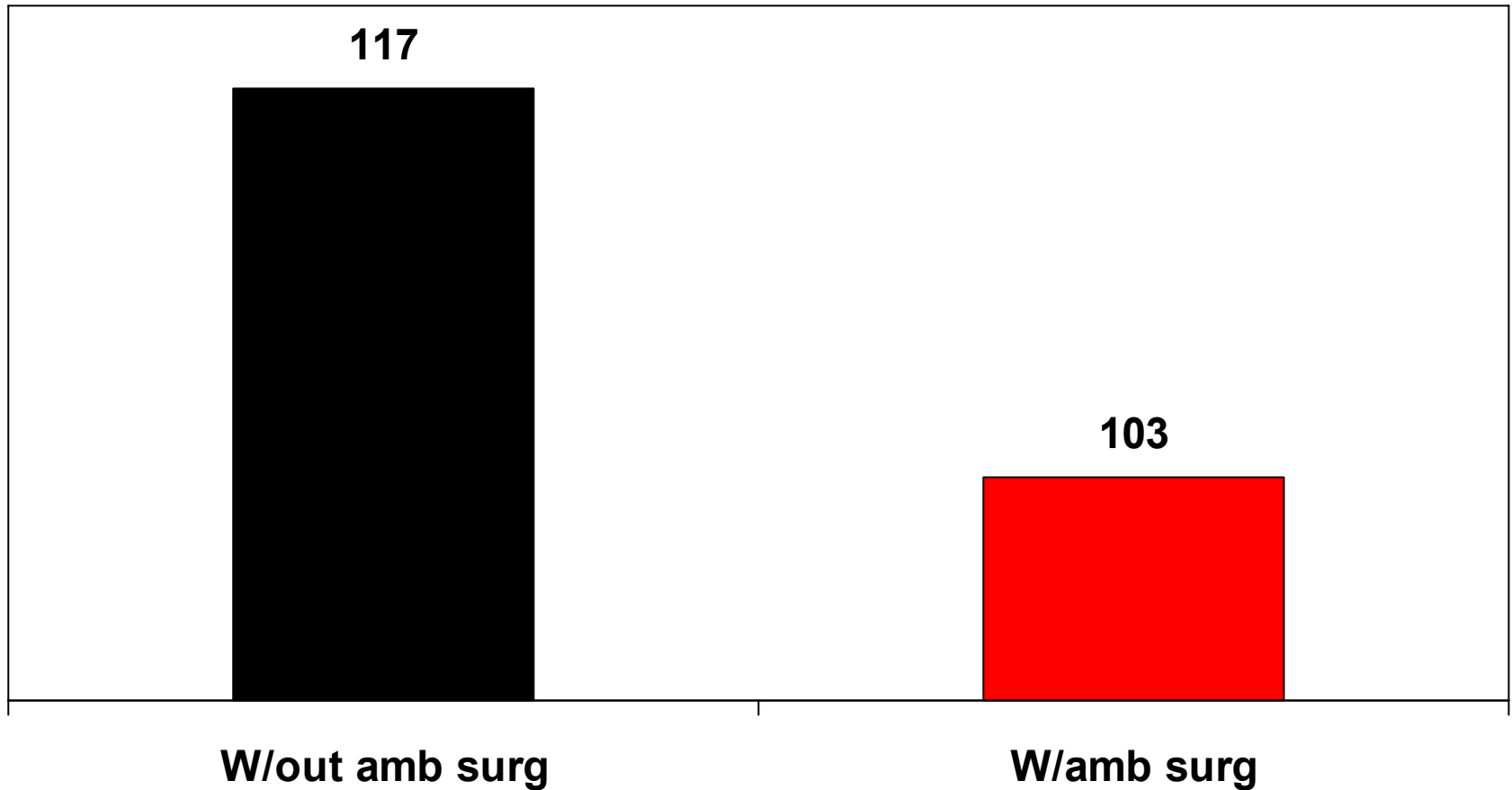
# Number of Days Operating at a High Occupancy Rate (OR) for the “Average Hospital” in 2003



# Percentage of Hospitals with At Least One Day at 95% Occupancy or Higher



# Average Number of Days with Occupancy Above 95% (among hospitals w/at least 1 such day)





# Conclusions

- Annual & quarterly occupancy measures hide periods of highly limited surge capacity in many hospitals.
- This result is based on a conservative measure of bed capacity. Actual periodic limitations in surge capacity may be greater.
- Ambulatory surgeries appear to diminish surge capacity even further in ways that are not measured with routine occupancy statistics.

# Caveats

- Use of daily billing data requires special permission from state authorities due to confidentiality concerns.
- Patients admitted at the end of a calendar year may not appear in billing data until the following year.
- Accounting for the impact of ambulatory surgery & other outpatient activities on surge capacity is not straightforward.

# Implications

- Seasonal variation in surge capacity can be measured in some detail with administrative data.
- These data can be useful for regional capacity planning or disaster preparedness.
- These data can also be used to analyze the effect of seasonal variation in surge capacity on:

Ambulance diversion

Healthcare quality

Hospital operating costs