



MRSA Surveillance: Challenges and Lessons Learned— Tennessee

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KILLER STAPH

*Experts say U.S. deaths from
'superbug' may surpass AIDS*

By **LINDSEY TANNER**
AP Medical Writer

10/17/07 JCP

CHICAGO — It now appears a dangerous type of staph infection is probably killing more Americans each year than AIDS.

INSIDE

■ Hampton Elementary
staph infections/1B

It's resistant to standard antibiotics, and the government reports in its first broad look at invasive disease caused by this superbug that more than 90,000 Americans

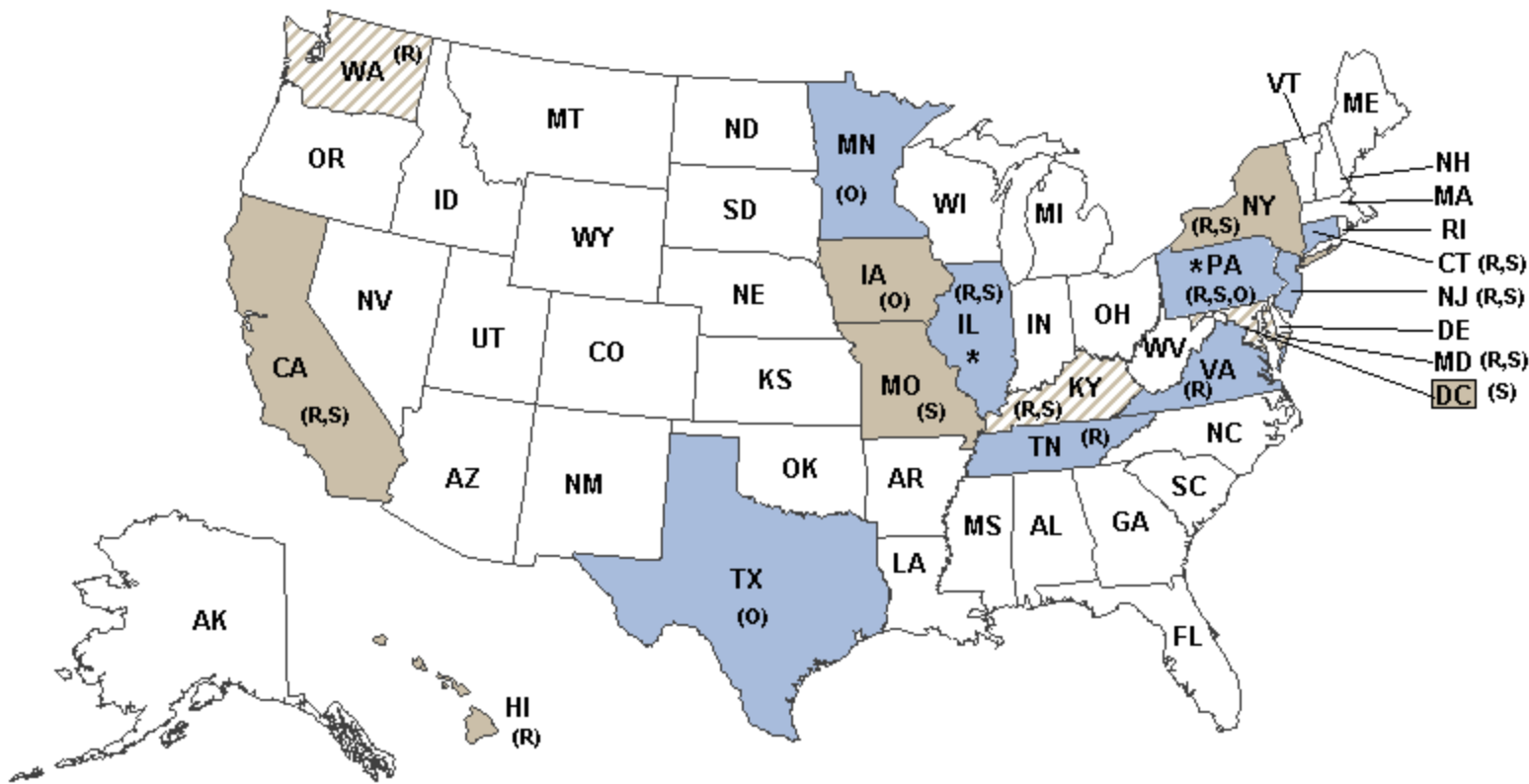
are sickened by it annually.

The drug-resistant germ goes by the nickname MRSA, short for methicillin-resistant *Staphylococcus aureus*.

"The rate of invasive MRSA was an astounding 31.8 per 100,000," according to an editorial published with

► See **STAPH**, Page 5A

MRSA Laws & Pending Legislation



- | | |
|---|---|
|  Enacted MRSA Law | R – Reporting Laws or Bills |
|  Pending MRSA Legislation | S – Screening Laws or Bills |
|  Enacted MRSA Law & Pending MRSA Legislation | O – Other Laws or Bills (e.g., studies, pilots, other infection control requirements) |
|  Legislature Adjourned Without Enactment | |



Why Should Public Health Conduct MRSA Surveillance?

- **Significant Public Health Burden**

- Morbidity, Mortality, Cost

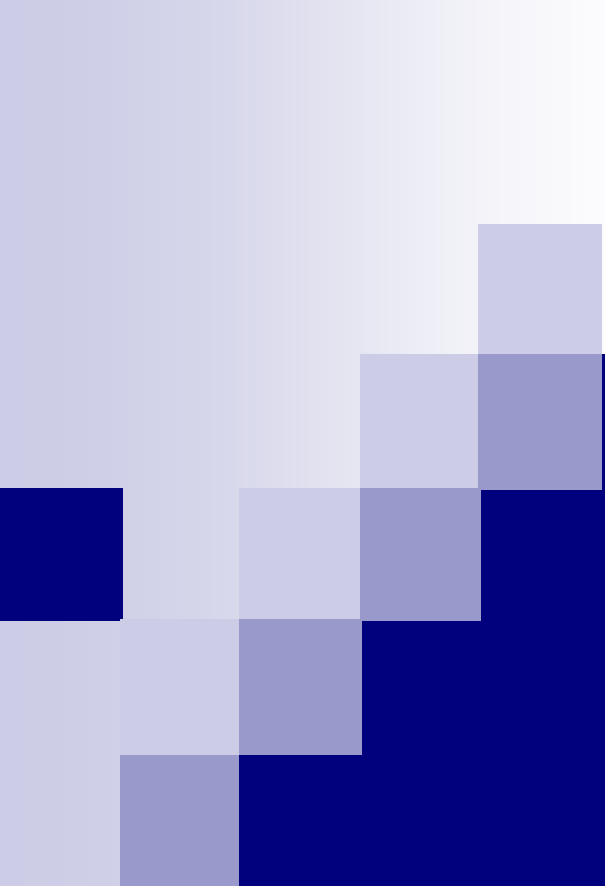
- **Emerging Factors in Disease**

- Community-associated MRSA [CA-MRSA]

- Changes in antibiotic susceptibility

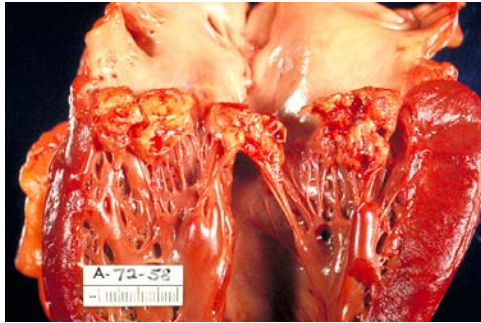
- **Preventable**

- Exact proportion not known, probably much larger than most people think



Approaches to MRSA Surveillance

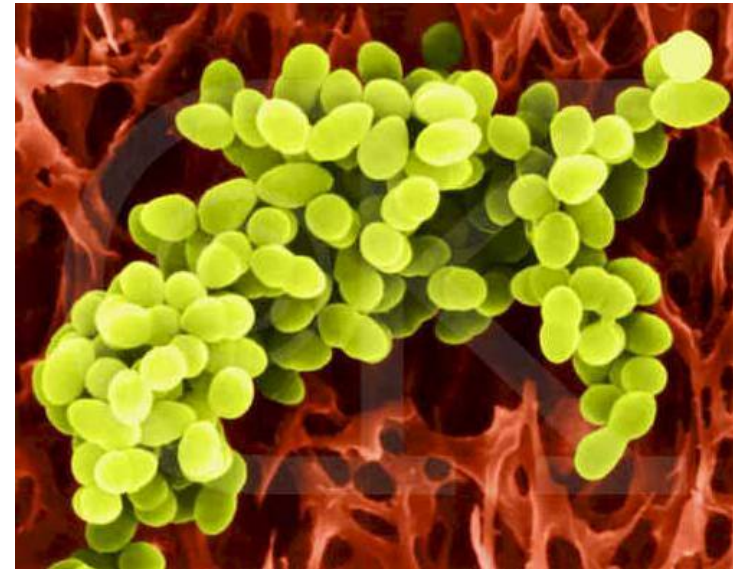
Invasive MRSA (I-MRSA) Surveillance in Tennessee



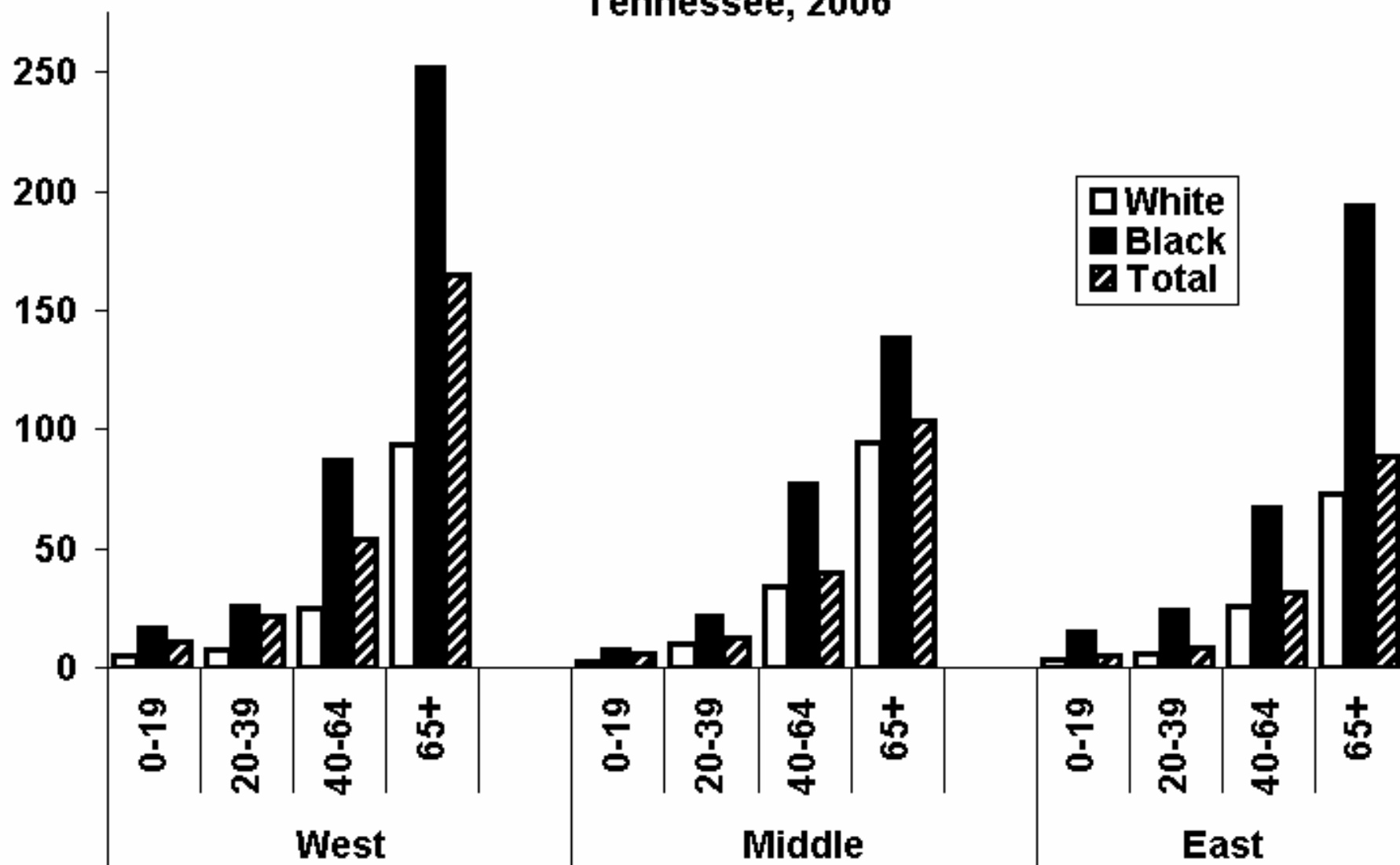
- Made reportable in June 2004
- Laboratory based surveillance
 - Specimen source= sterile (blood, joint, bone, CSF, pericardial, peritoneal, pleural).
 - Not urine, wounds, resp. tract, catheter tips
- Basic demographics (age, gender, race, county)
- NOT differentiate between healthcare and community-associated (no med. chart review)

Invasive MRSA (I-MRSA) Surveillance in Tennessee

- **~2,000 cases per year**
 - **~90% Blood cultures (BSI)**
- **Incidence: 33 per 100,000**
 - **Stable 2005 -2007**
- **3rd most common reportable communicable disease in Tennessee**



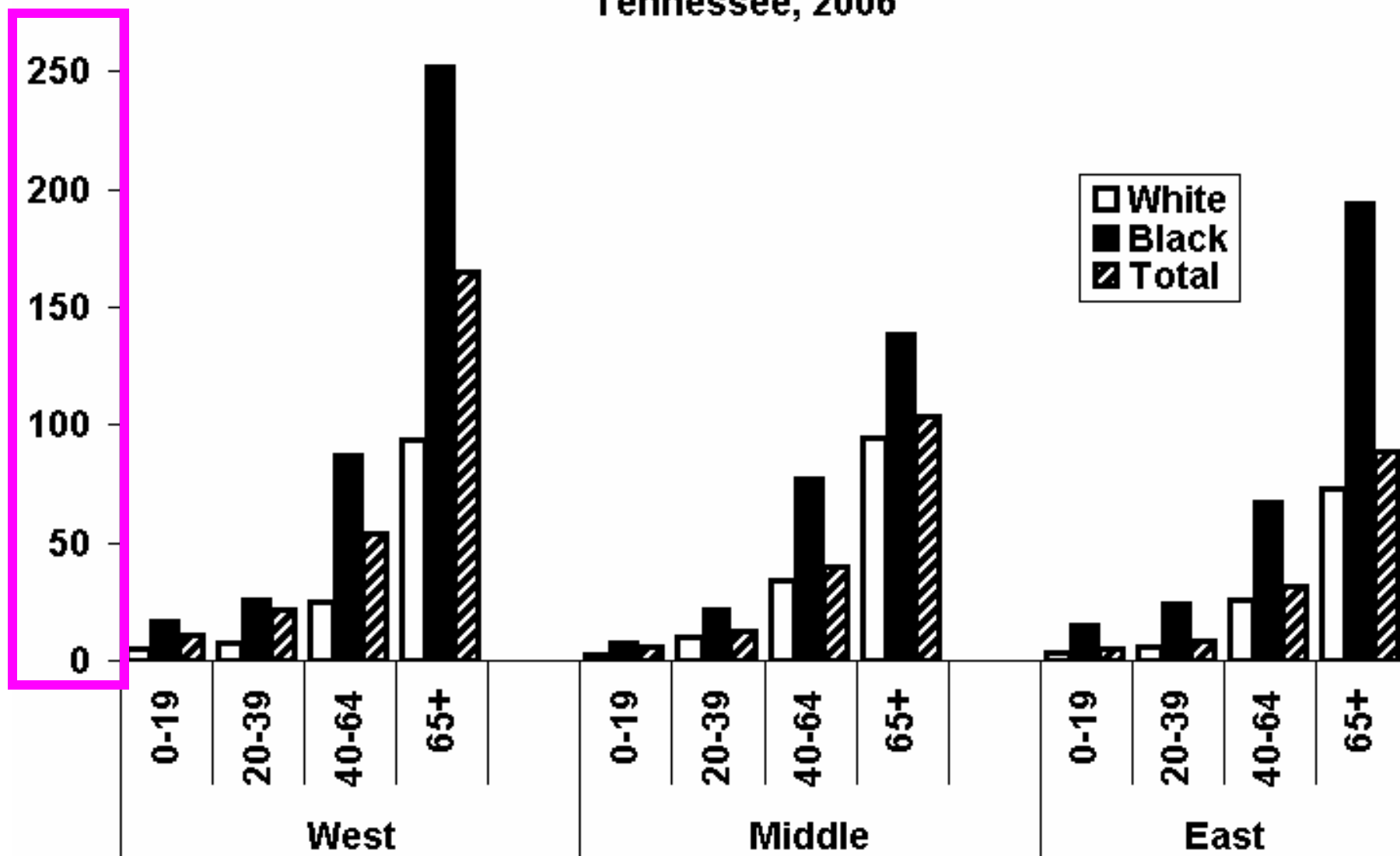
Invasive MRSA per 100,000 by Race, Age, and Grand Division, Tennessee, 2006



Grand Division and Age Group (Years)

<http://health.state.tn.us/Downloads/MRSAreport307.pdf>

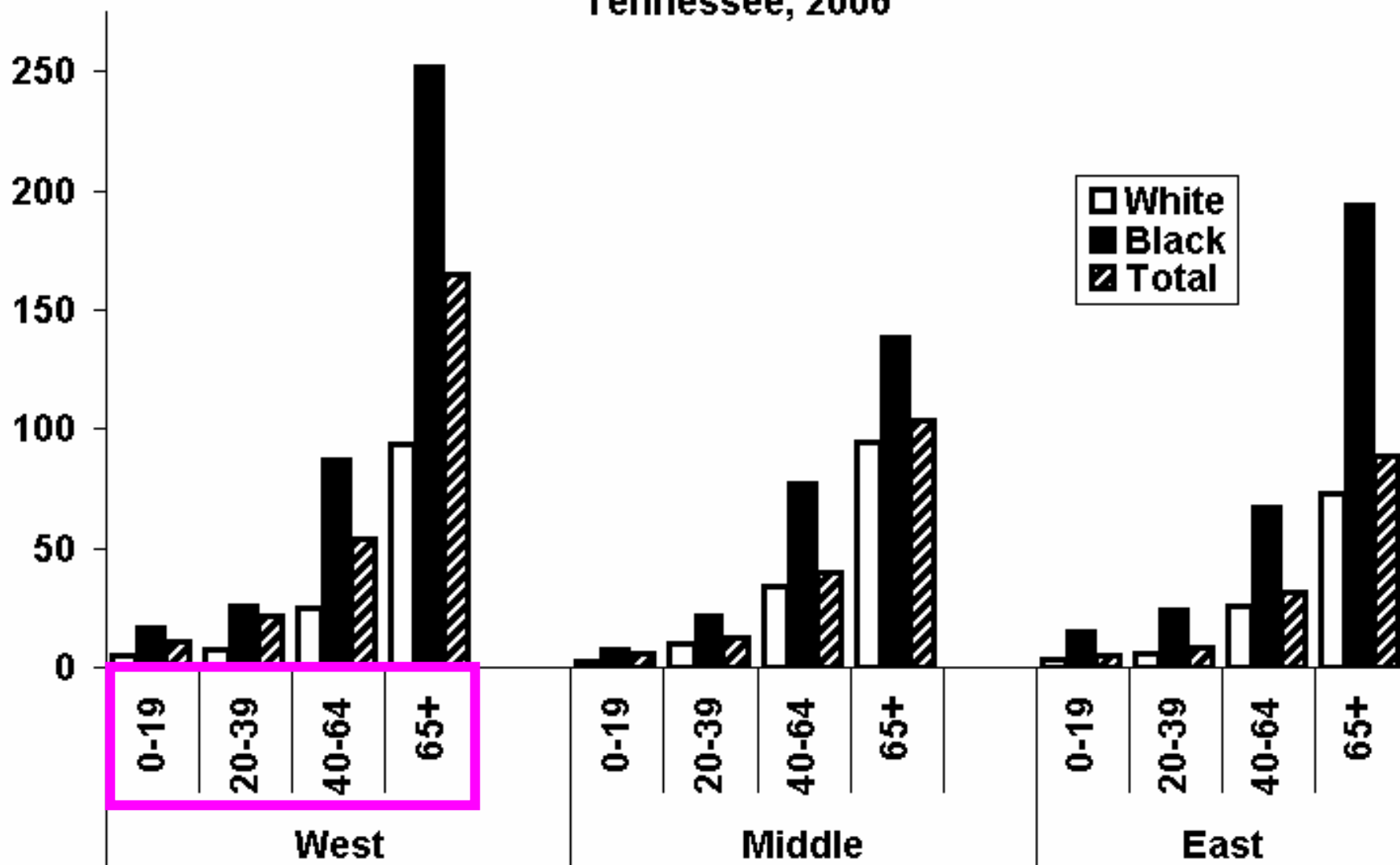
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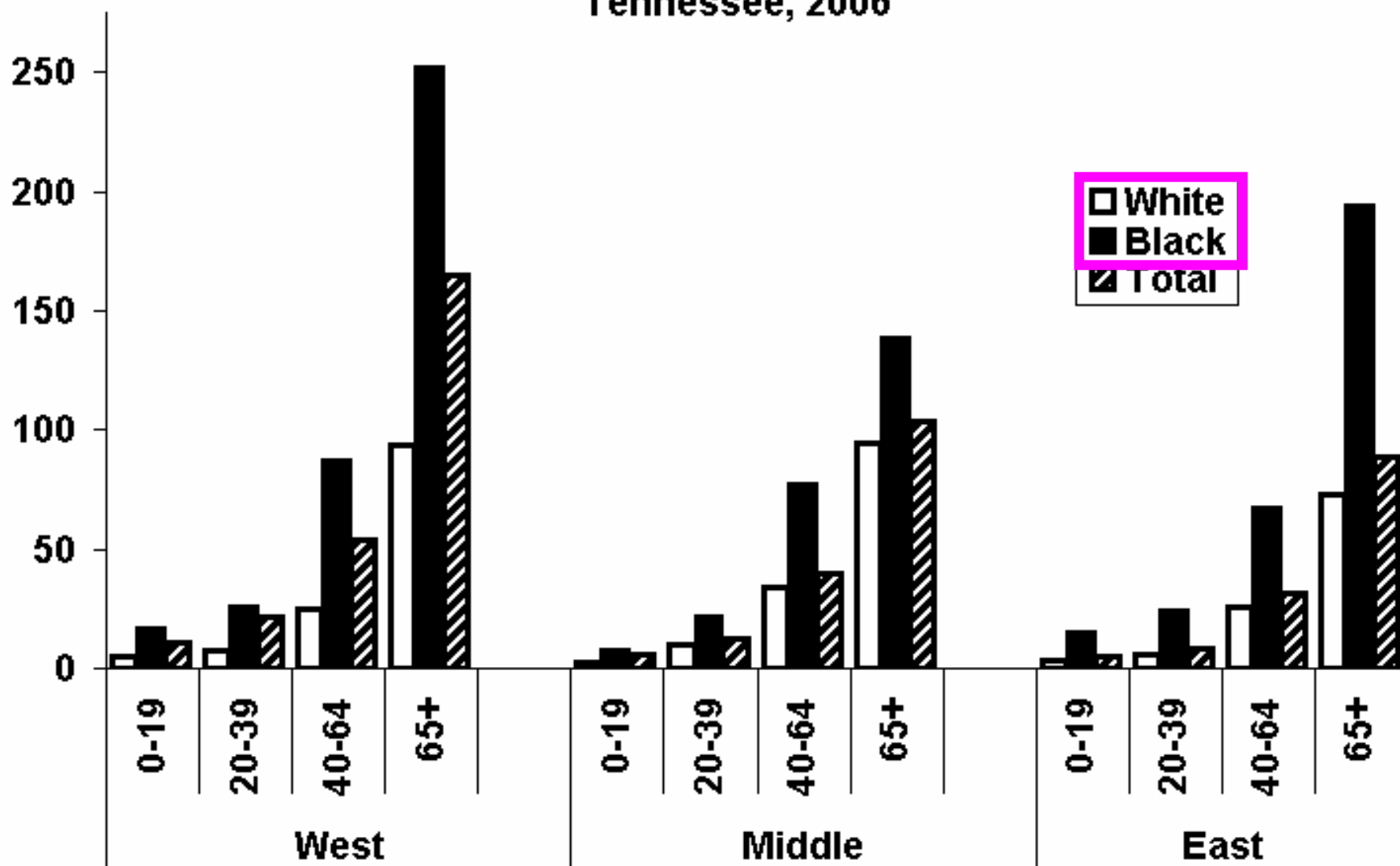
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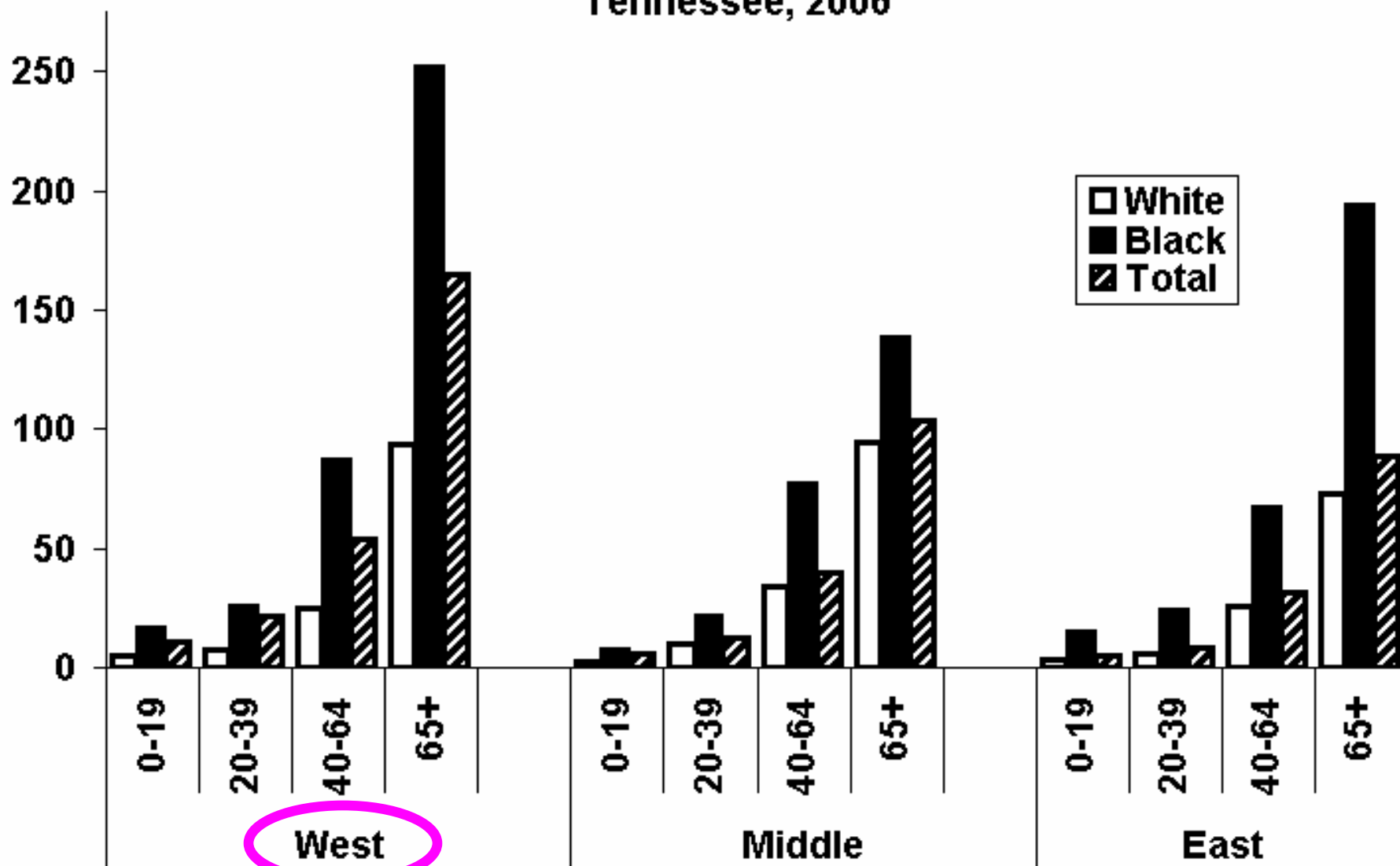
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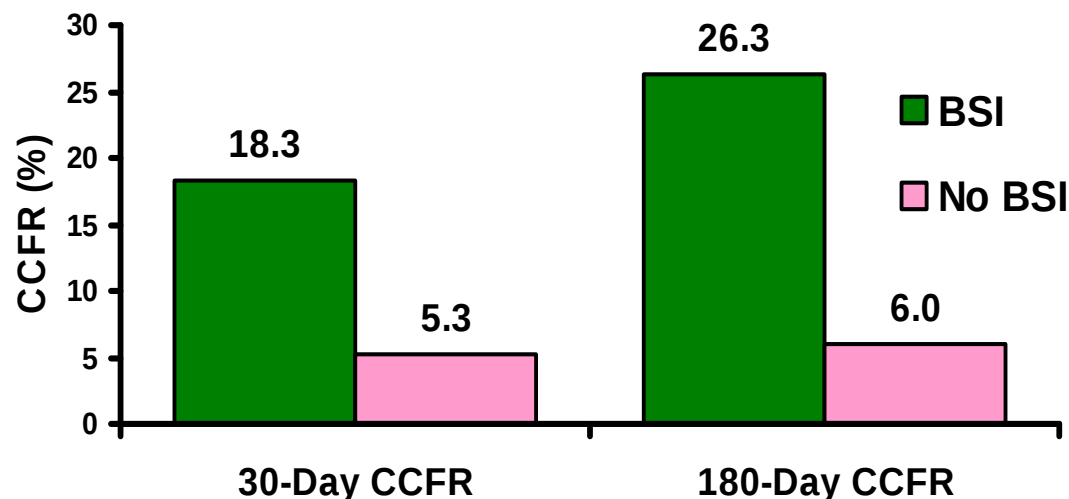
Grand Division and Age Group (Years)

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Surveillance: MRSA-BSI or I-MRSA?

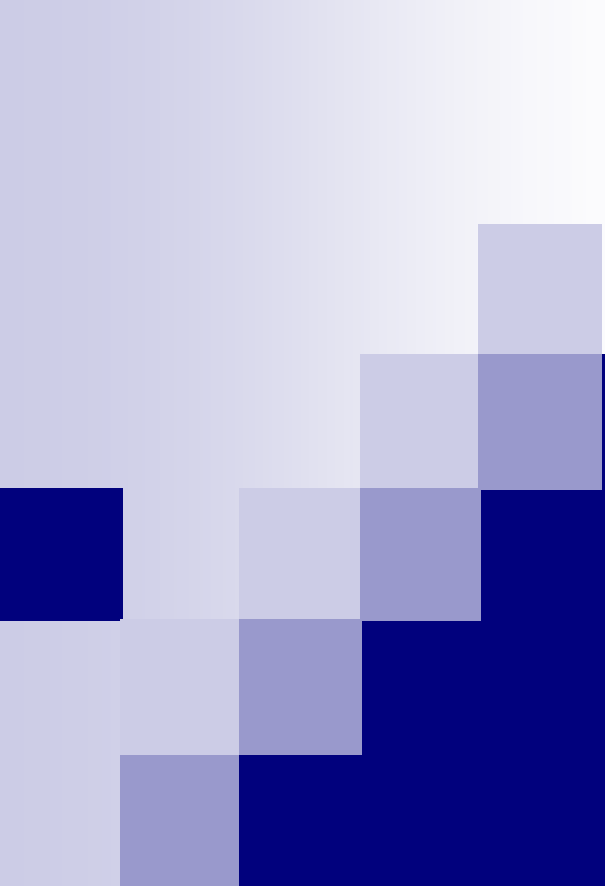
- **MRSA-BSI = 85% of invasive MRSA infections**
 - Easier & more reliable to obtain from Laboratory Information Systems (coding of specimen source)

30- and 180-Day Crude Case Fatality Ratios Among I-MRSA Patients with Bloodstream Infections, Tennessee, 2004-2007 (N=889)



- **MRSA-BSI: 30 day Crude Case Fatality Rate (CCFR) = 3.5 x higher than non-BSI**

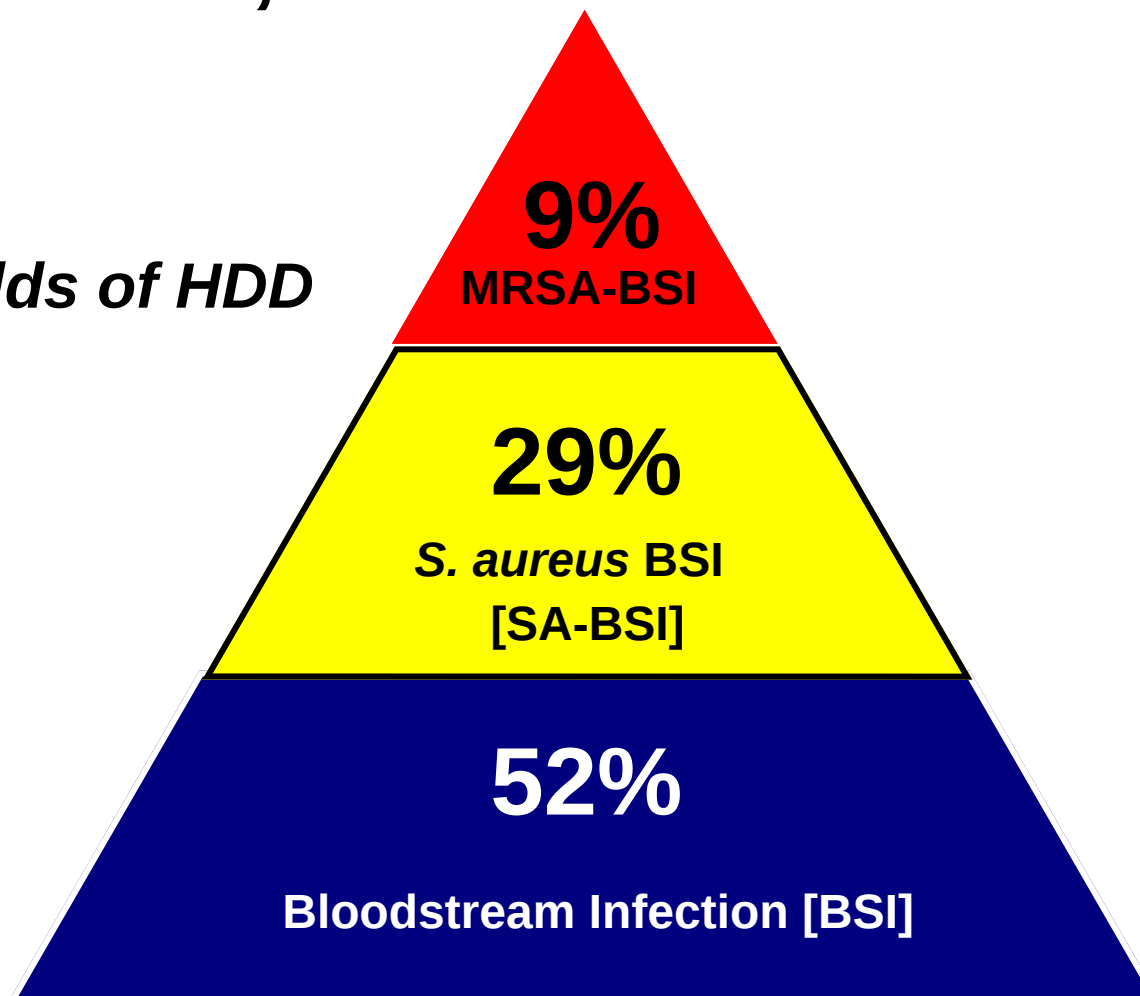
Glenn, Kainer, Craig, ICEID, 2008



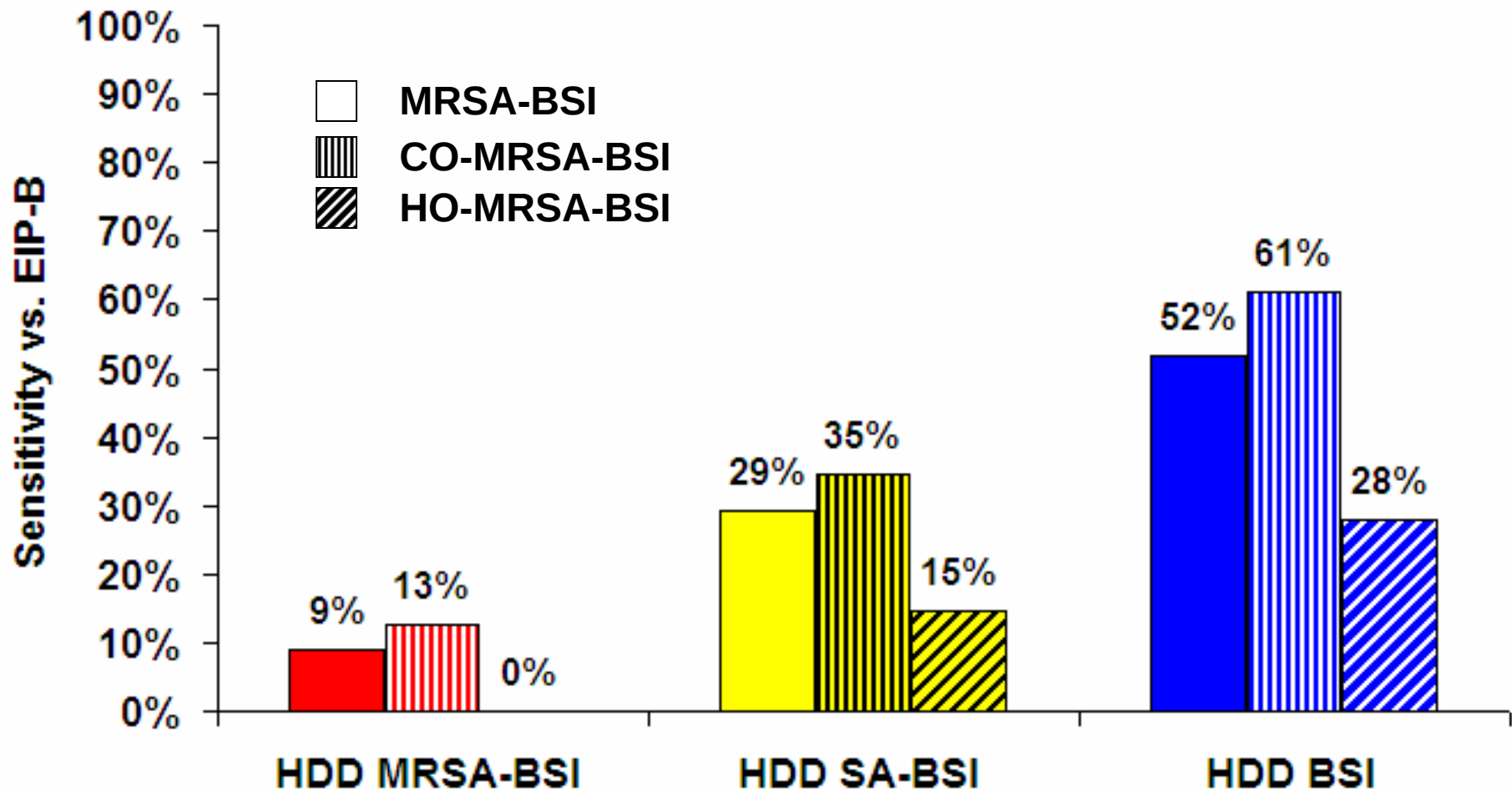
Administrative data: Hospital Discharge Dataset [HDD]

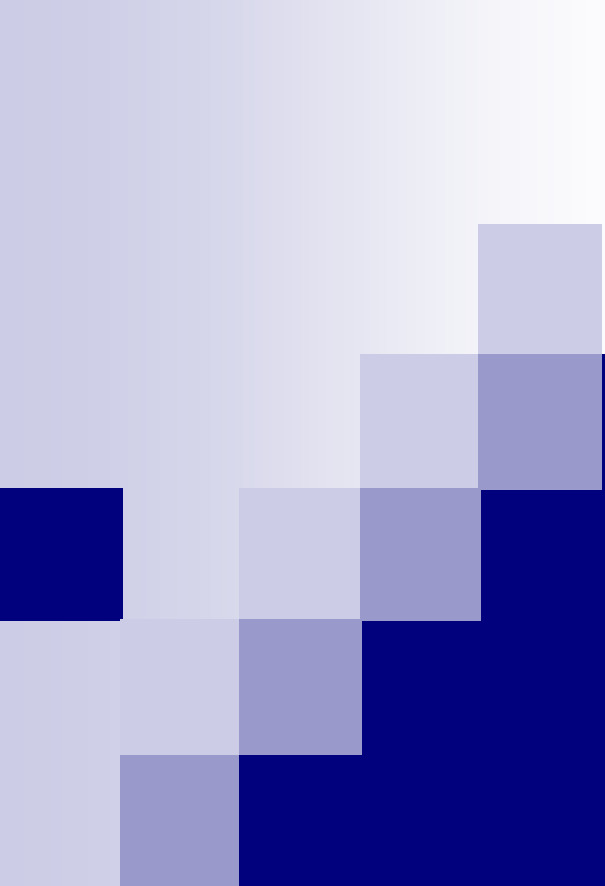
Sensitivity of Hospital Discharge Database [HDD]* in Detecting MRSA-BSI – Tennessee, 2005

** First 9 Fields of HDD*



Sensitivity of Hospital Discharge Database [HDD] in Detecting MRSA-BSI by Onset, --Tennessee, 2005

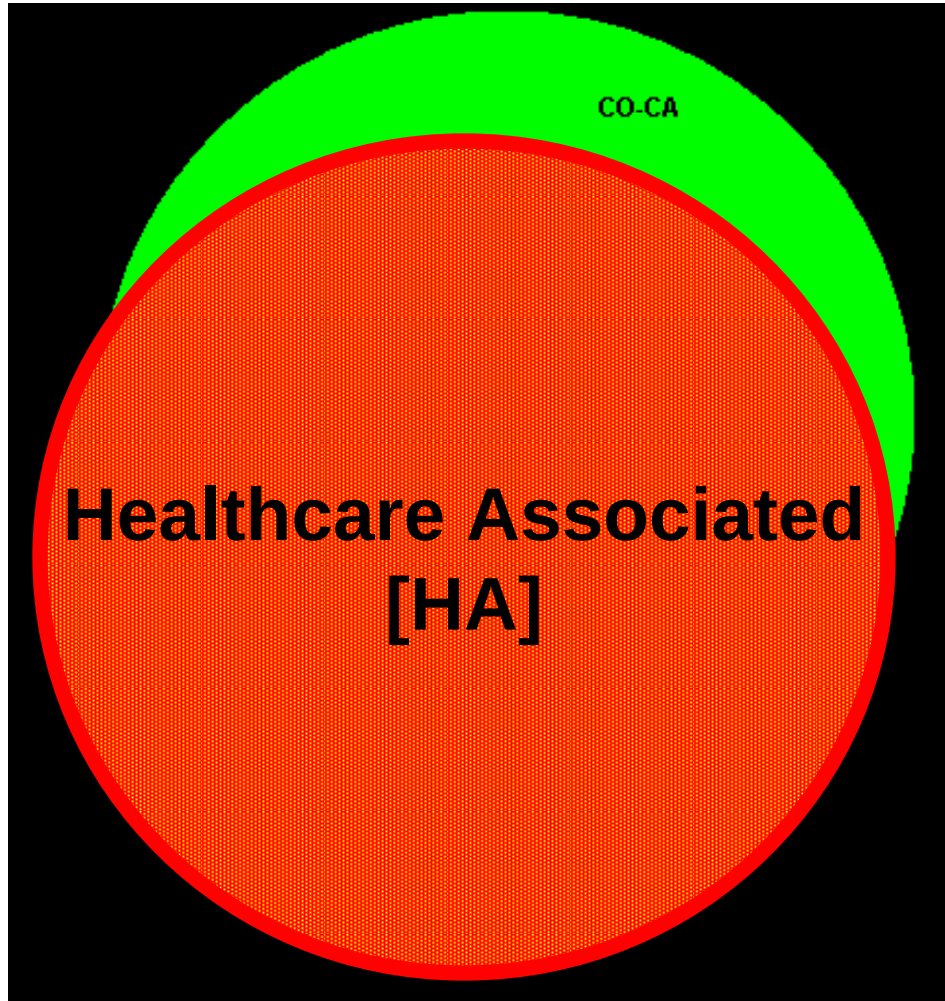




Which MRSA-BSI?

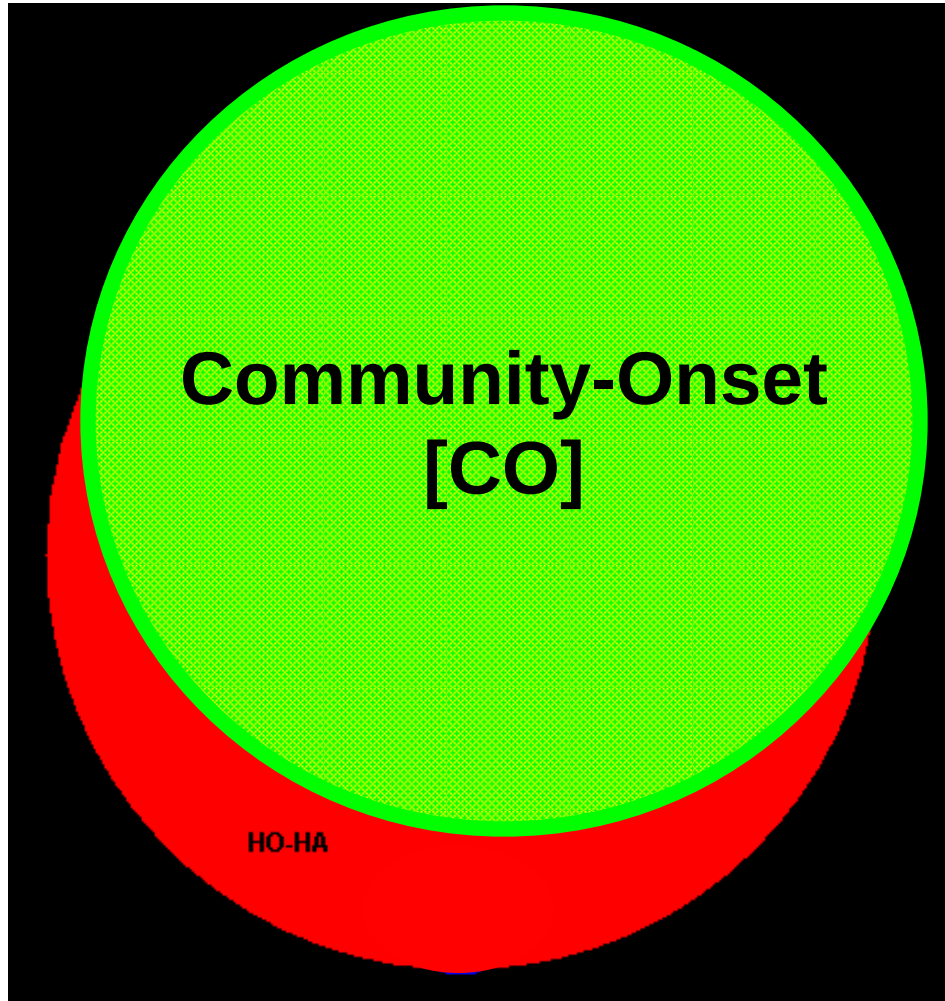
Community-associated? [CA]
Healthcare-associated? [HA]
Community-onset? [CO]
Hospital-onset? [HO]

MRSA-BSI: Onset and Association, Tennessee 2004-2007 (N=756)



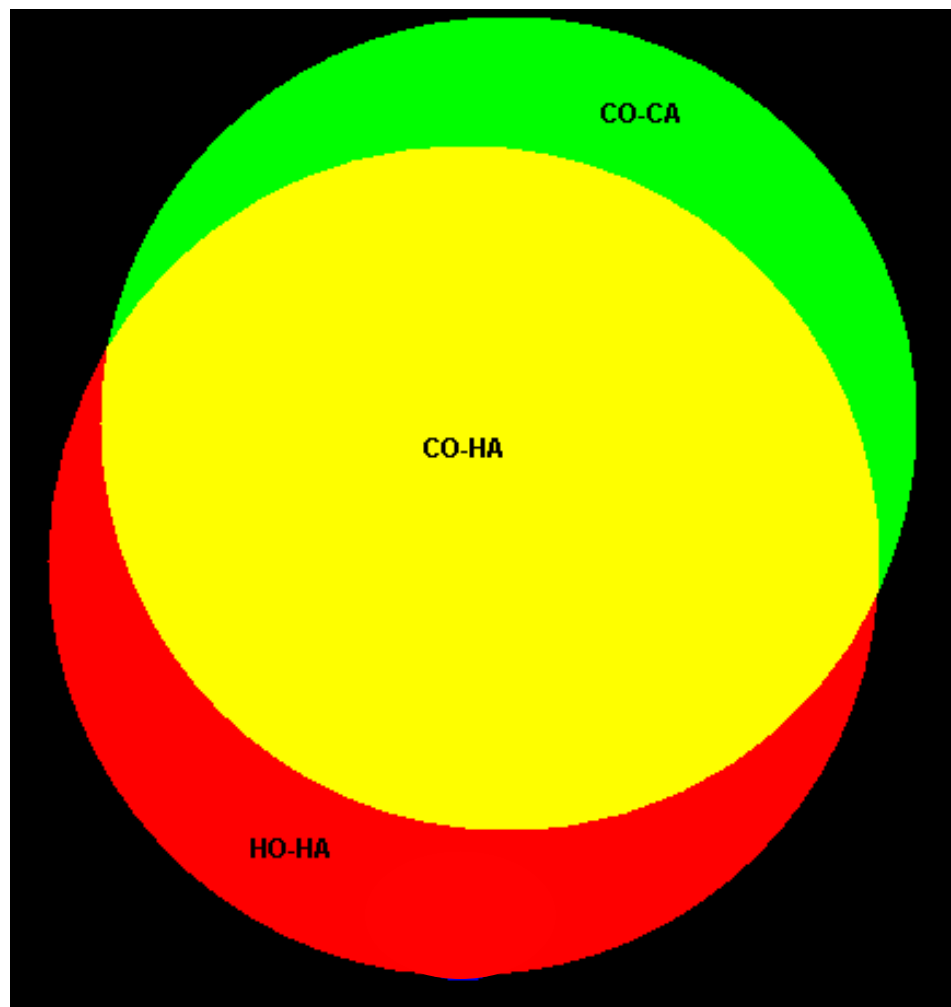
ABC data, TN 2004-2007

MRSA-BSI: Onset and Association, Tennessee 2004-2007 (N=756)



ABC data, TN 2004-2007

MRSA-BSI: Onset and Association, Tennessee 2004-2007 (N=756)



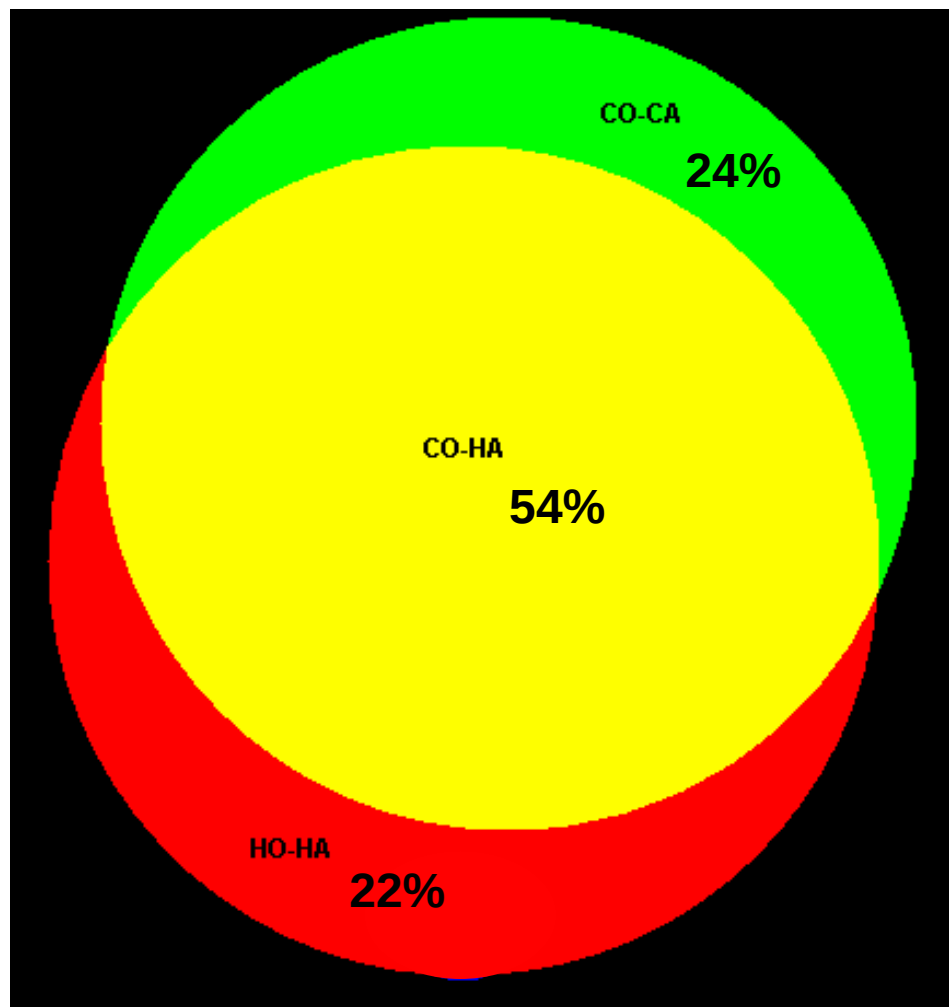
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 CO-HA: Community Onset, Healthcare Associated

 HO-HA: Hospital Onset, Healthcare Associated

ABC data, TN 2004-2007

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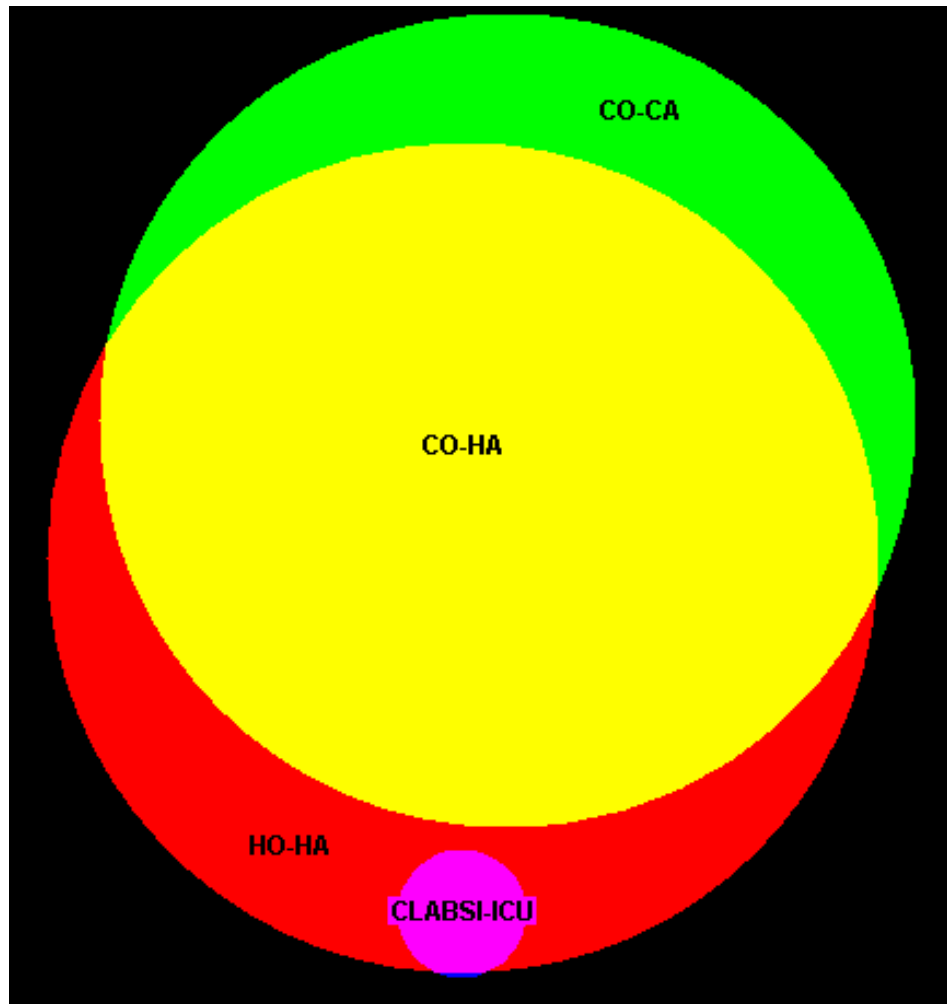
ABC data, TN 2004-2007

MRSA-BSI Associated with Central Lines, TN 2004-2007 (N=756)



- For 5.4% of MRSA-BSI events, patients were in the ICU when blood cultures were drawn and had a central line (proxy for CLABSI in ICU)

MRSA-BSI: Onset and Association, Tennessee 2004-2007 (N=756)



 CO-CA: Community Onset, Community Associated

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 CLABSI-ICU: Central Line-Associated BSI in Intensive Care Units [ICU]

ABC data, TN 2004-2007

MRSA-BSI Associated with Central Lines, TN 2004-2007 (N=756)

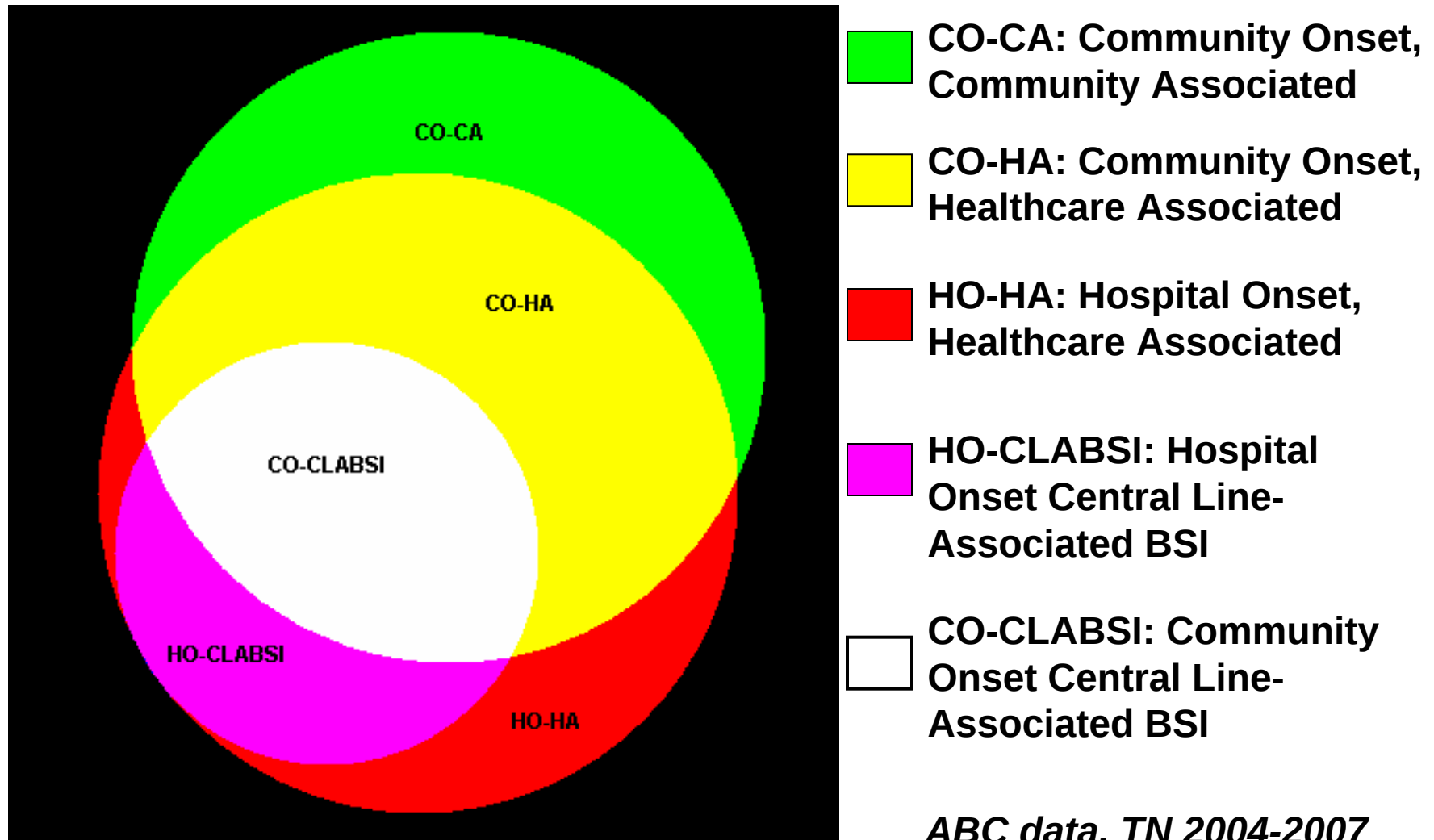


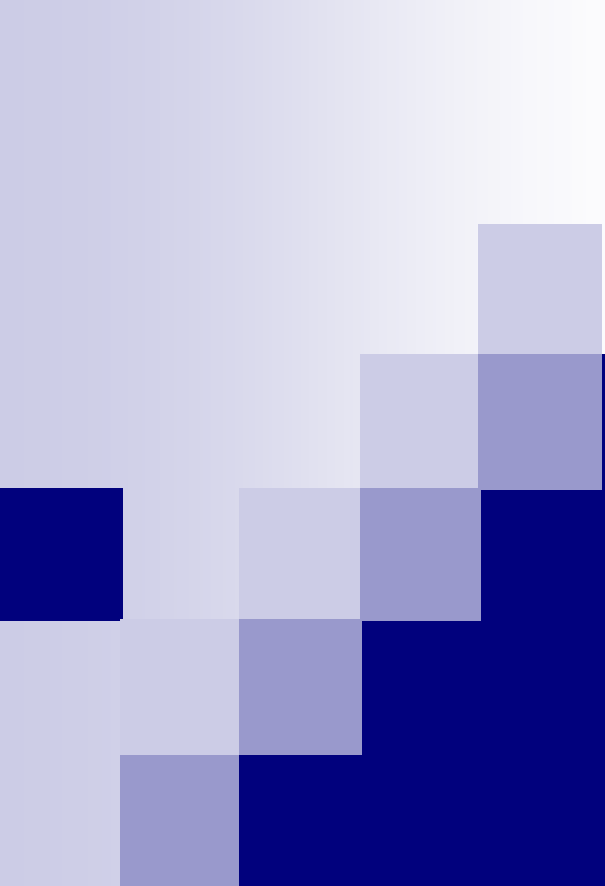
- Central lines were associated with:
 - 30% of all MRSA-BSI
 - 40% of all HA-MRSA-BSI
 - 1/3 Hospital-onset
 - 2/3 Community-onset



ABC data, TN 2004-2007

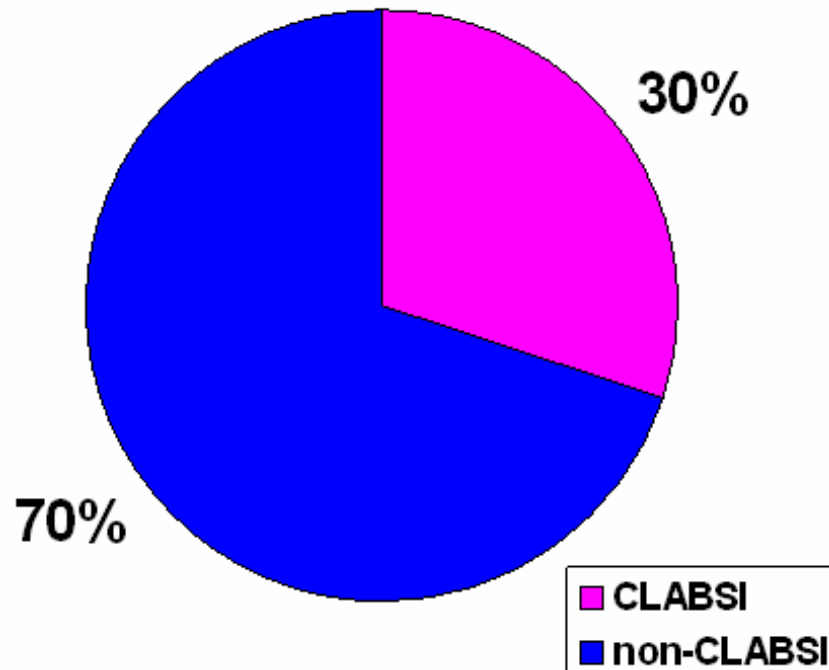
MRSA-BSI: Central Line-Associated, Tennessee, 2004-2007 (N=756)





Implications for Prevention of MRSA-BSI

Prevention of MRSA-BSI



Prevent Infections

- CLABSI– but must go beyond the ICU!
 - CLABSI in ICU: 5.4% of MRSA-BSI
- Dialysis population
 - Primary Prevention (Obesity, DM, HT)
 - “Fistula First”

Prevent Transmission



Example of MRSA Campaign: Preventing Transmission

Active Surveillance

Culture high risk patients and place them on contact precautions so that MRSA does not spread. Includes pre-op surgical recommendations.

A

Barrier Precautions

Gowns, gloves, and masks are available for patient, staff, and visitor transmission prevention.

B

Compulsive Hand Hygiene

The easiest and most effective way to stop MRSA and other healthcare associated infections from spreading.

C

Disinfection/Environmental

Thorough cleaning and appropriate use of products are absolutely necessary to reduce the transmission of MRSA.

D

Executive Championship

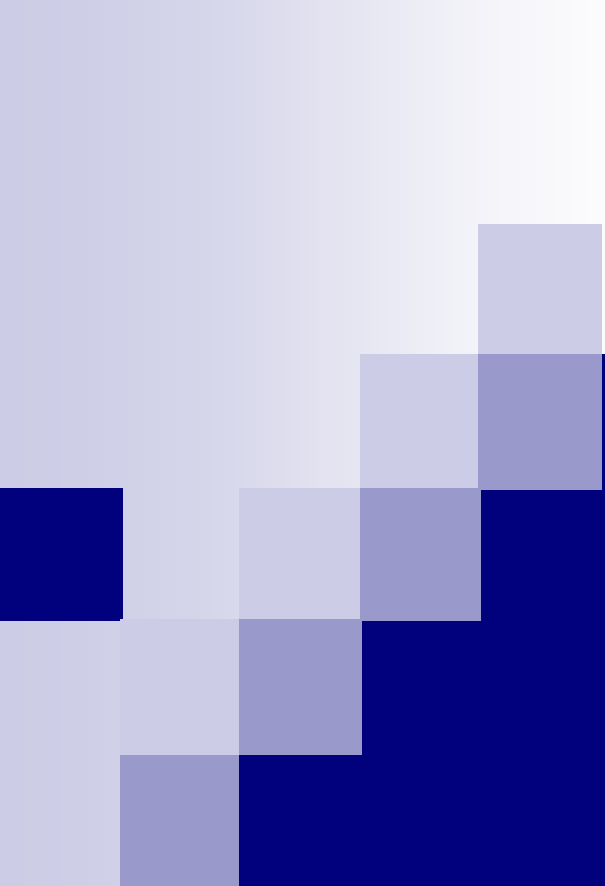
Facility, division, and corporate support of clinicians' efforts.

E

MRSA Toolbox

click here for materials 

WASH YOUR HANDS.
REMAND YOUR CAREGIVERS TO DO THE SAME.



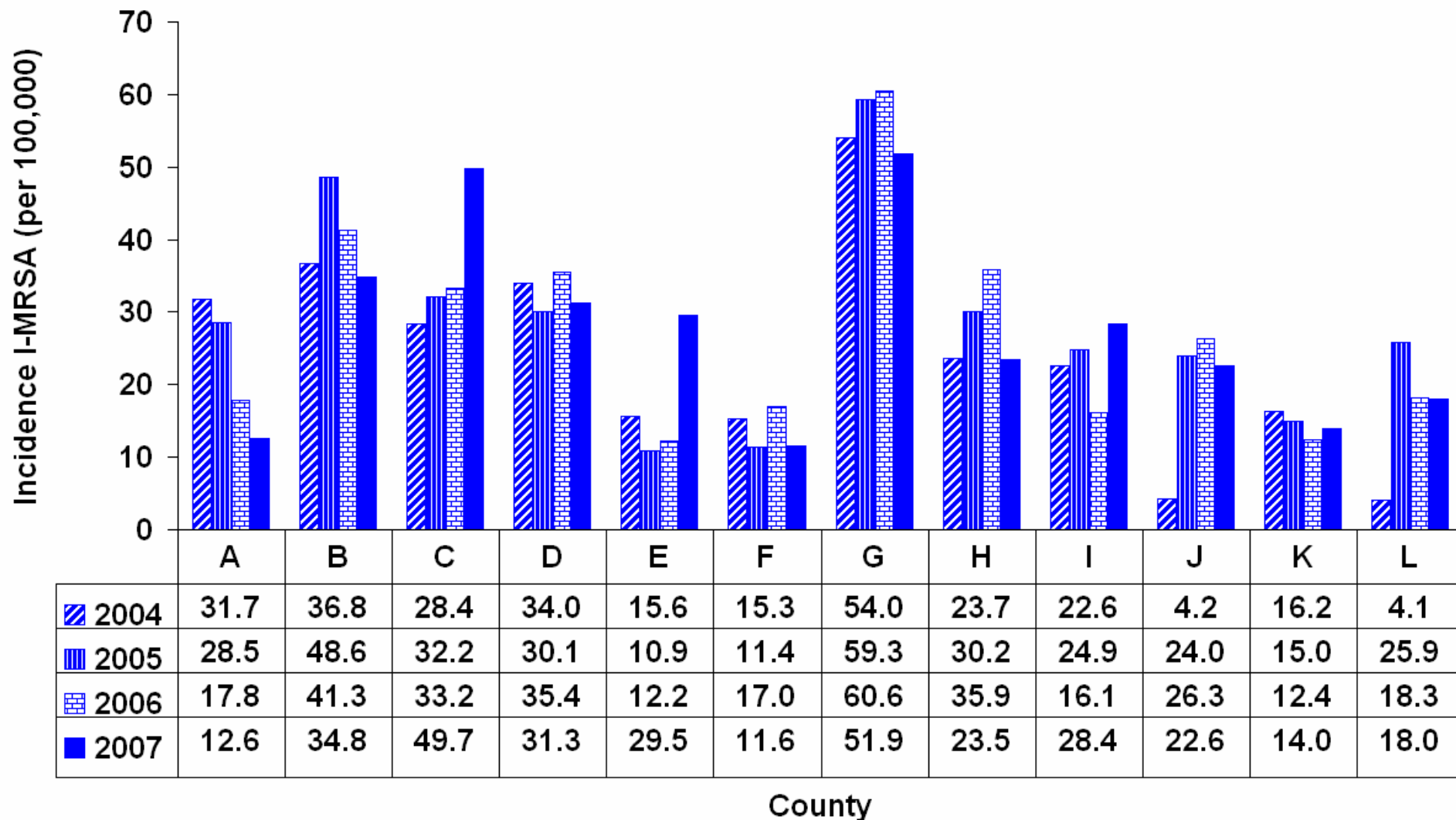
I-MRSA trends in Tennessee: 2004-7

Insights into Preventability

Incidence Invasive MRSA- TN, 2004-2007

Counties with Populations $\geq 100,000$

▨ 2004
 ▤ 2005
 ▥ 2006
 ■ 2007

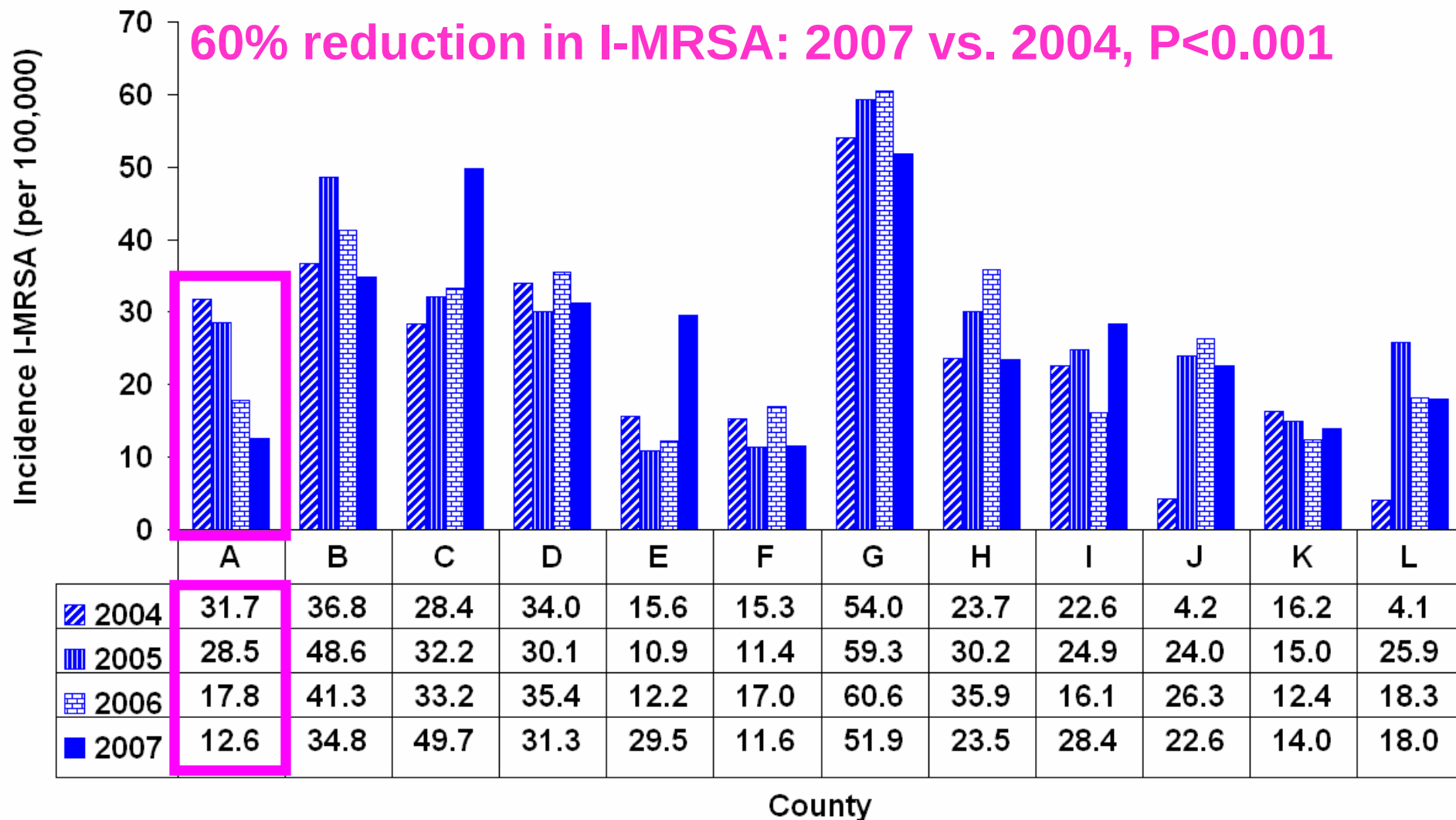


Incidence Invasive MRSA- TN, 2004-2007

Counties with Populations $\geq 100,000$

▨ 2004
 ▤ 2005
 ▥ 2006
 ■ 2007

60% reduction in I-MRSA: 2007 vs. 2004, $P < 0.001$



Ranking of Counties in TN by I-MRSA Rates

Rank	2004	2005	2006	2007
1 (best)	L	E	E	F
2	J	F	K	A
3	F	K	I	K
4	E	J	F	L
5	K	I	A	J
6	I	L	L	H
7	H	A	J	I
8	C	D	C	E
9	A	H	D	D
10	D	C	H	B
11	B	B	B	C
12 (worst)	G	G	G	G

Ranking of Counties in TN by I-MRSA Rates

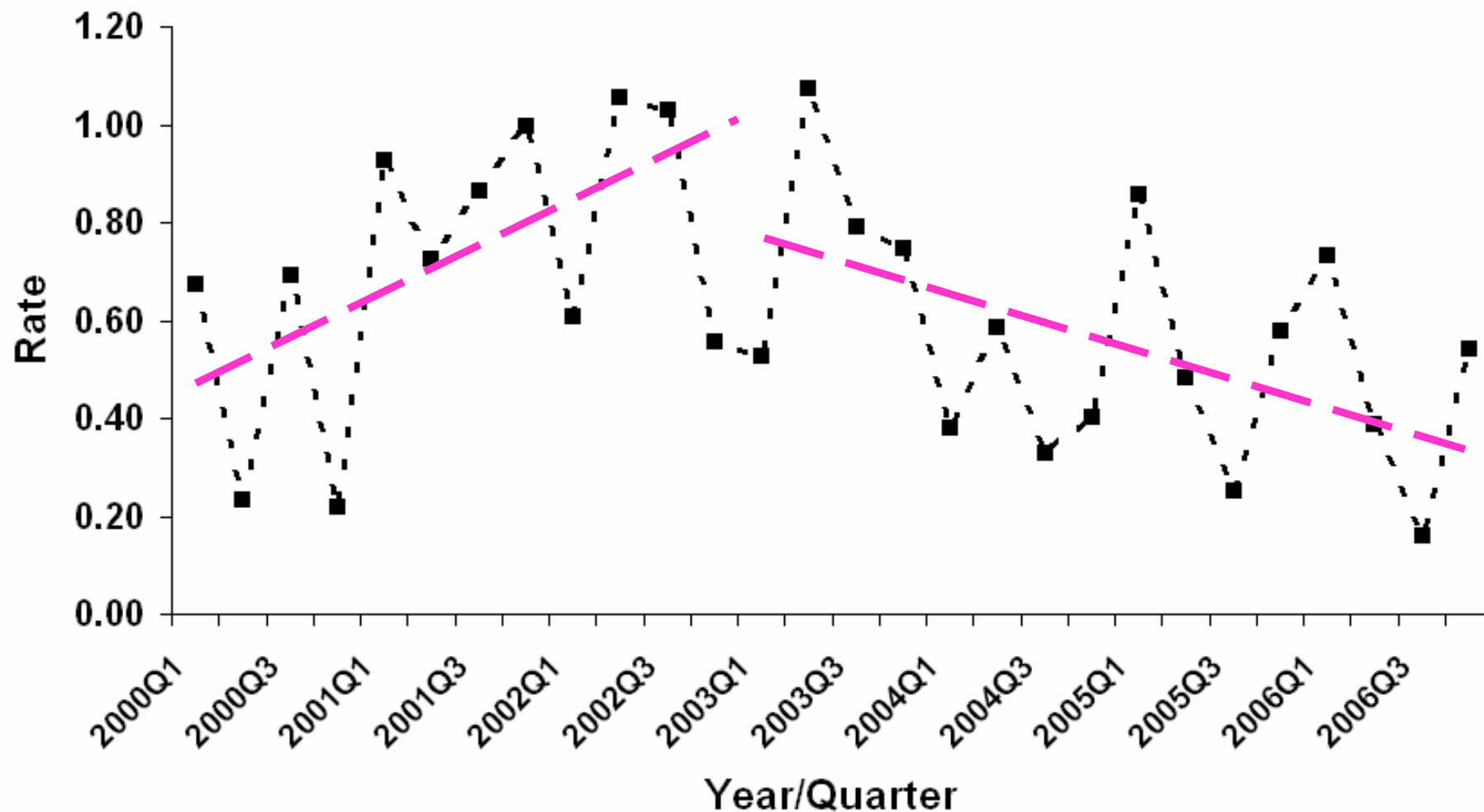
Rank	2004	2005	2006	2007
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2	J	F	K	A
3	F	K	I	K
4	E	J	F	L
5	K	I	A	J
6	I	L	L	H
7	H	A	J	I
8	C	D	C	E
9	A	H	D	D
10	D	C	H	B
11	B	B	B	C
12 (worst)	G	G	G	G

Blount Memorial Hospital

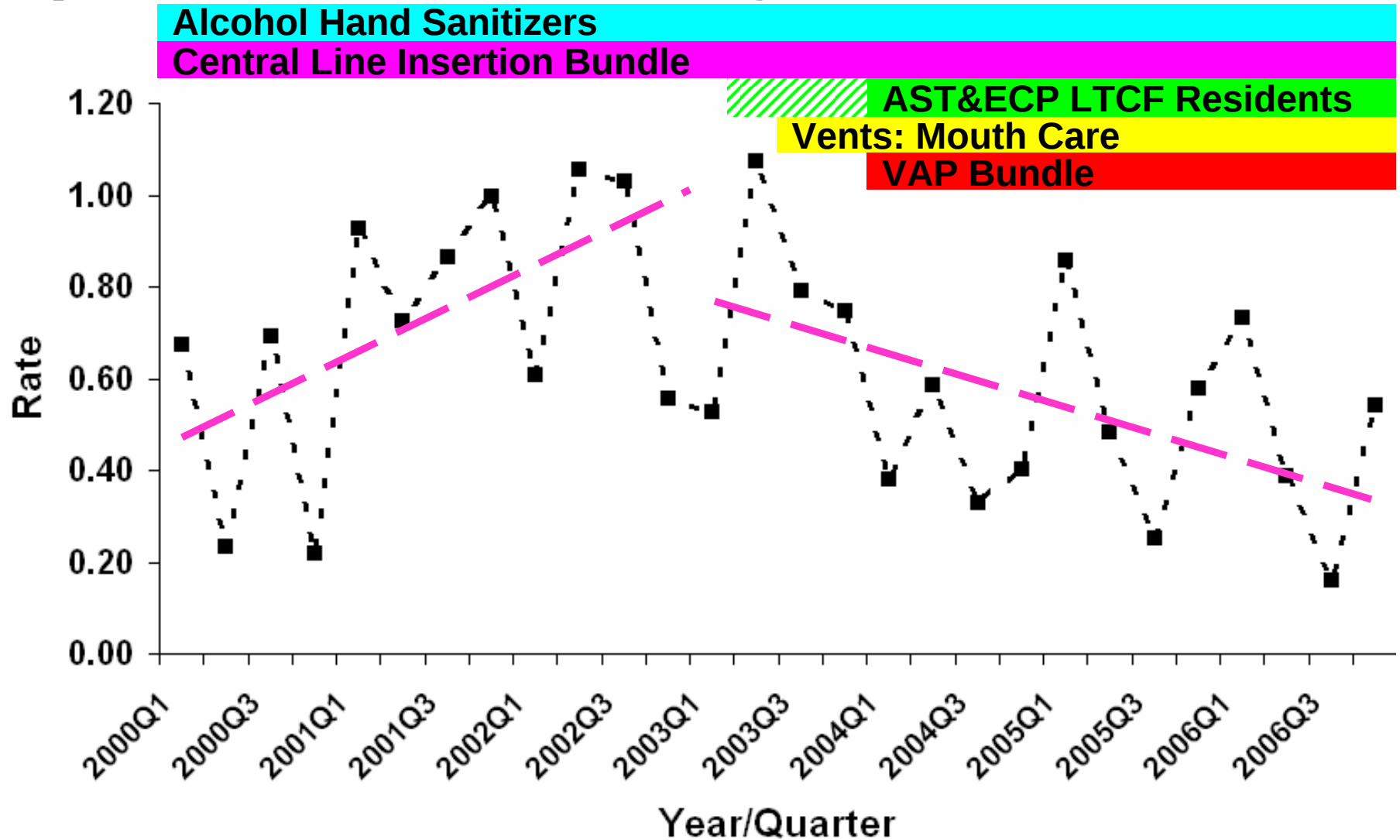


- **Nationally recognized leader in MRSA prevention**
- **Partnered with long term care facilities**
- **Instituted AST for MRSA & Contact Precautions**
- **Reduction in hospital-onset MRSA & hospital length of stay (2.2 days)**

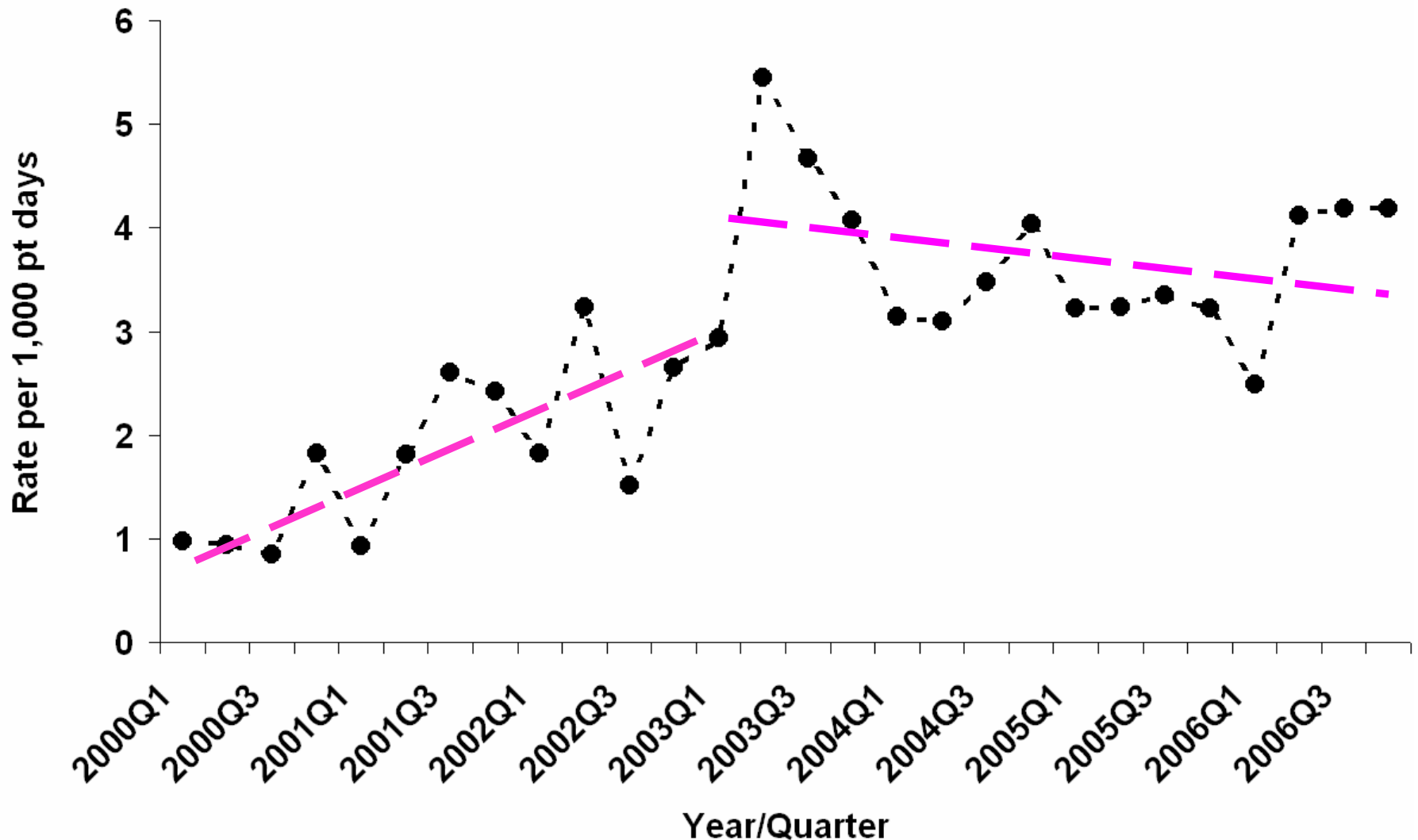
Hospital-onset MRSA Infection per 1,000 Patient-days, 2000-2006



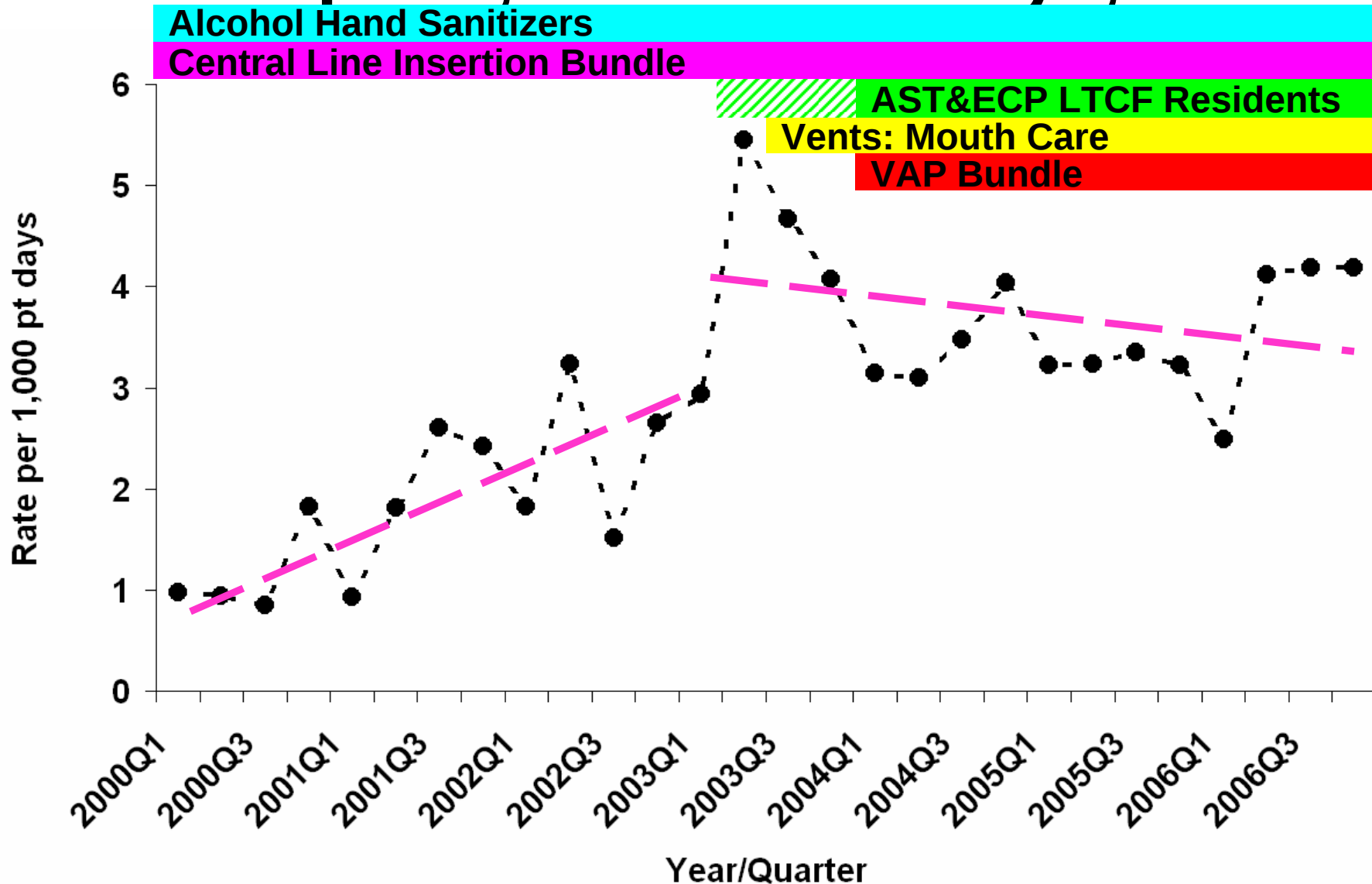
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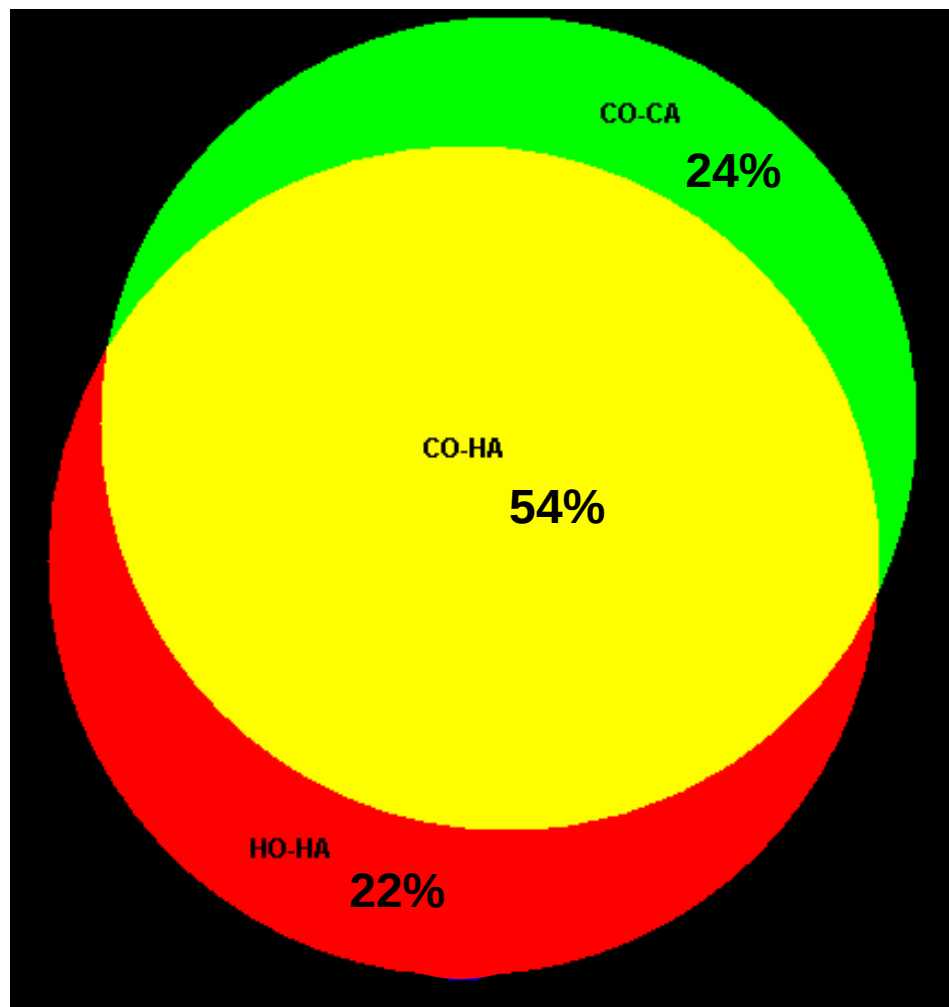
Community-onset MRSA Clinical Isolates per 1,000 Patient-days, 2000-6



Community-onset MRSA Clinical Isolates per 1,000 Patient-days, 2000-6



MRSA-BSI: Onset and Association, Tennessee 2004-2007 (N=756)



 CO-CA: Community Onset, Community Associated

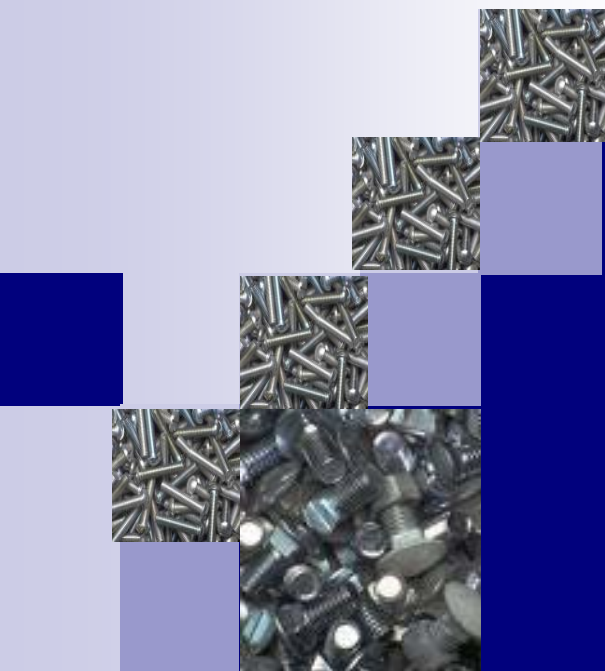
 CO-HA: Community Onset, Healthcare Associated

 HO-HA: Hospital Onset, Healthcare Associated

ABC data, TN 2004-2007



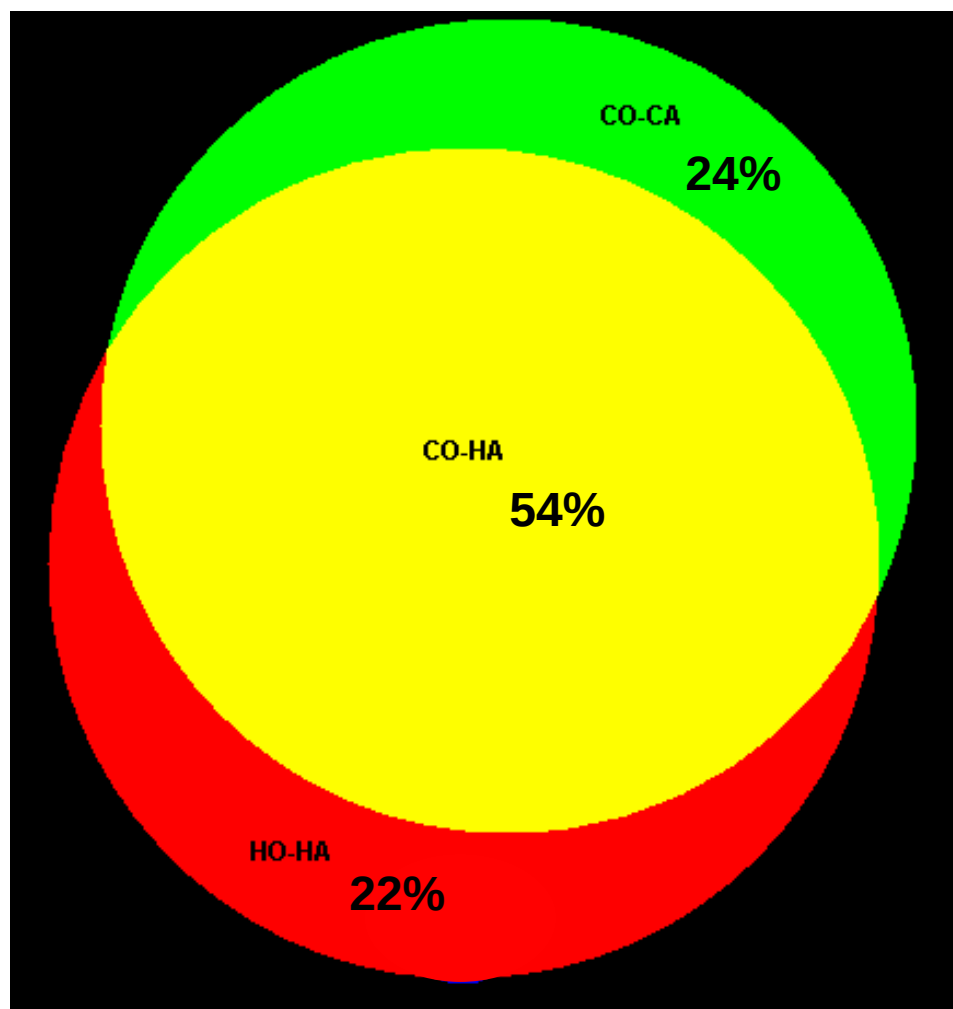
Nuts and Bolts: Basic Definitions



Definition: Hospital Onset

**48 Hours or
Day 4 of Admission
(Day of Admission= Day 1)**

MRSA-BSI: Hospital Onset Definition: 48 Hours vs. Day 4 of Admission



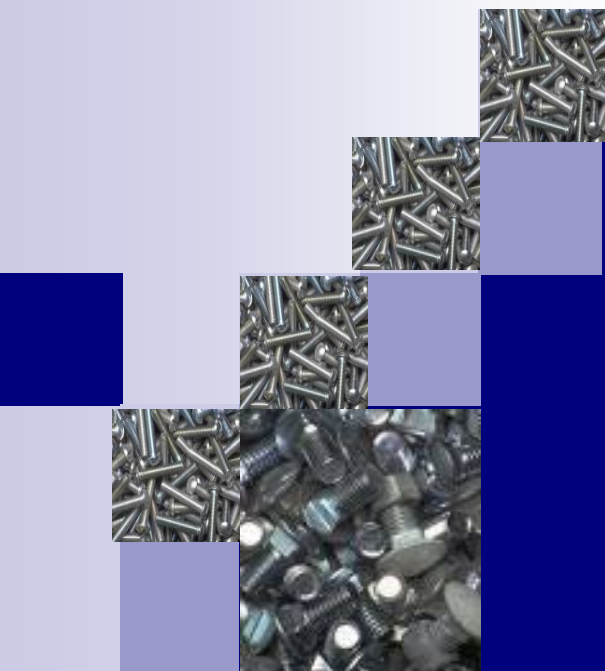
- Changed classification of only 3/756 (0.4%)

 CO-CA: Community Onset, Community Associated

 CO-HA: Community Onset, Healthcare Associated

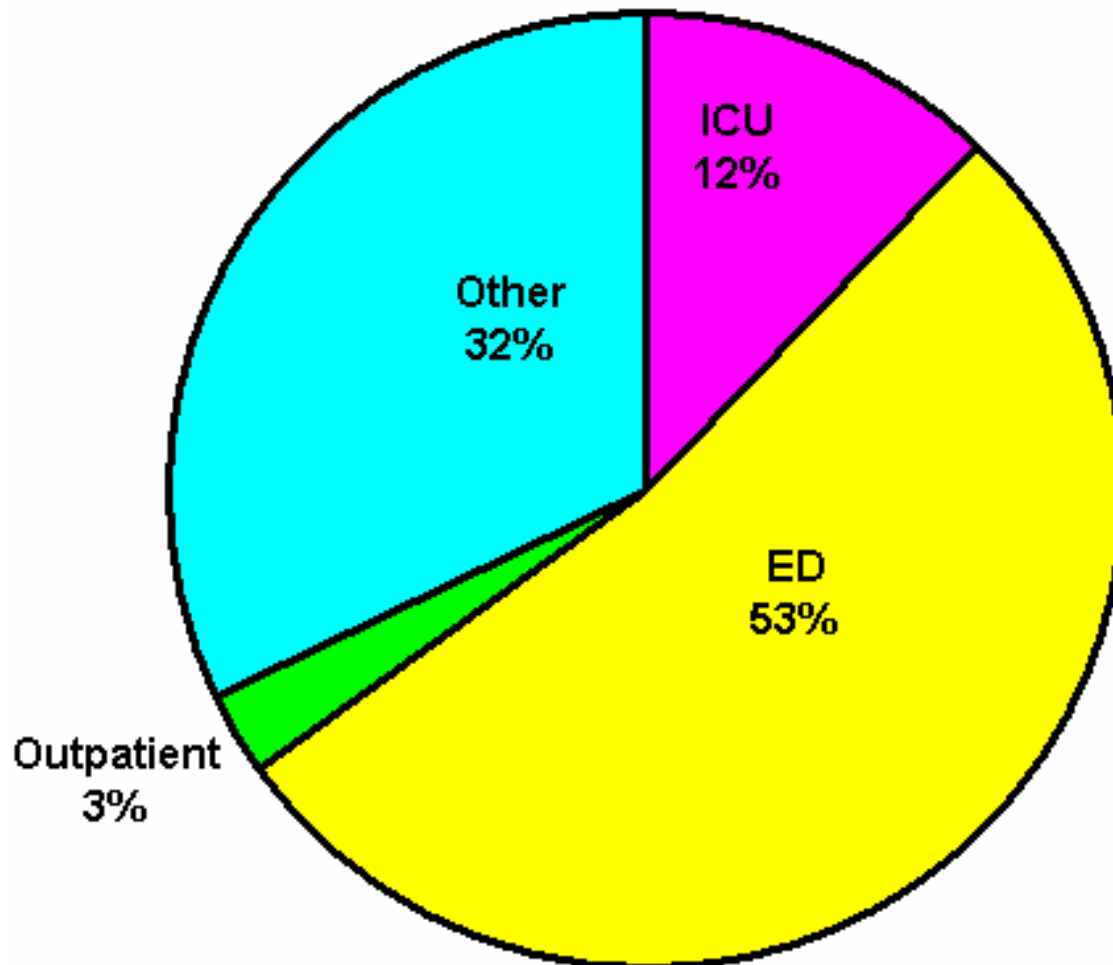
 HO-HA: Hospital Onset, Healthcare Associated

ABC data, TN 2004-2007



**Should one include
cultures taken in the
Emergency Dept?**

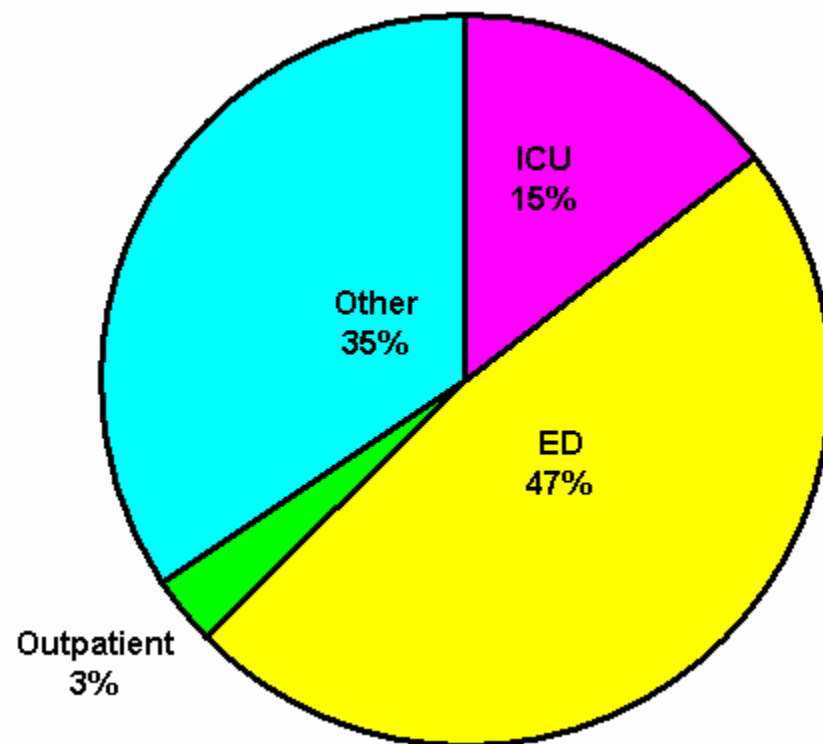
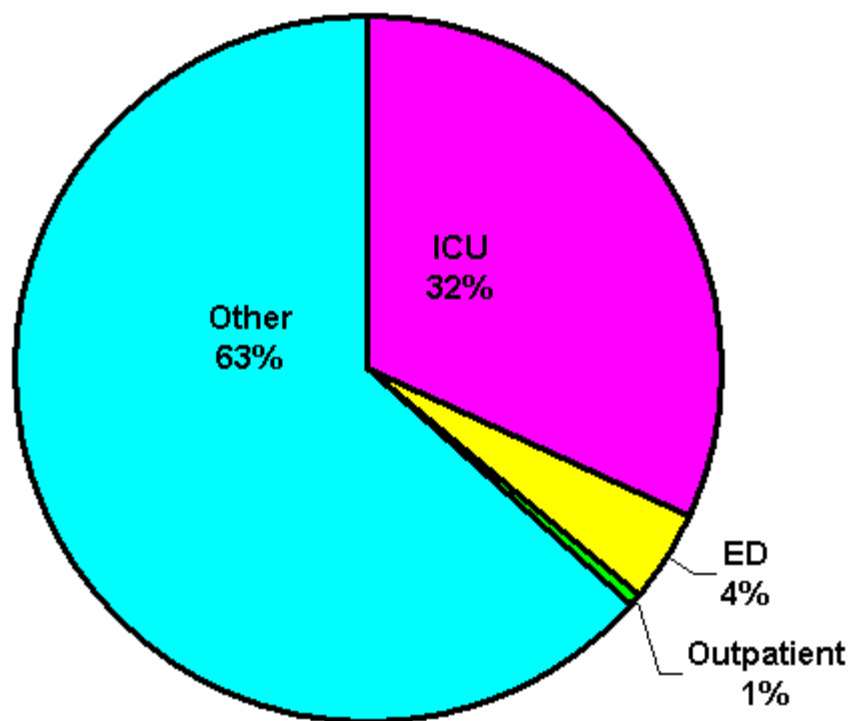
MRSA-BSI by Patient Location At Time of Culture Collection, Tennessee Oct. 2004-Jul. 2007(N=756)

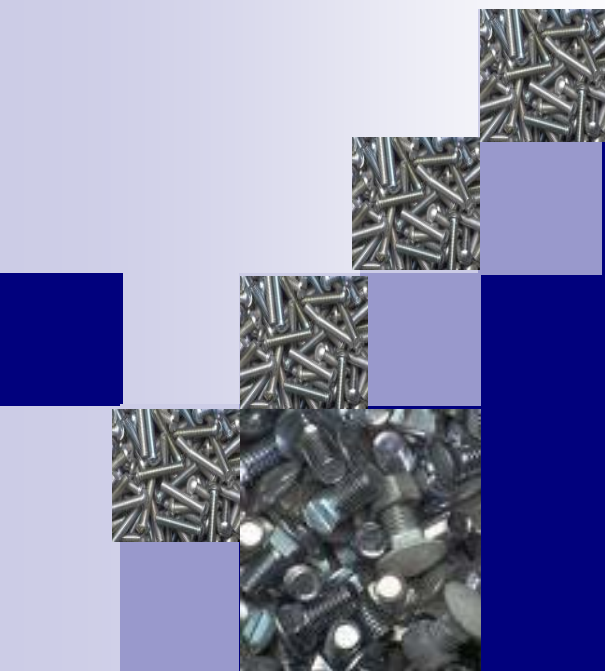


MRSA-BSI by Patient Location At Time of Culture Collection, TN, Oct. 2004- Jul. 2007

Hospital-Onset (N=166)

Healthcare-Associated (N=573)



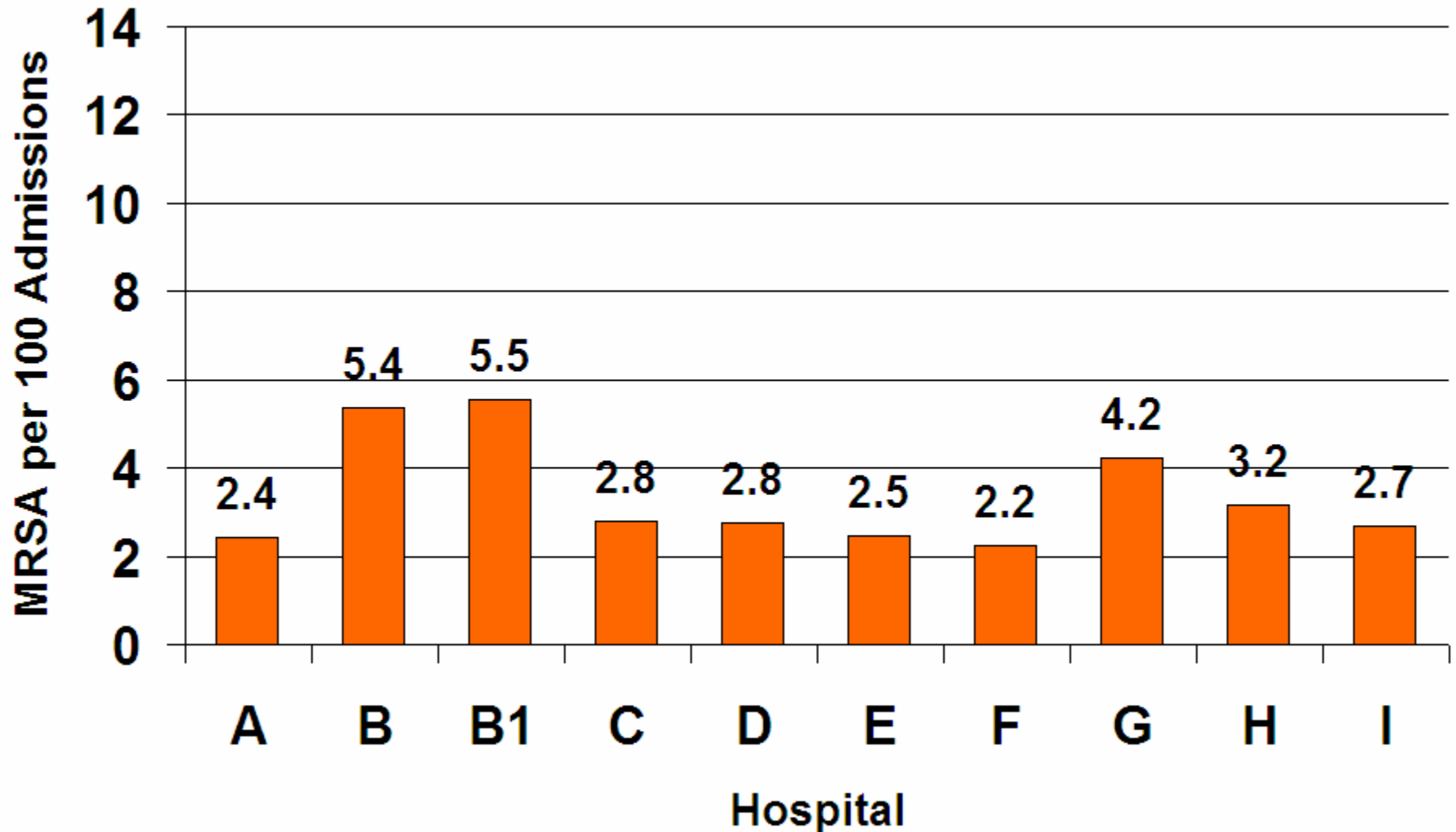


Hospital-based MRSA Rates

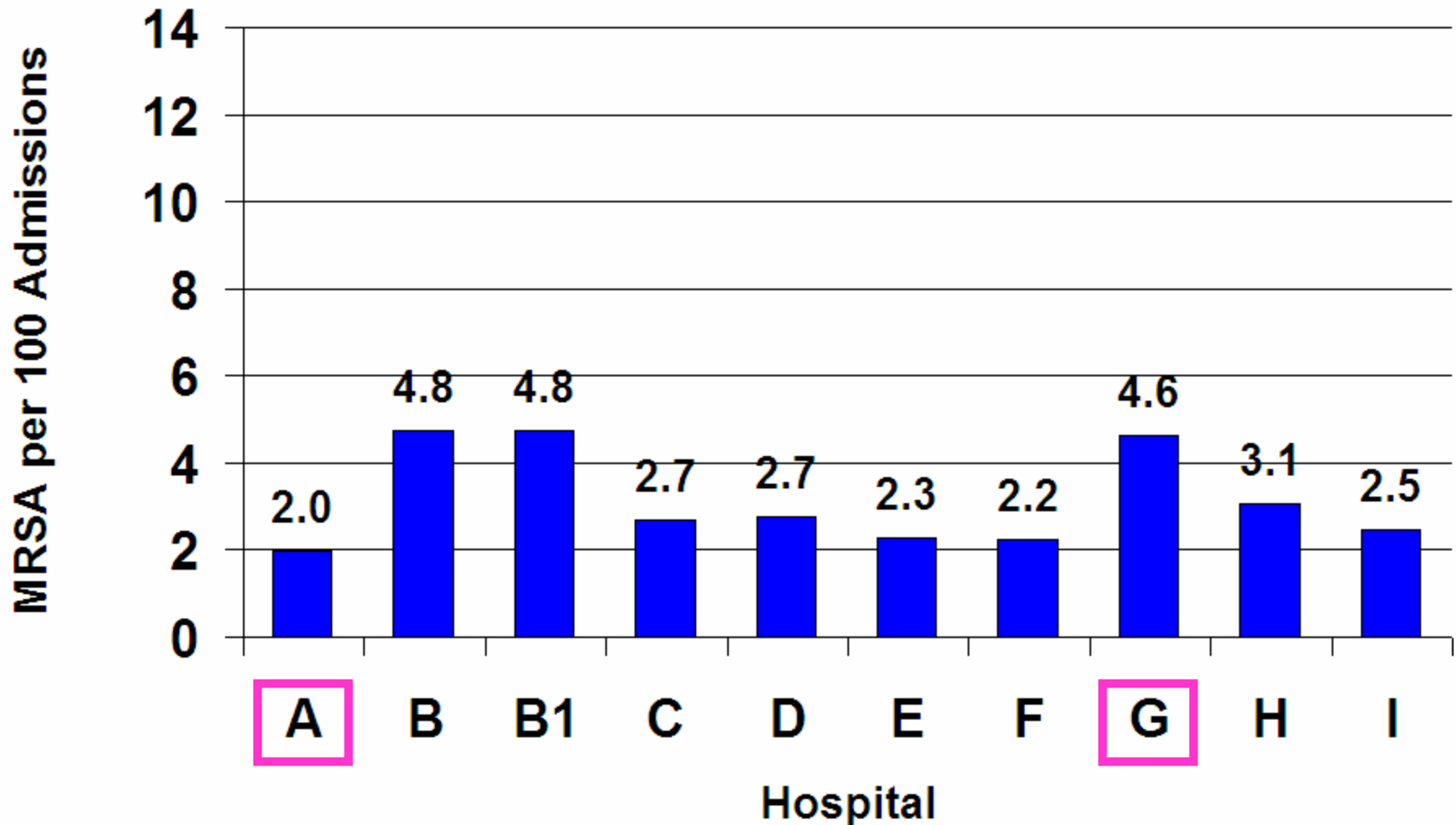
Hospital-wide?

Which Locations to Aggregate?

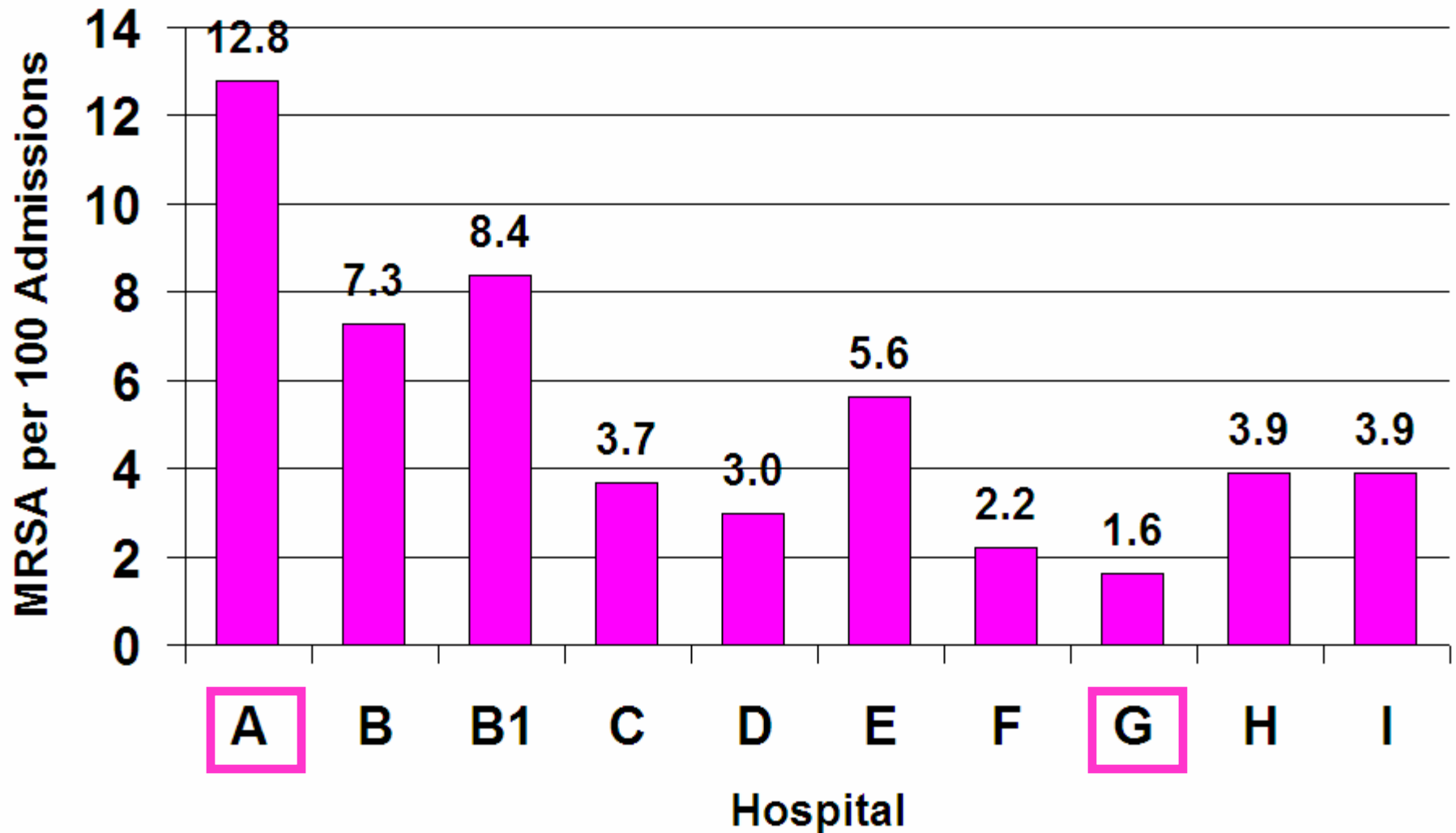
MRSA Rates: Hospital-wide per 100 Admissions



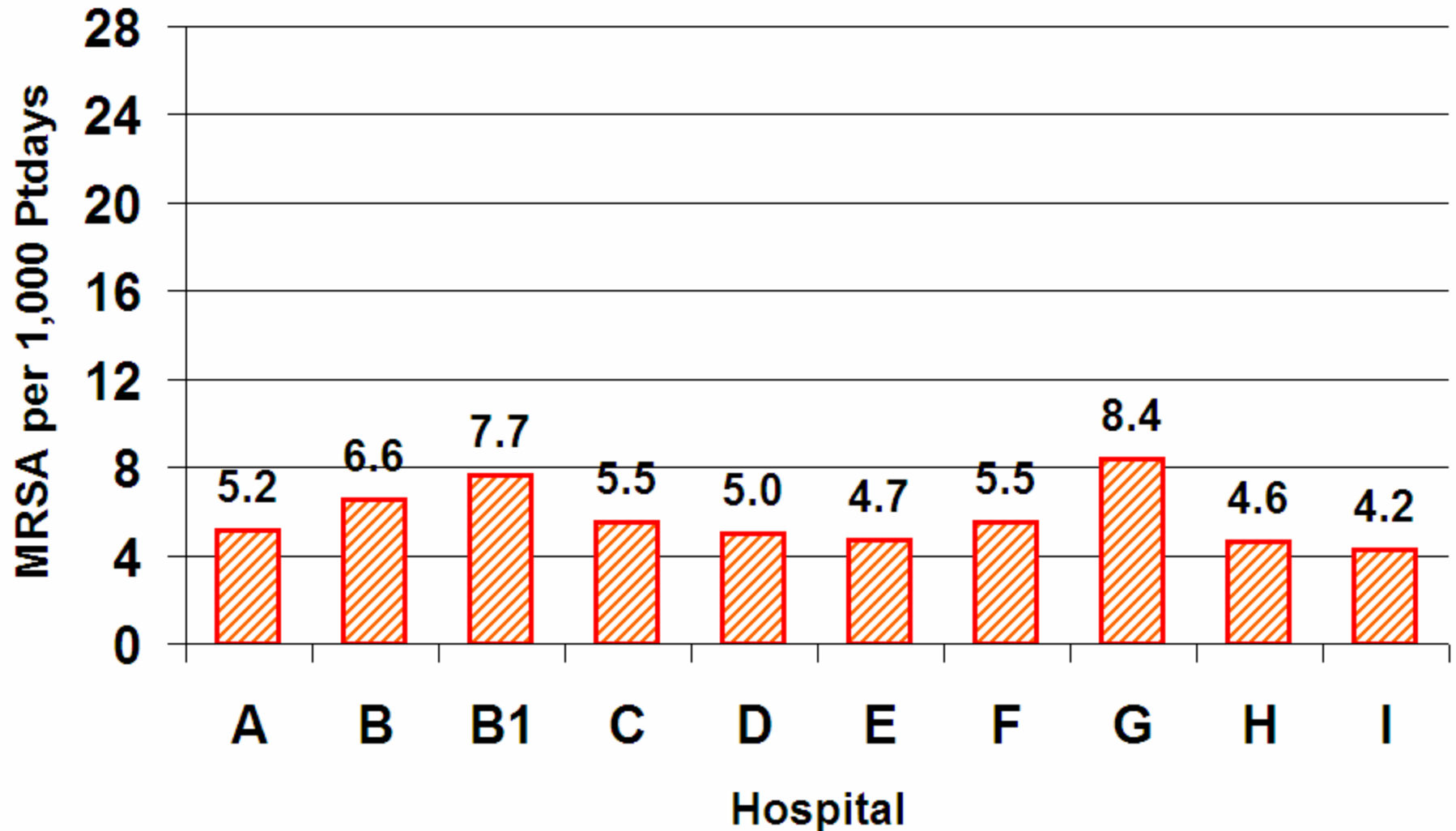
MRSA Rates: General Floor per 100 Admissions



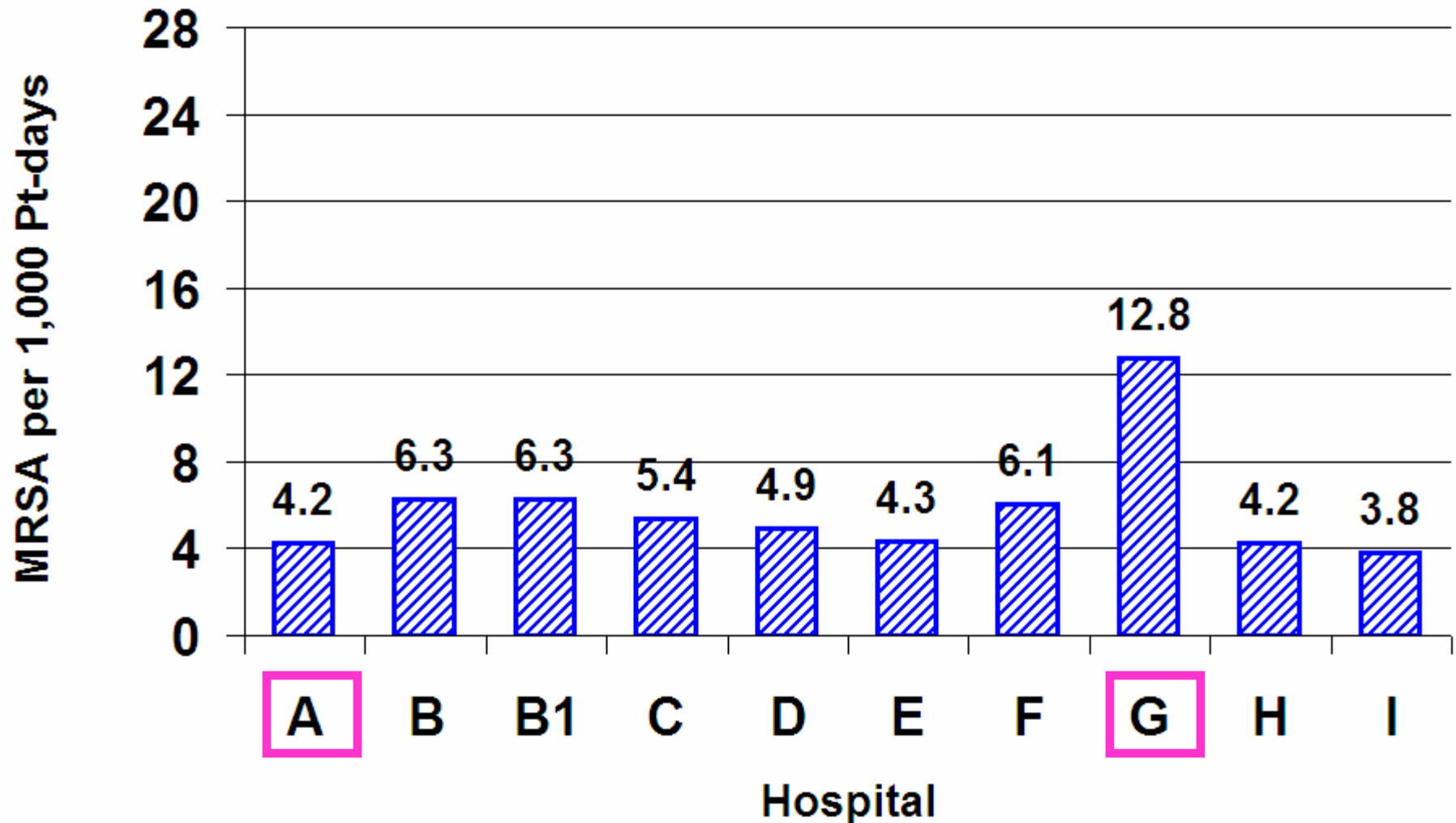
MRSA Rates: Critical Care Areas per 100 Admissions



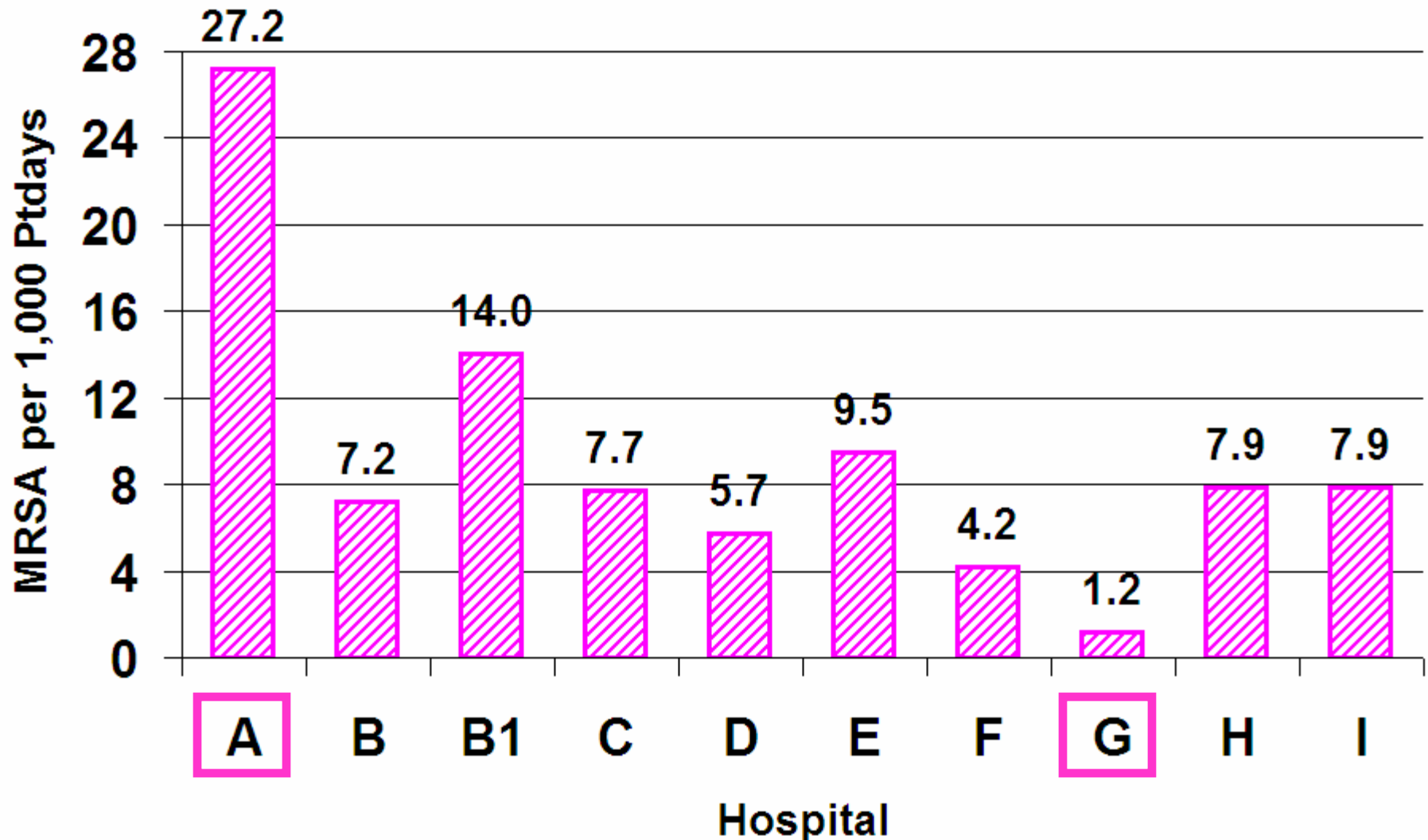
MRSA Rates: Hospital-wide per 1,000 Patient-days



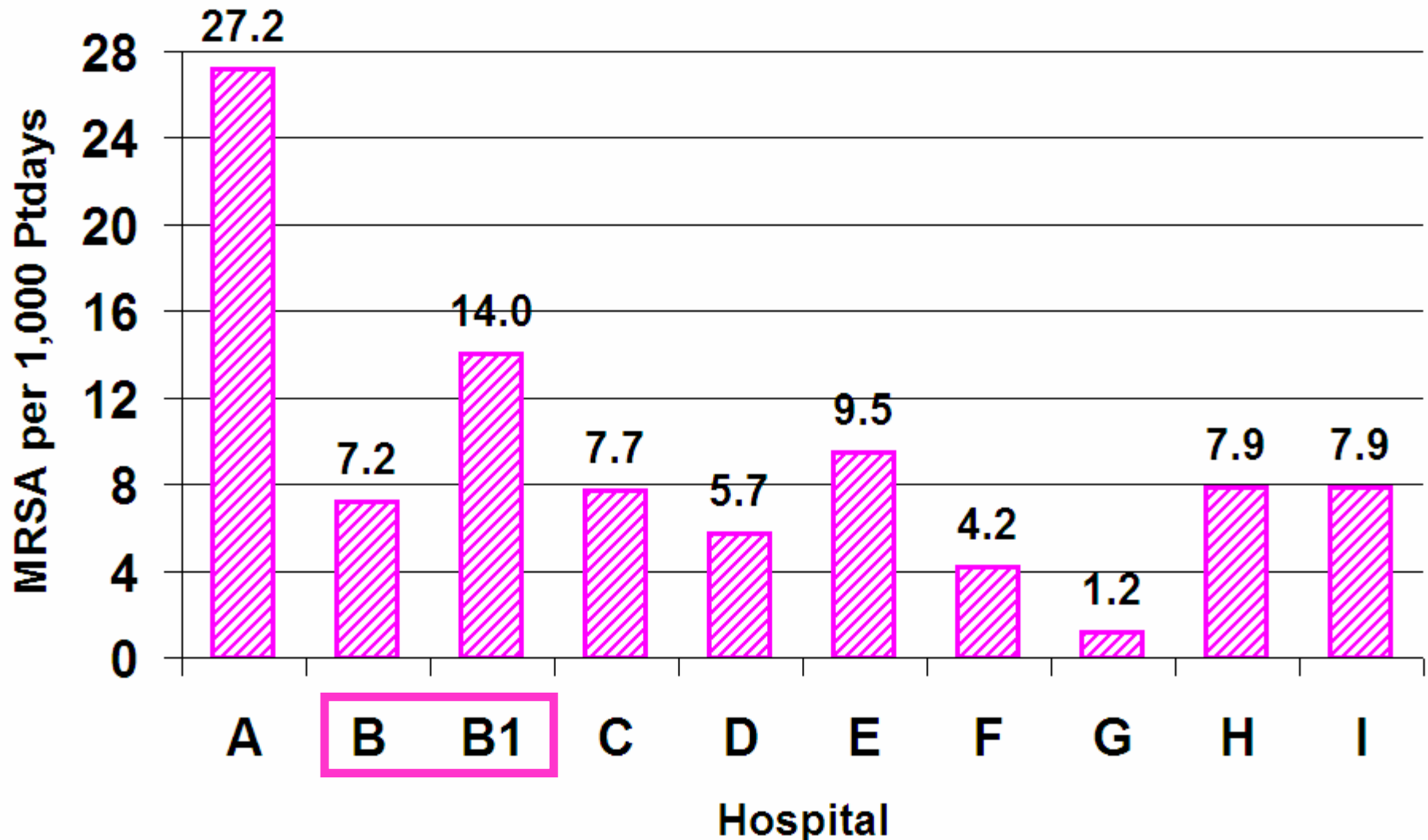
MRSA Rates: General Floor per 1,000 Patient-days

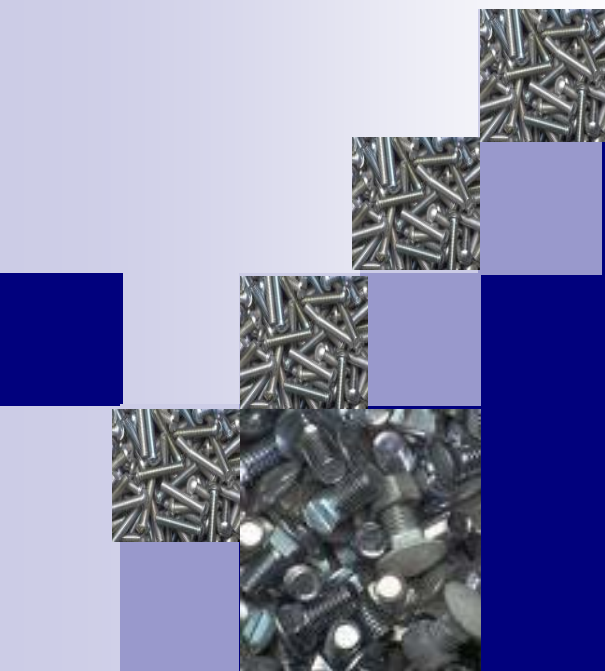


MRSA Rates: Critical Care Areas per 1,000 Patient-days



MRSA Rates: Critical Care Areas per 1,000 Patient-days



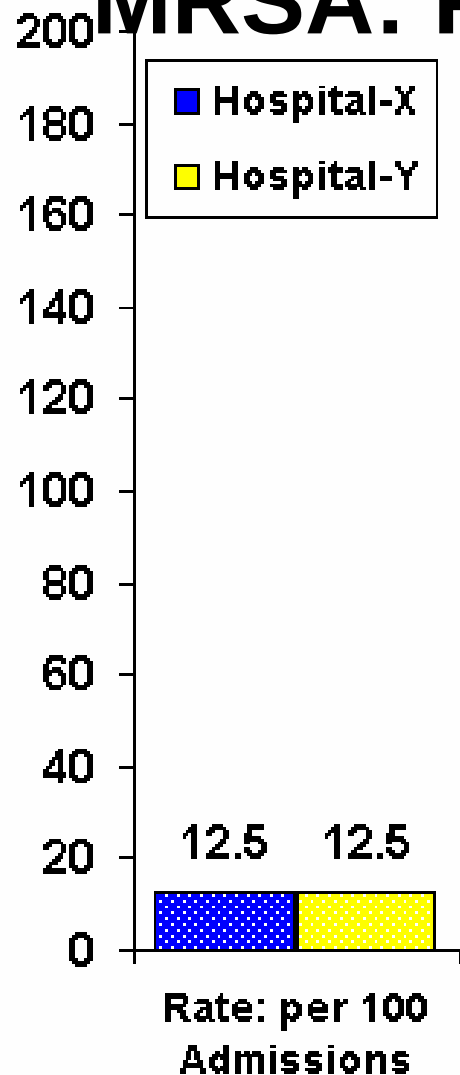


Measurement: Impact of Denominators on Rates: Patient-days at Risk

Illustration: Hypothetical Hospitals/Units: X & Y

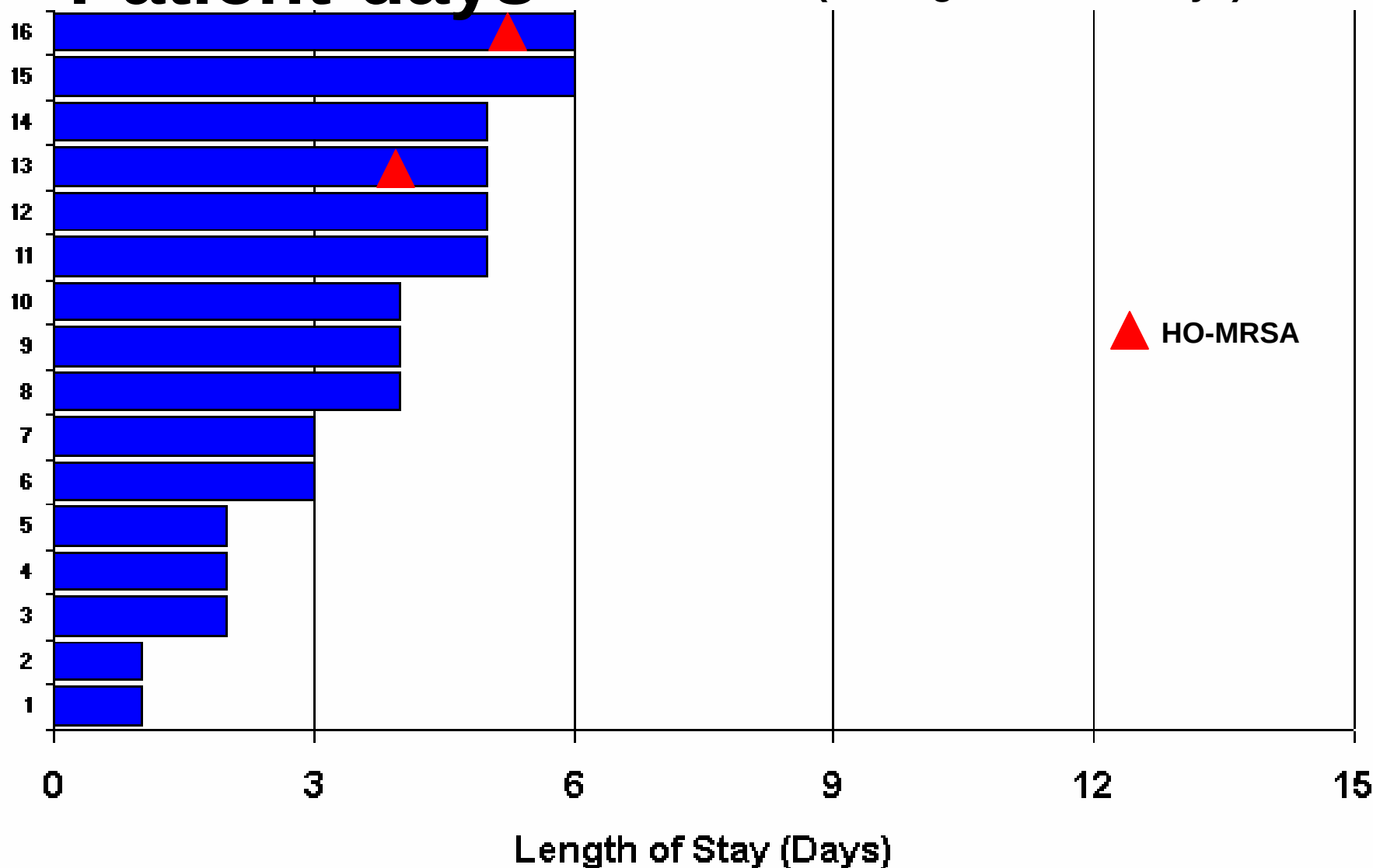
	X	Y
# HO-MRSA Infections	2	2
# Admissions	16	16
Rate: per 100 Admissions	12.5	12.5

Impact of Denominator on Rates of HO-MRSA: Patient-days vs. Admissions



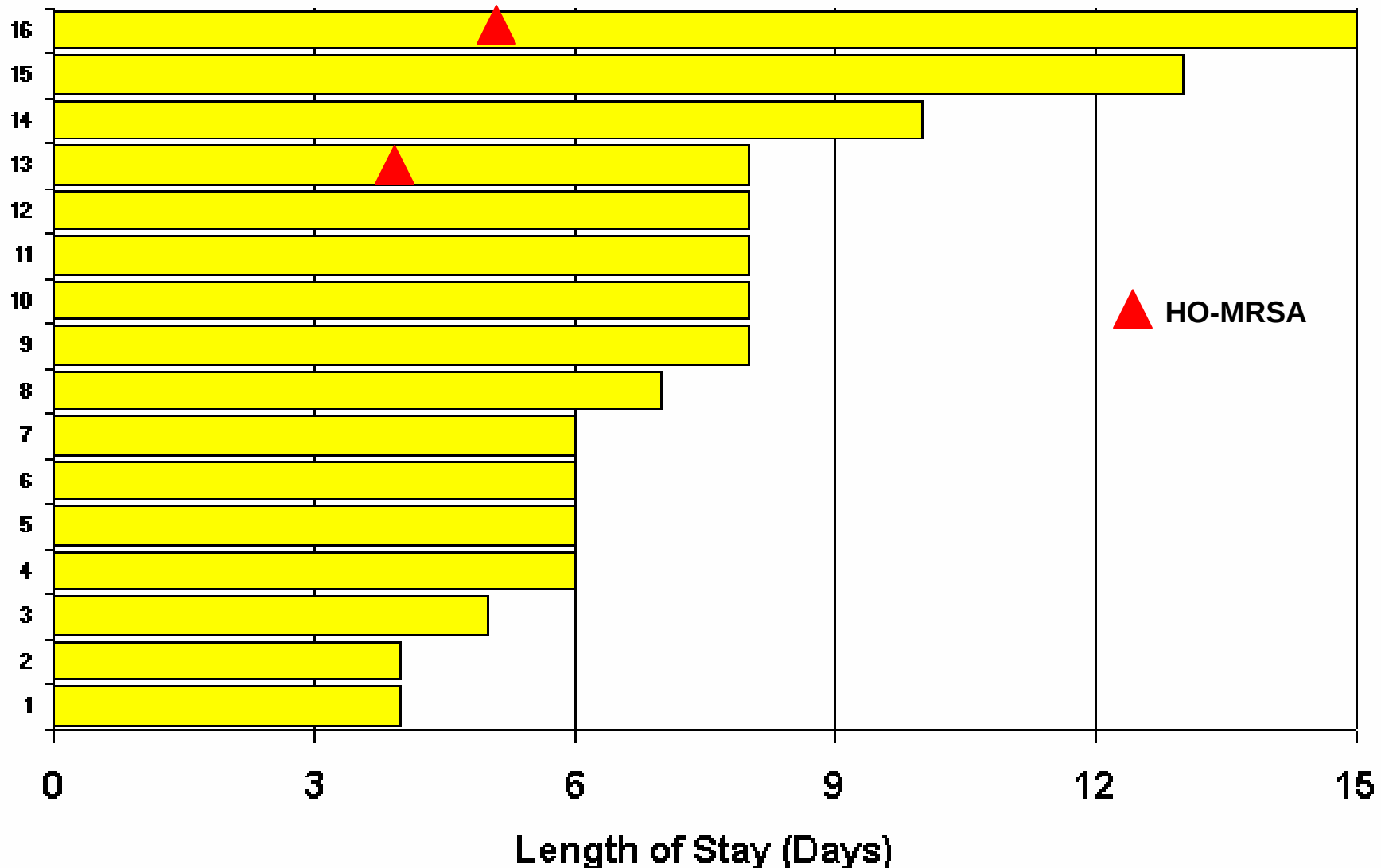
Impact of Denominator: Hospital X Patient-days

(Average LOS: 3.6 days)

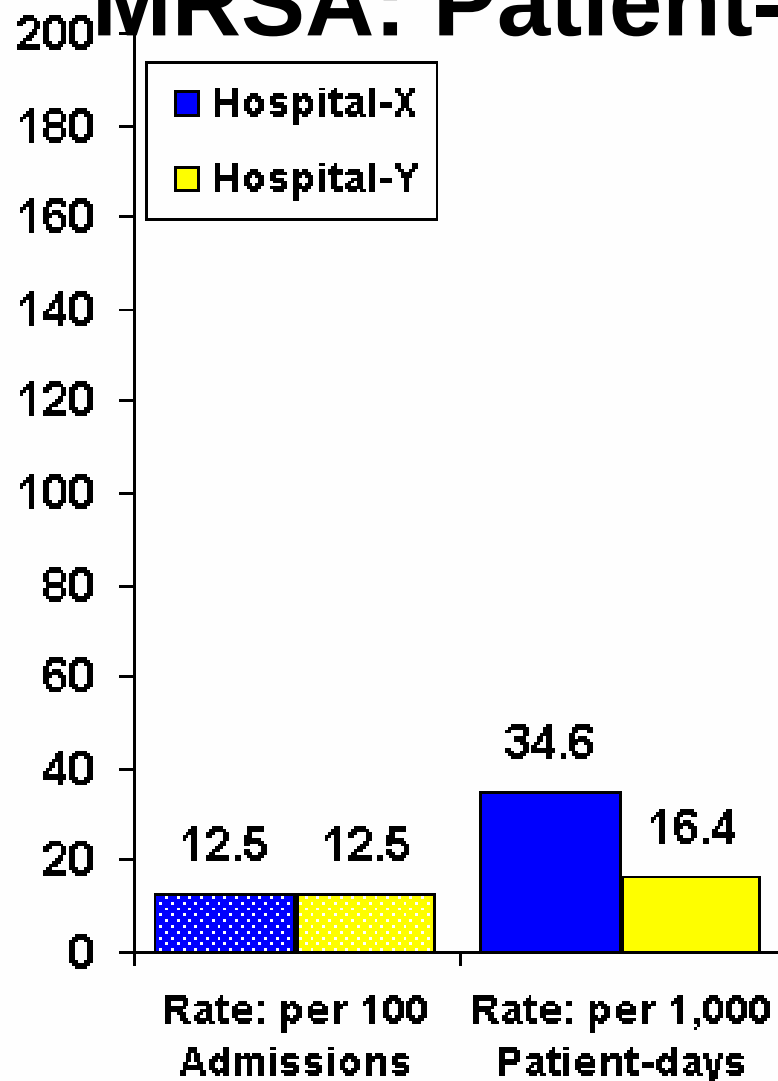


Impact of Denominator: Hospital Y Patient-days

(Average LOS: 7.6 days)



Impact of Denominator on Rates of HO-MRSA: Patient-days vs. Admissions

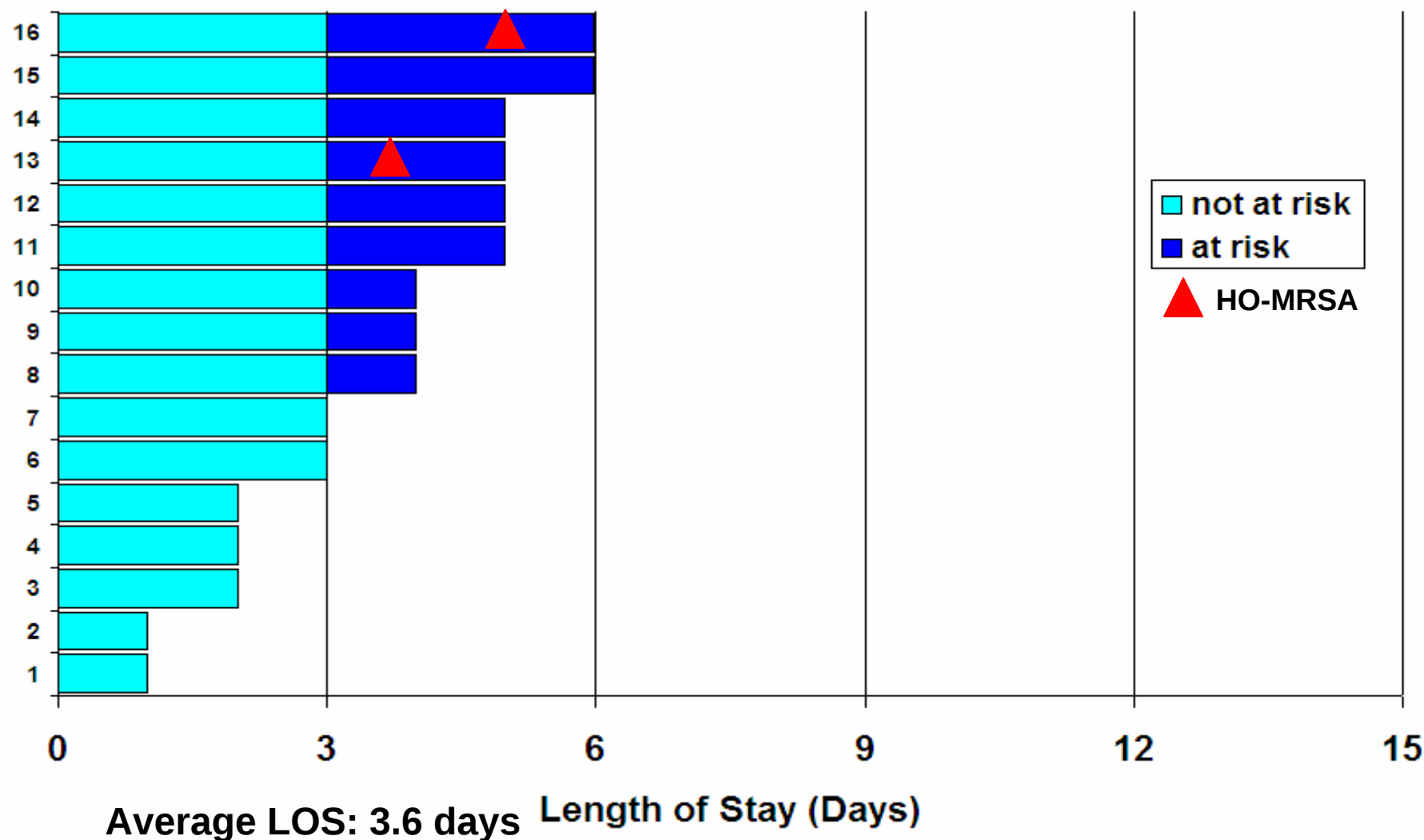




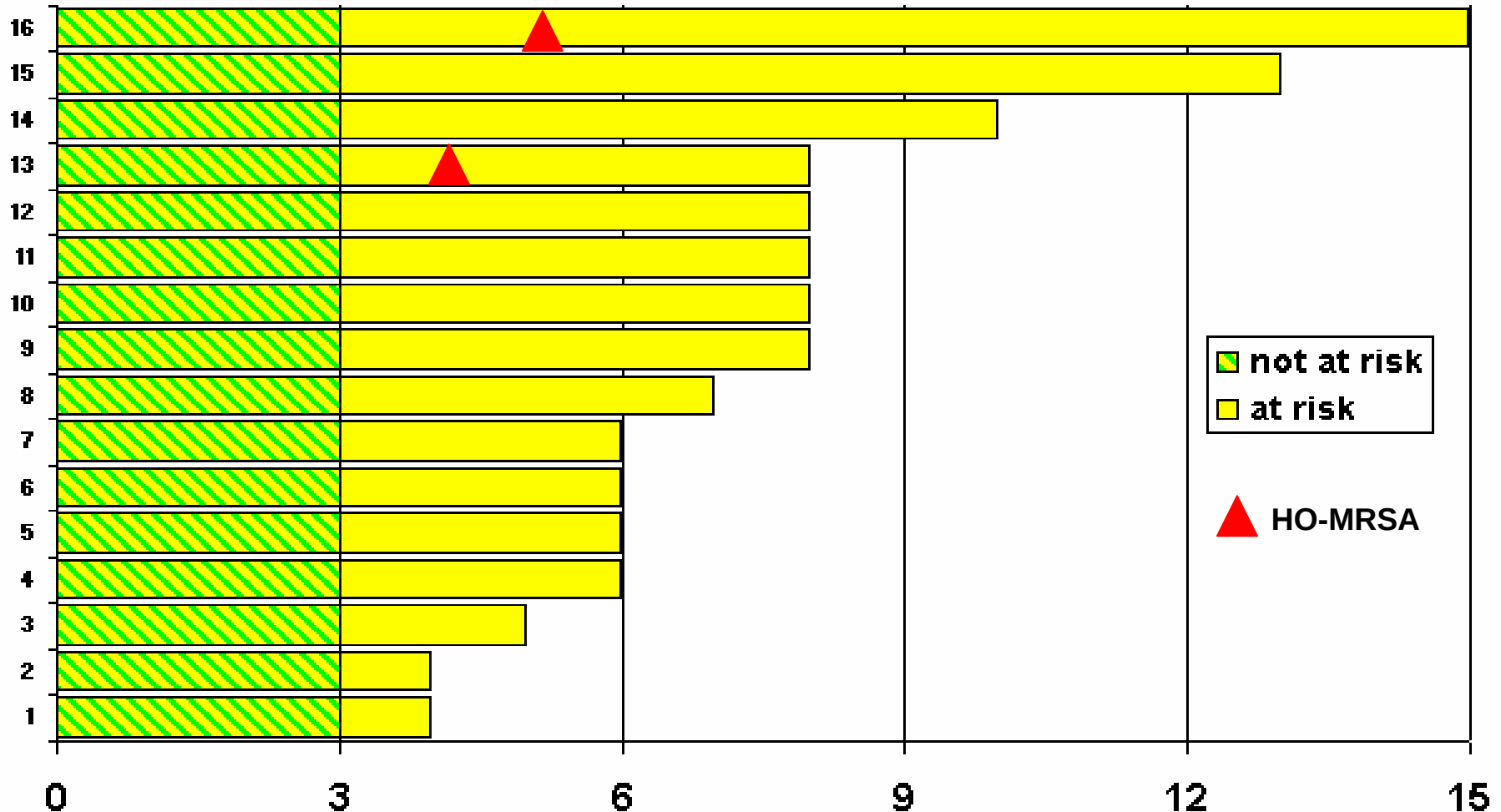
Impact of Denominator: Patient-days at Risk

- **If Length of Stay (LOS) $\leq$ 3 days,
cannot get HO-MRSA**
 - **False inflation of denominator**

Impact of Denominator: Hospital X Patient-days at Risk (LOS)

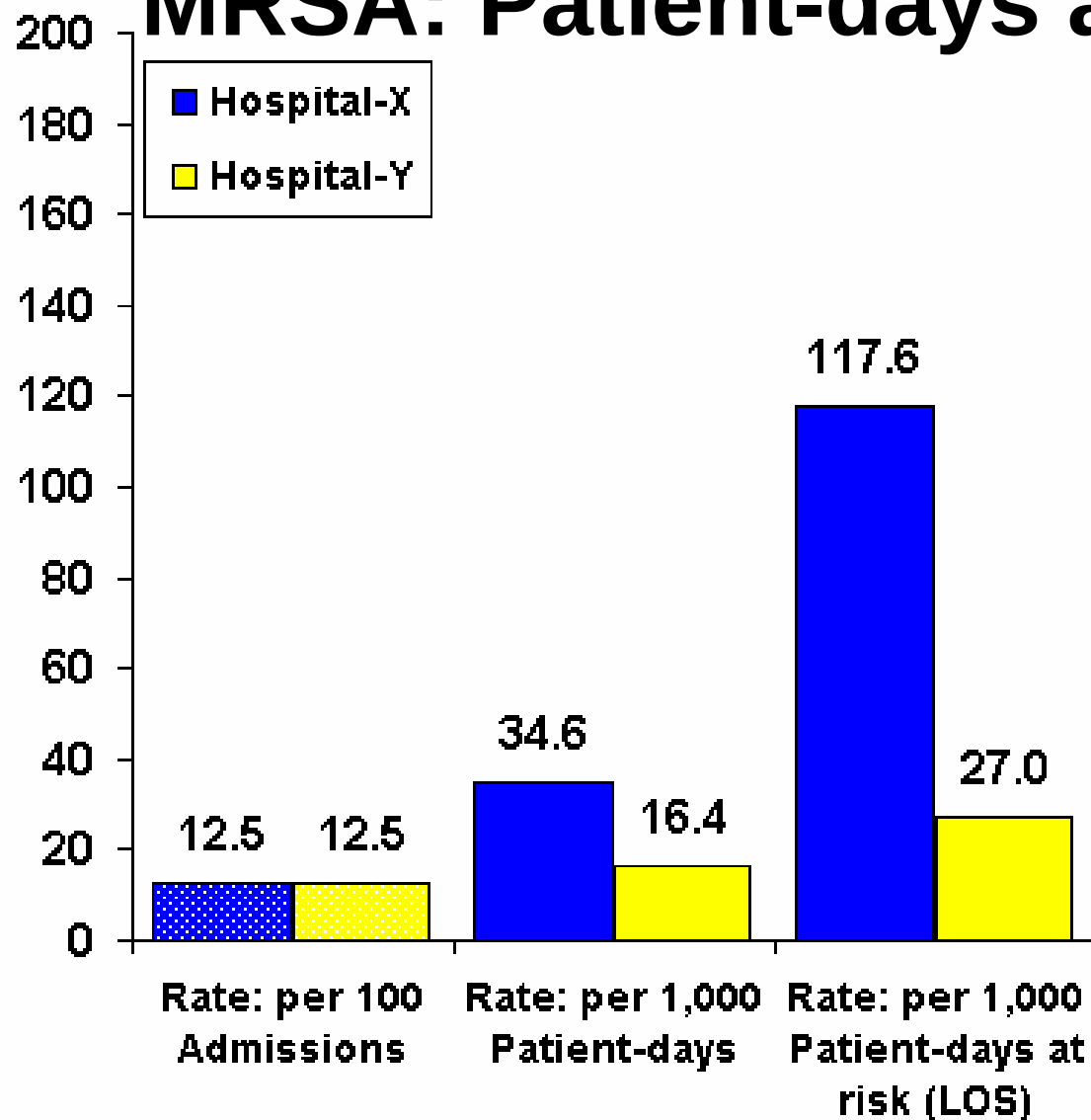


Impact of Denominator: Hospital Y Patient-days at Risk (LOS)



Average LOS: 7.6 days Length of Stay (Days)

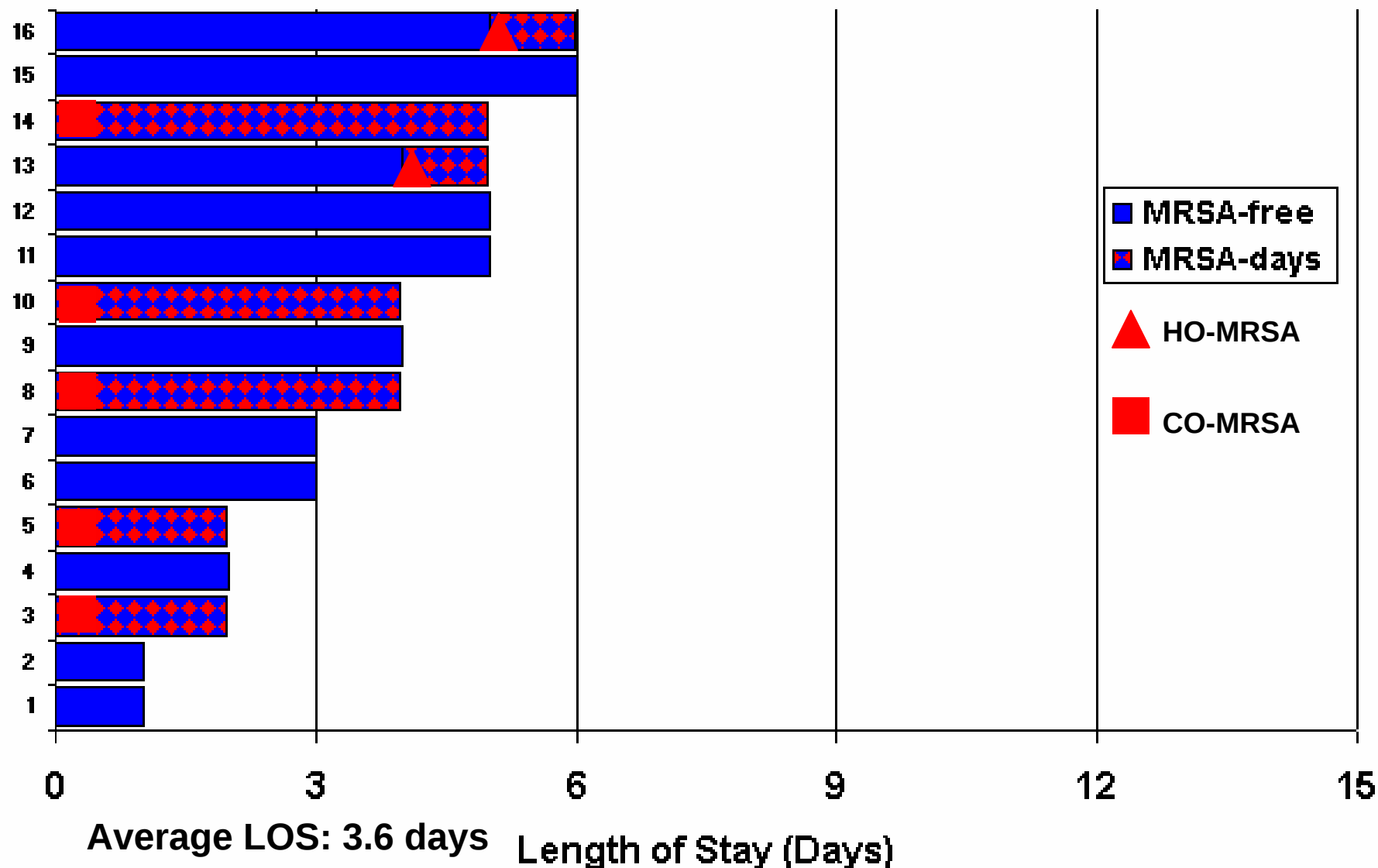
Impact of Denominator on Rates of HO-MRSA: Patient-days at Risk (LOS)



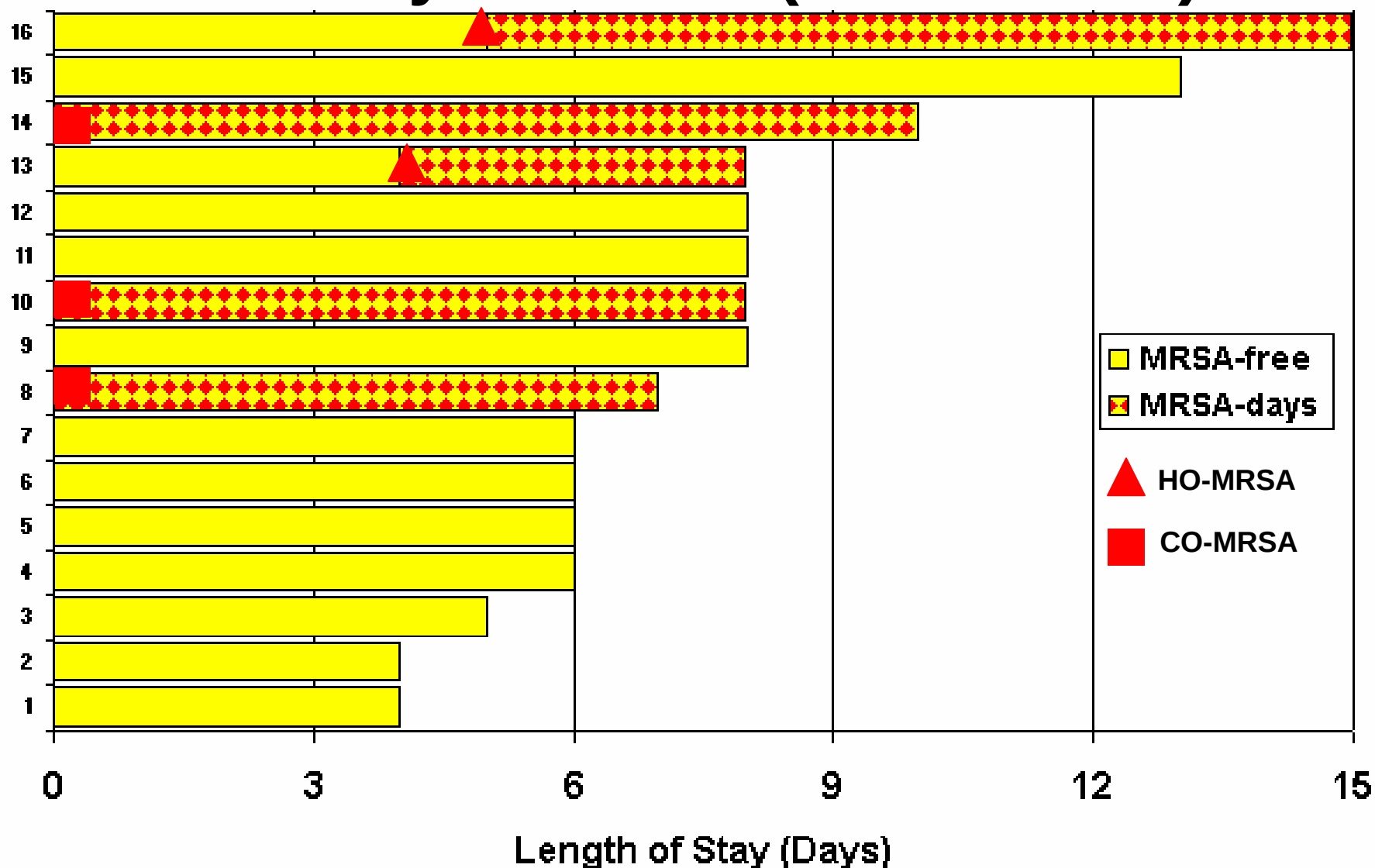
Impact of Denominator: Patient-days at Risk

- **If already have MRSA... no longer “at risk” of being counted (again) in numerator**
 - **False inflation of denominator**
 - **Especially if number of patients admitted with CO-MRSA is not small**

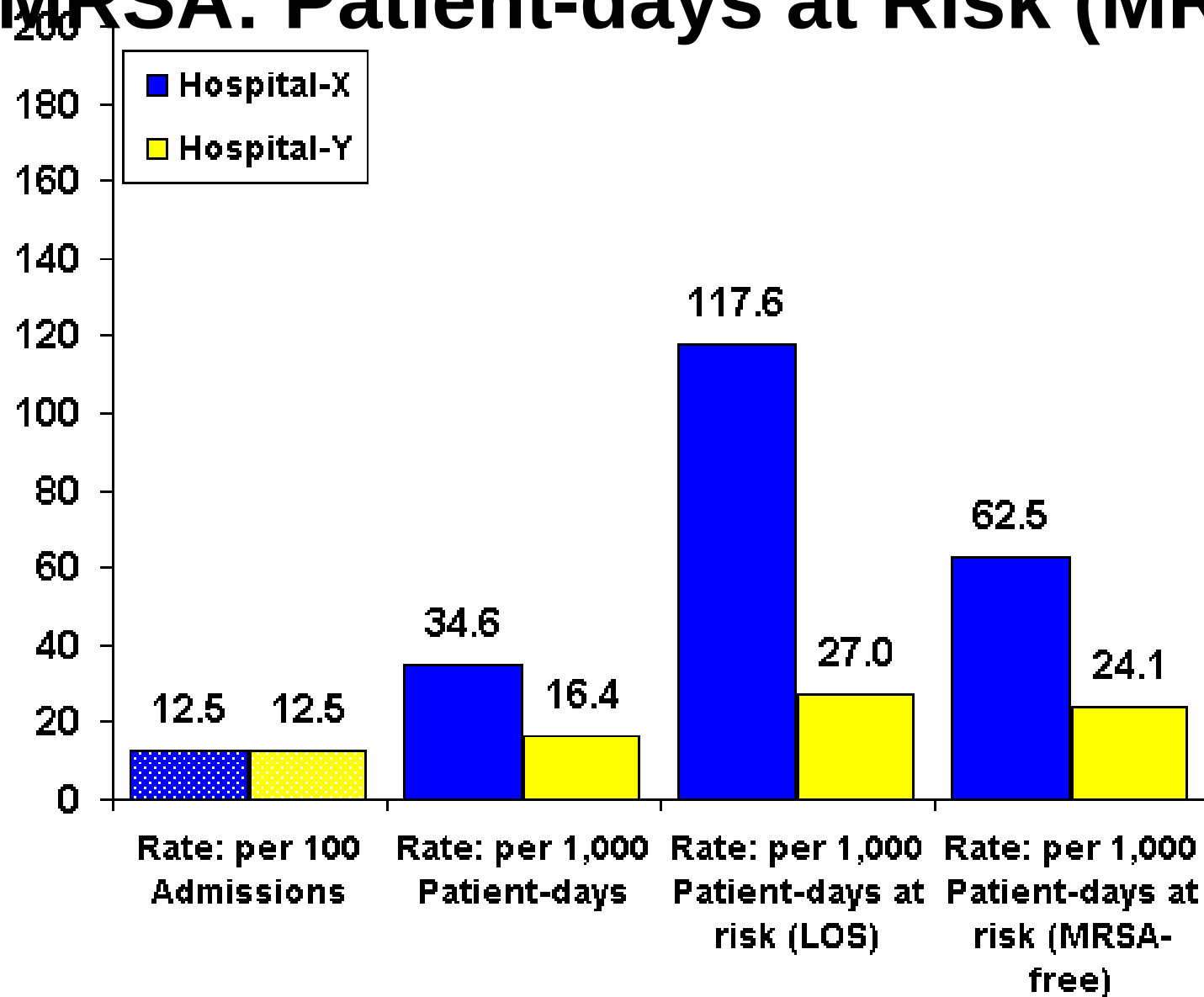
Impact of Denominator: Hospital X Patient-days at Risk (MRSA-Free)



Impact of Denominator: Hospital Y Patient-days at Risk (MRSA-Free)

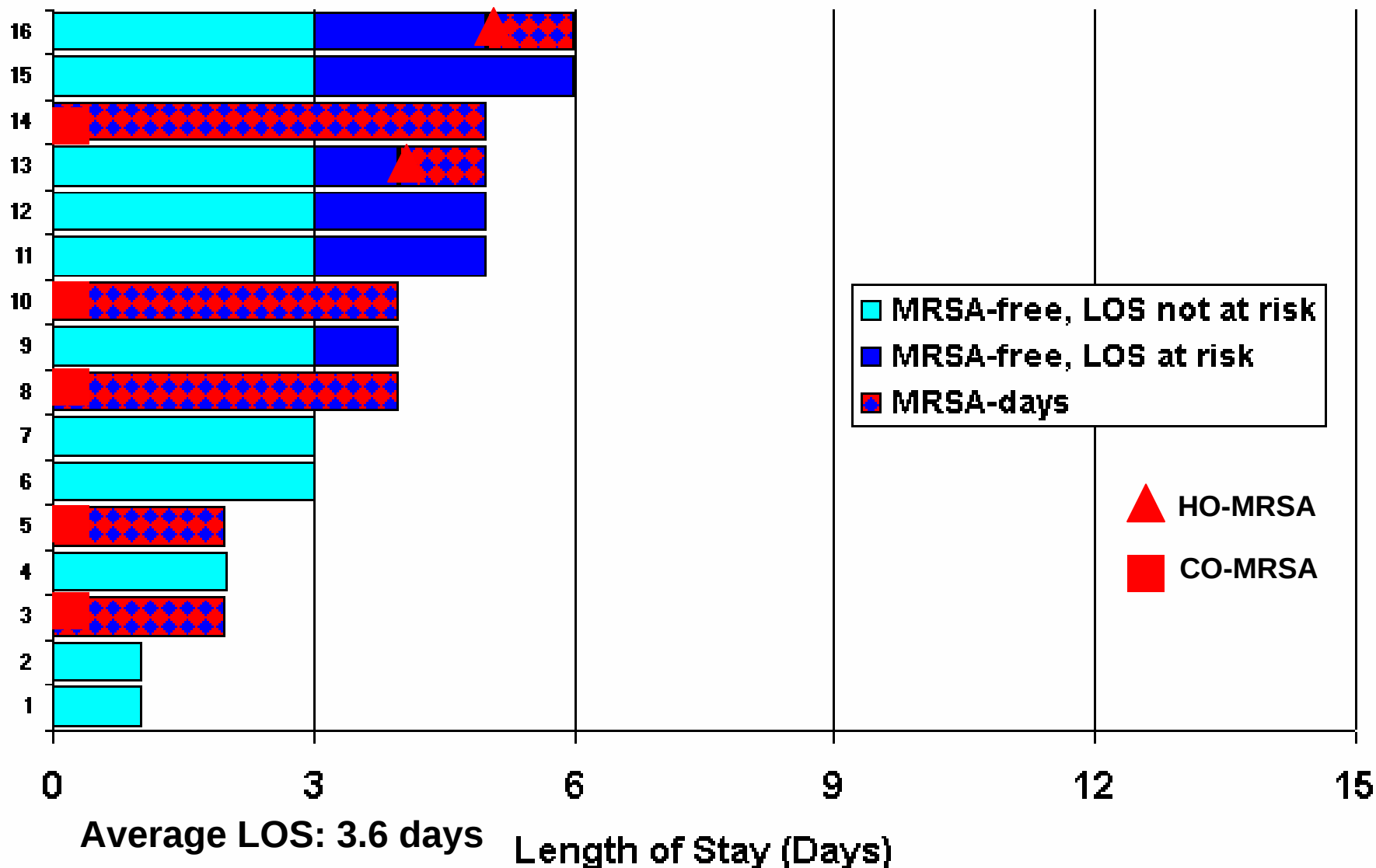


Impact of Denominator on Rates of HO-MRSA: Patient-days at Risk (MRSA-free)



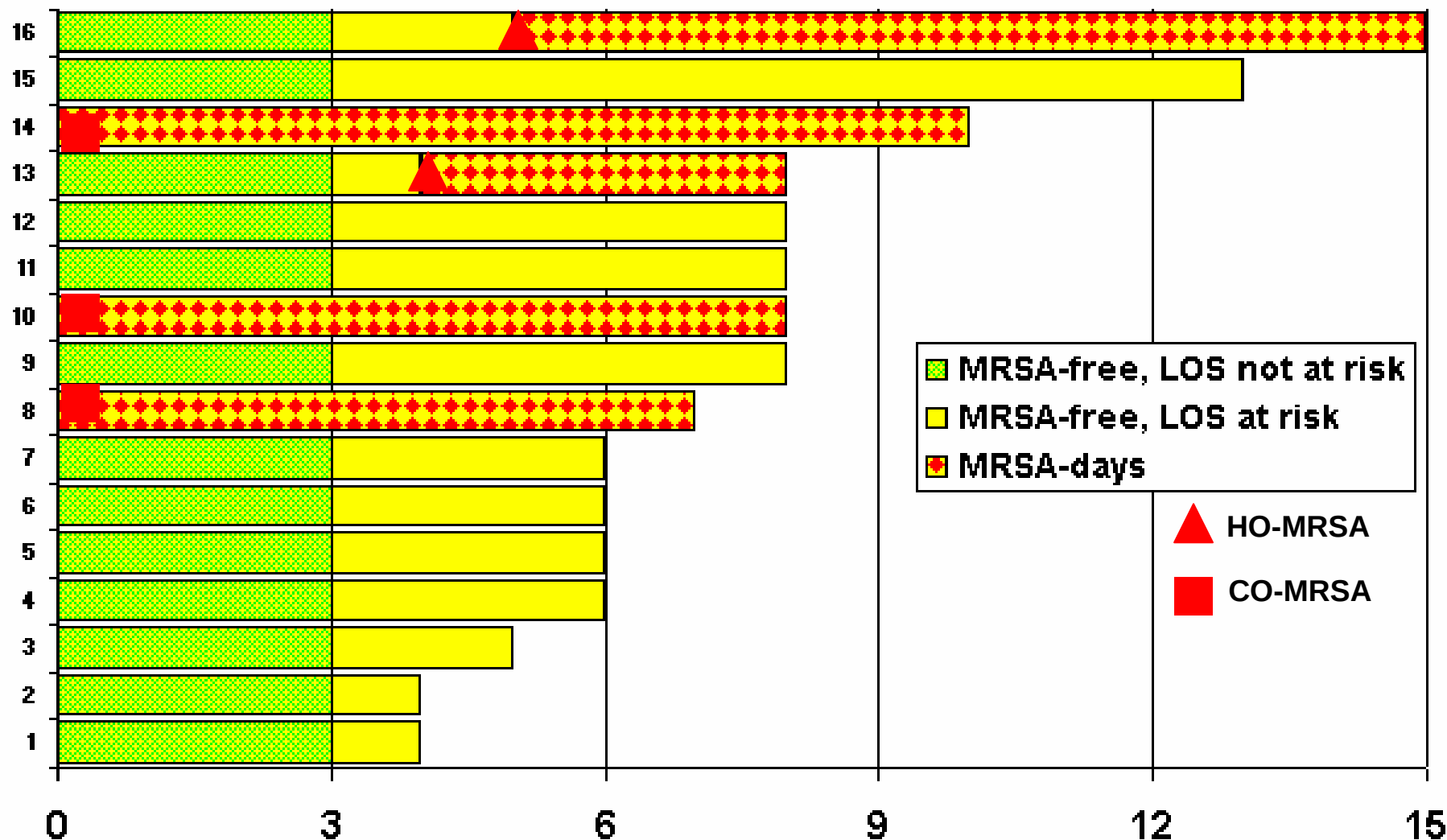
Impact of Denominator: Hospital X

Patient-days at Risk (MRSA-free & LOS)



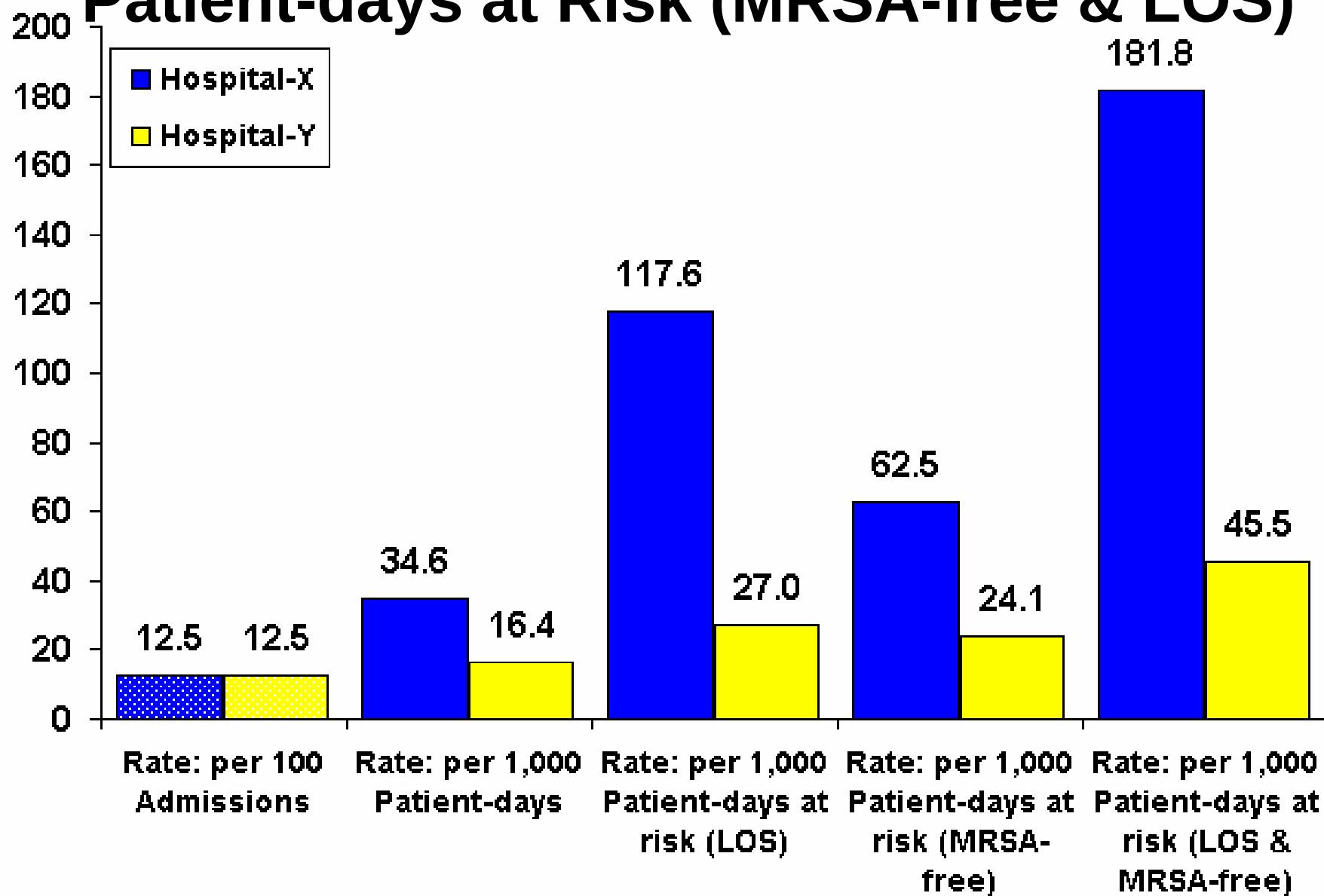
Impact of Denominator: Hospital Y

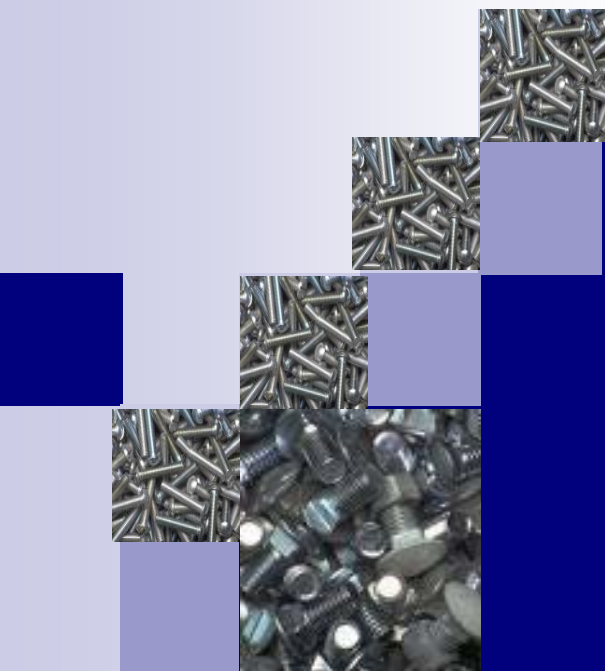
Patient-days at Risk (MRSA-free & LOS)



Average LOS: 7.6 days Length of Stay (Days)

Impact of Denominator on Rates of HO-MRSA: Patient-days at Risk (MRSA-free & LOS)



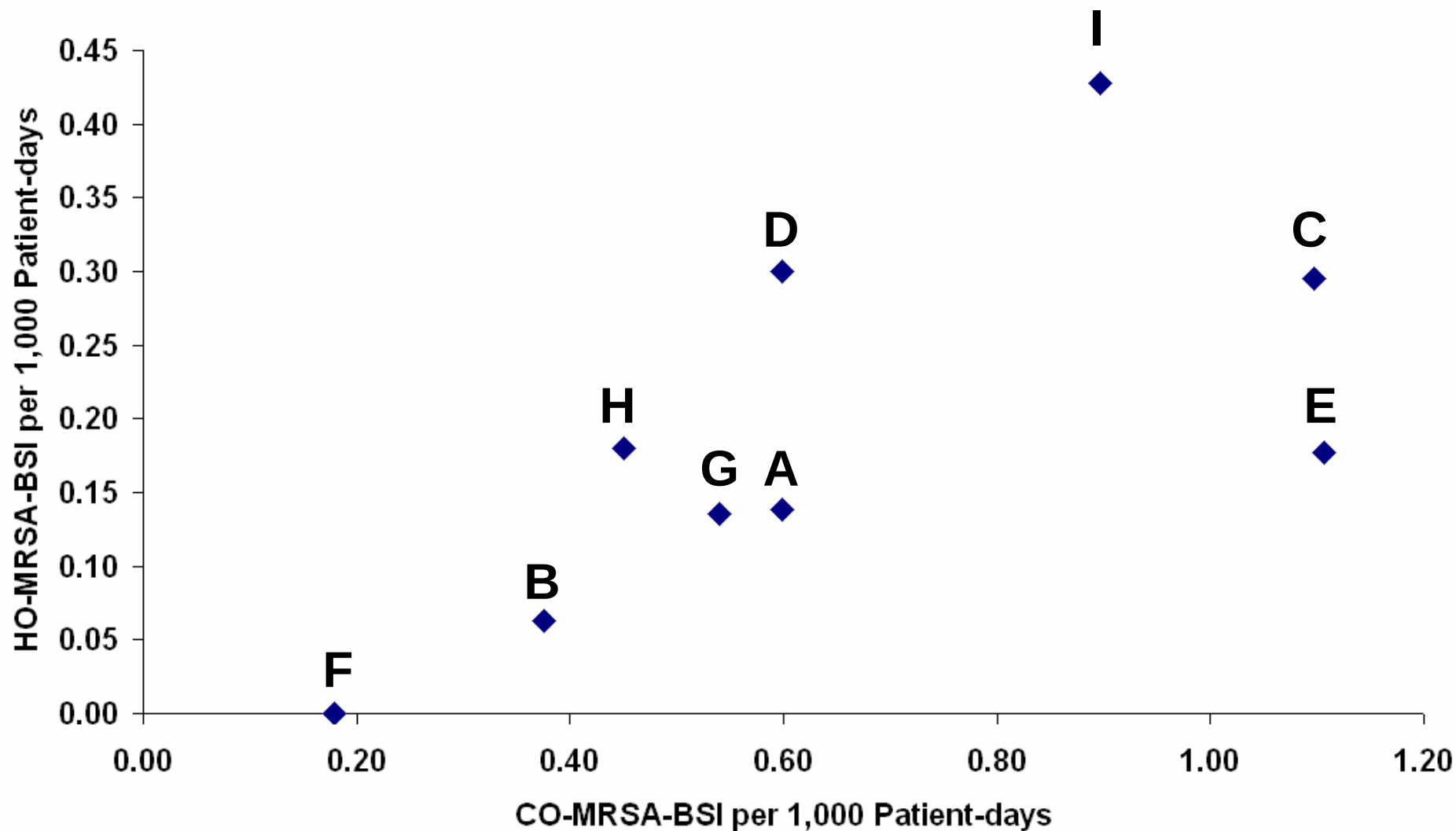


How to Rank Hospitals – What Measurement?

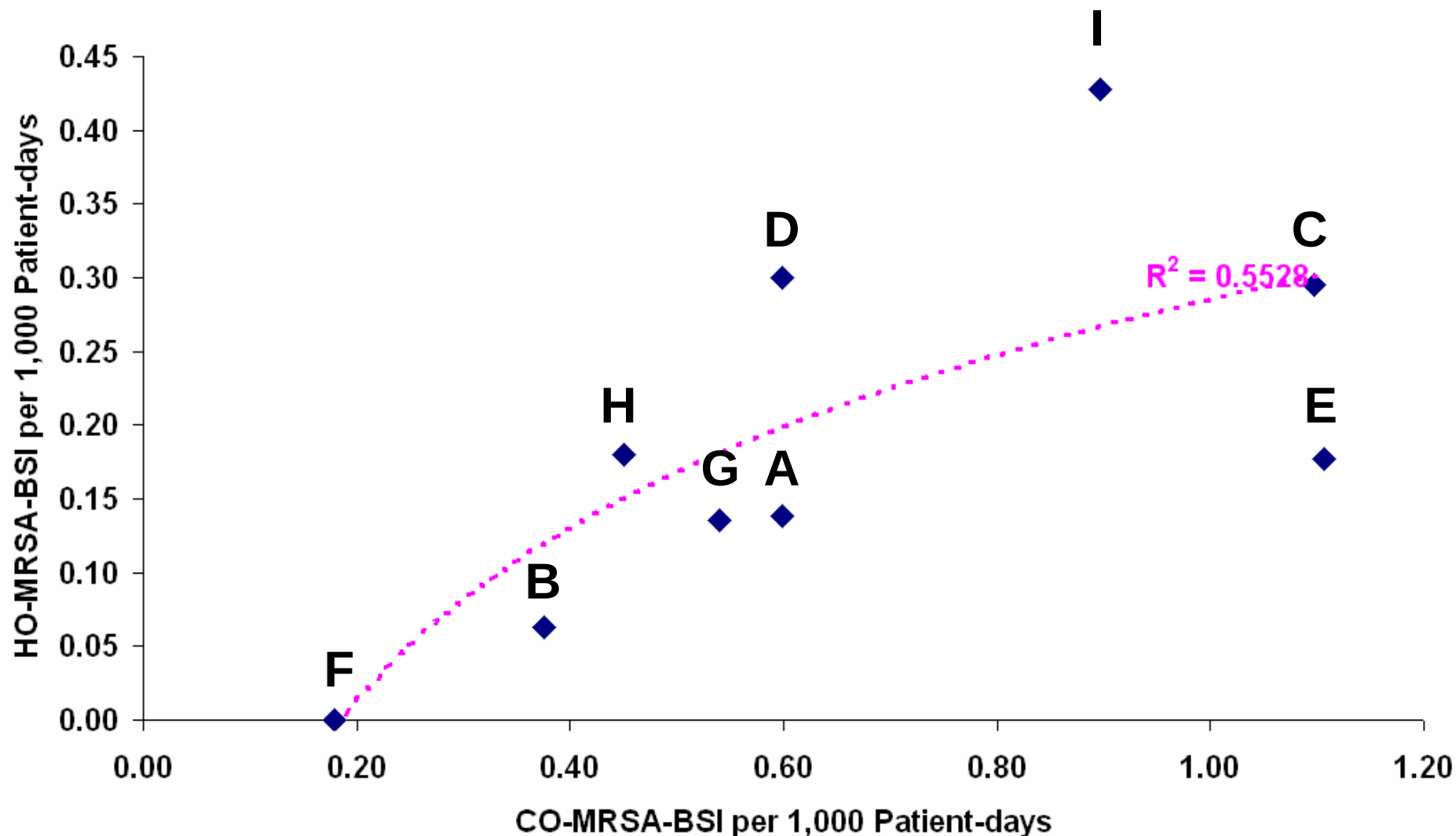
Hospital Ranking: MRSA-BSI Rates, Tennessee, 2005

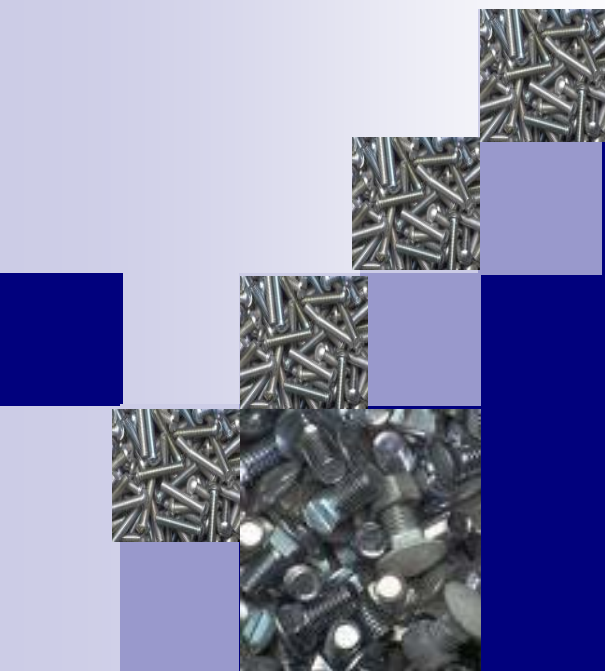
Rank	HO-MRSA-BSI per 1000 pt days GTED4	HO-MRSA-BSI per 1,000 pt days	HA-MRSA-BSI per 1,000 pt days	MRSA-BSI per 1,000 pt days
1	F	F	F	F
2	B	B	B	B
3	A	G	G	H
4	E	A	H	G
5	G	E	A	A
6	H	H	D	D
7	D	C	E	E
8	C	D	C	I
9	I	I	I	C

Hospital-Wide Rates in Tennessee, 2005: CO-MRSA-BSI & HO-MRSA-BSI per 1,000 ptds



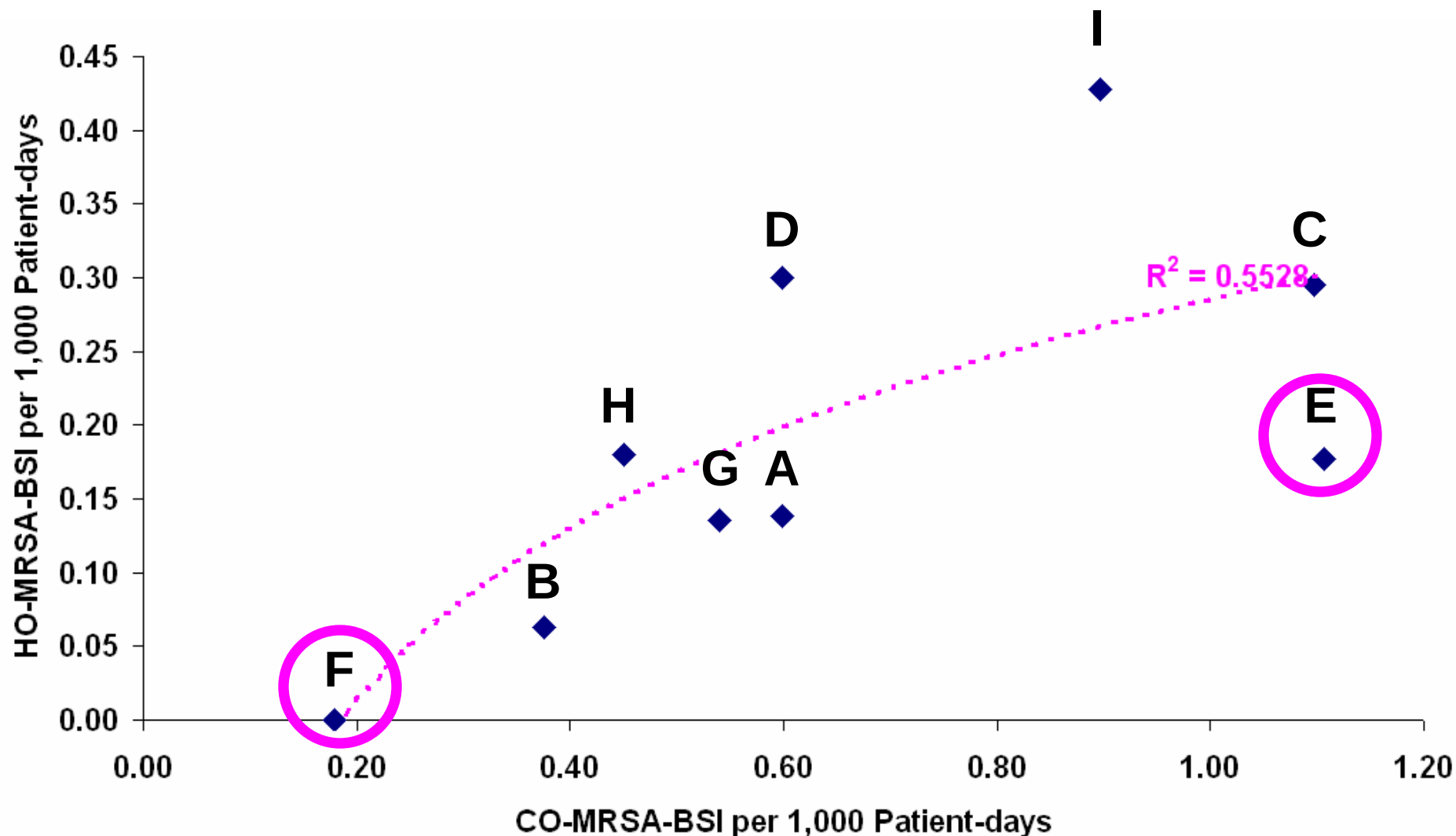
Hospital-Wide Rates in Tennessee, 2005: CO-MRSA-BSI & HO-MRSA-BSI per 1,000 ptds





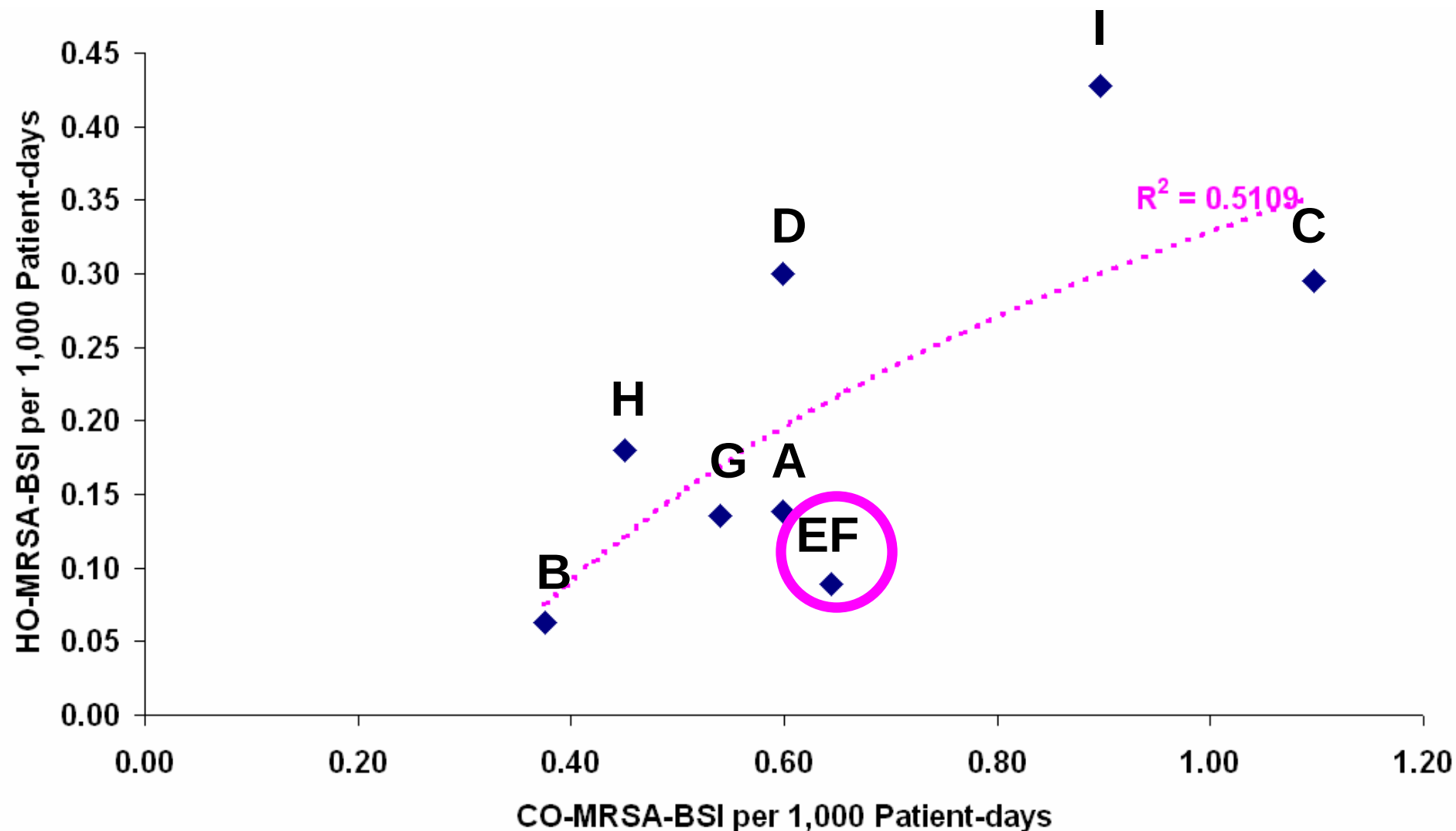
Impact of Reporting by Hospital System vs. Individual Hospital

Hospital-Wide Rates in Tennessee, 2005: CO-MRSA-BSI & HO-MRSA-BSI per 1,000 ptds



Hospital-Wide Rates in Tennessee, 2005

CO-MRSA-BSI & HO-MRSA-BSI per 1,000 ptds



Crude Approximation of Patient-days at Risk

- **Joint Annual Report (JAR):**

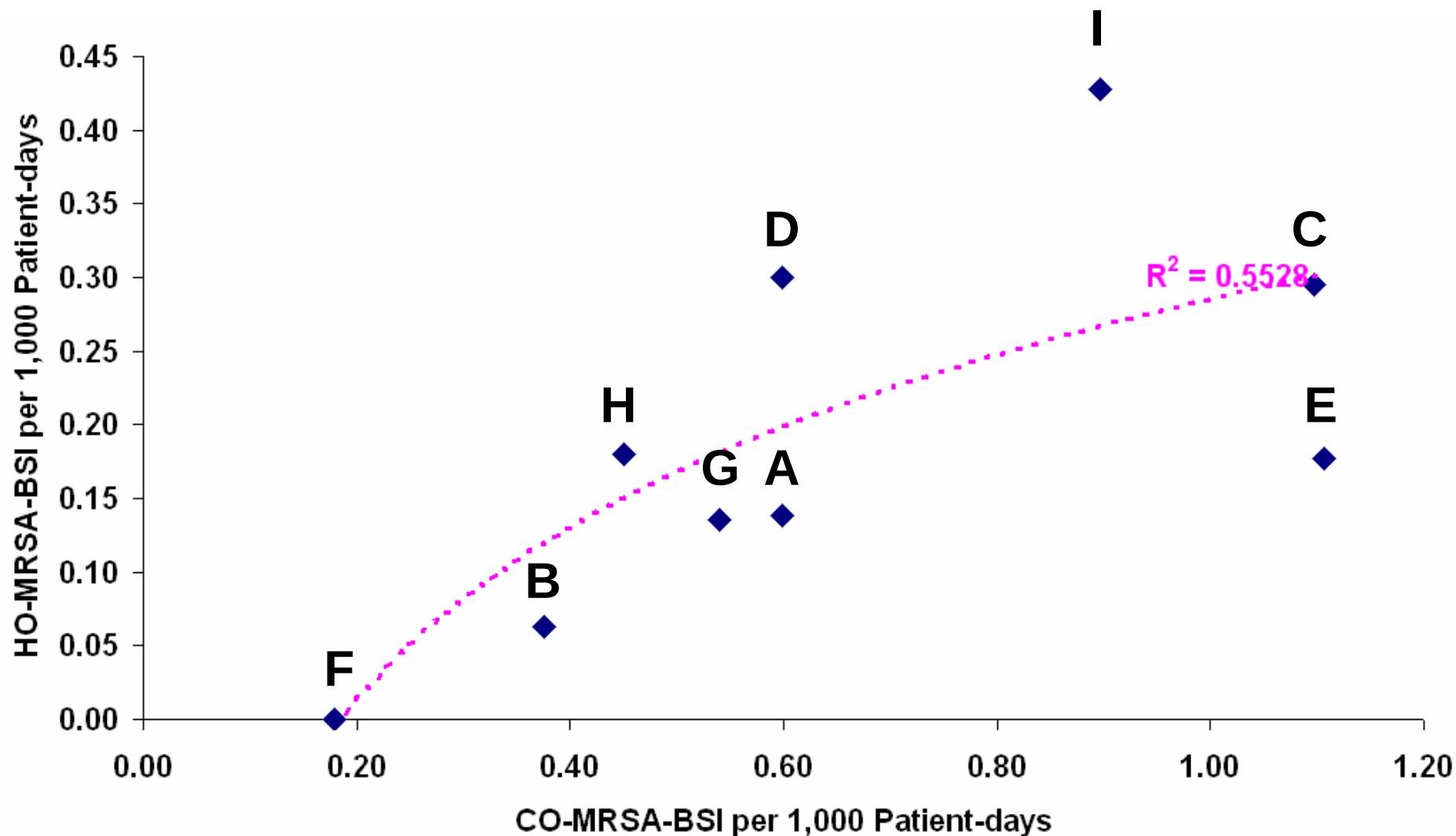
- **Admissions (county residents)**

- **Patient-days (county residents)**

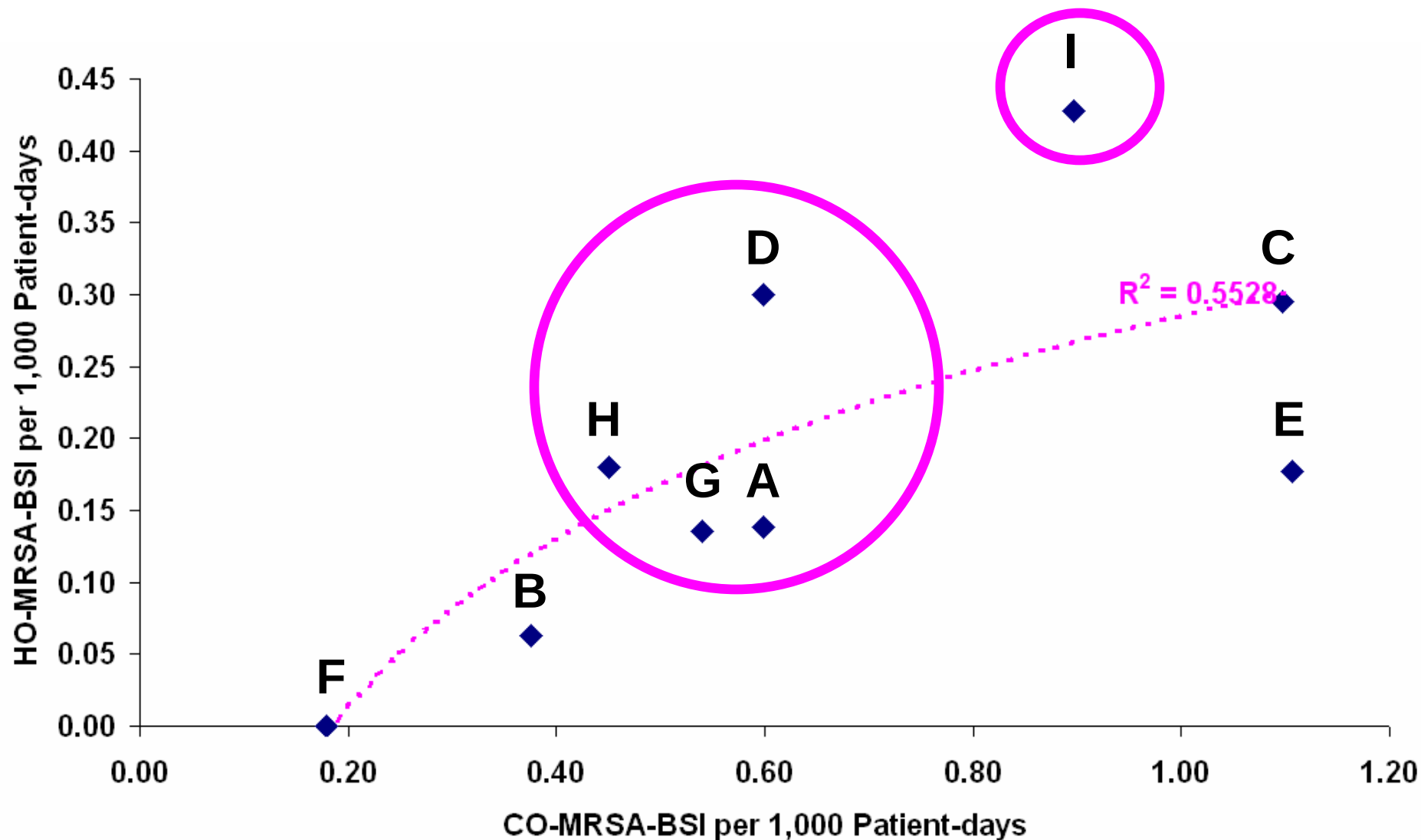
- **Patient days at risk =**

- # Patient-days – (# Admissions *3)**

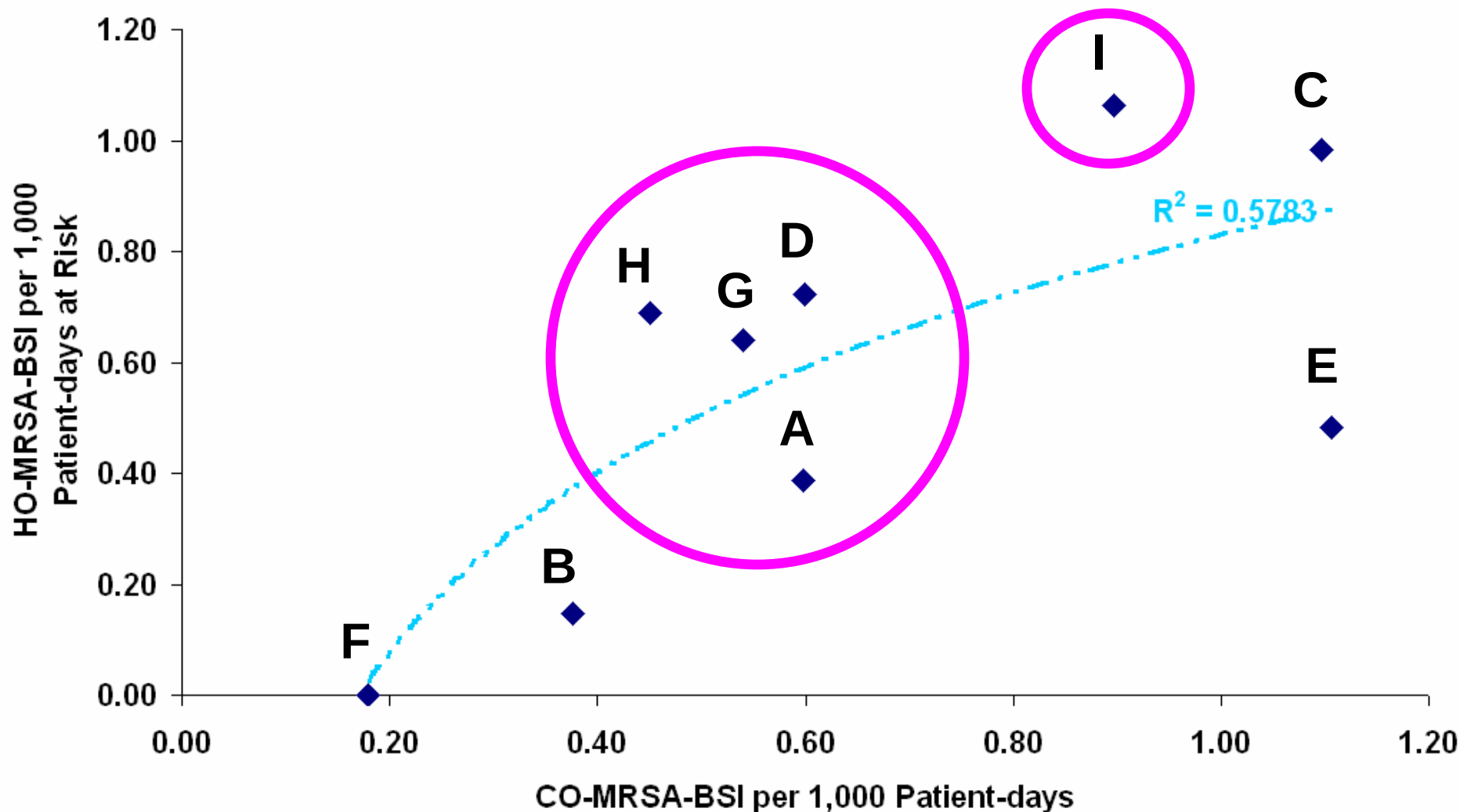
Hospital-Wide Rates in Tennessee, 2005: CO-MRSA-BSI & HO-MRSA-BSI



Hospital-Wide Rates in Tennessee, 2005: CO-MRSA-BSI & HO-MRSA-BSI



Hospital Rates in Tennessee, 2005: CO-MRSA-BSI & HO-MRSA-BSI





Acknowledgements

- **Kimberly Glenn**
- **Infection Control Professionals**
- **ABC/ Emerging Infection Program Staff**
- **Blount Memorial Hospital**



Thank You!

Questions?

HAI working group:

**3rd Tuesday of Month,
3 pm ET**

marion.kainer@state.tn.us