

Containment of Multidrug- Resistant Organisms

Tabletop Exercise
2018





**Multidrug-Resistant
Organisms (MDROs)**

A microscopic view of various bacteria, including rod-shaped and spherical forms, in shades of purple and blue. The text "SUPERBUG OUTBREAK" is overlaid in the center.

SUPERBUG OUTBREAK

Estimated minimum number of illnesses and deaths caused by antibiotic resistance*:

At least  **2,049,442** illnesses,
 **23,000** deaths

**bacteria and fungus included in this report*

INFECTIOUS DISEASE

A Superbug That Resisted 26 Antibiotics

January 17, 2017 - 3:01 PM ET

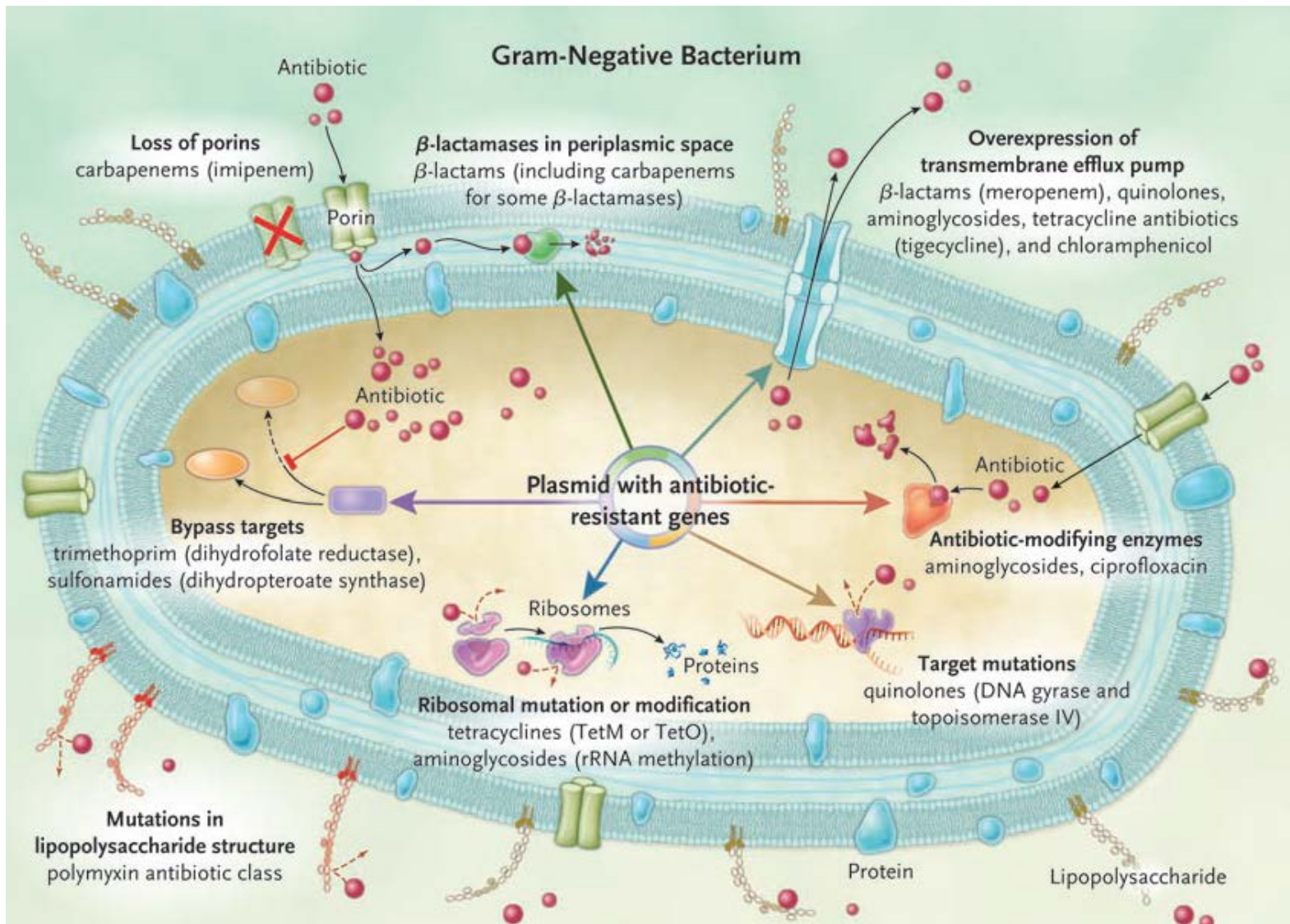
SUSAN BRINK



This illustration depicts *Klebsiella pneumoniae* bacteria, which can cause different types of infections, including pneumonia, bloodstream infections and meningitis.

CDC

Mechanisms of Resistance to Antibiotics



Antibiotic Resistance — Simplified



How Antibiotic Resistance Happens

1.

Lots of germs.
A few are drug resistant.



2.

Antibiotics kill
bacteria causing the illness,
as well as good bacteria
protecting the body from
infection.



3.

The drug-resistant
bacteria are now allowed to
grow and take over.

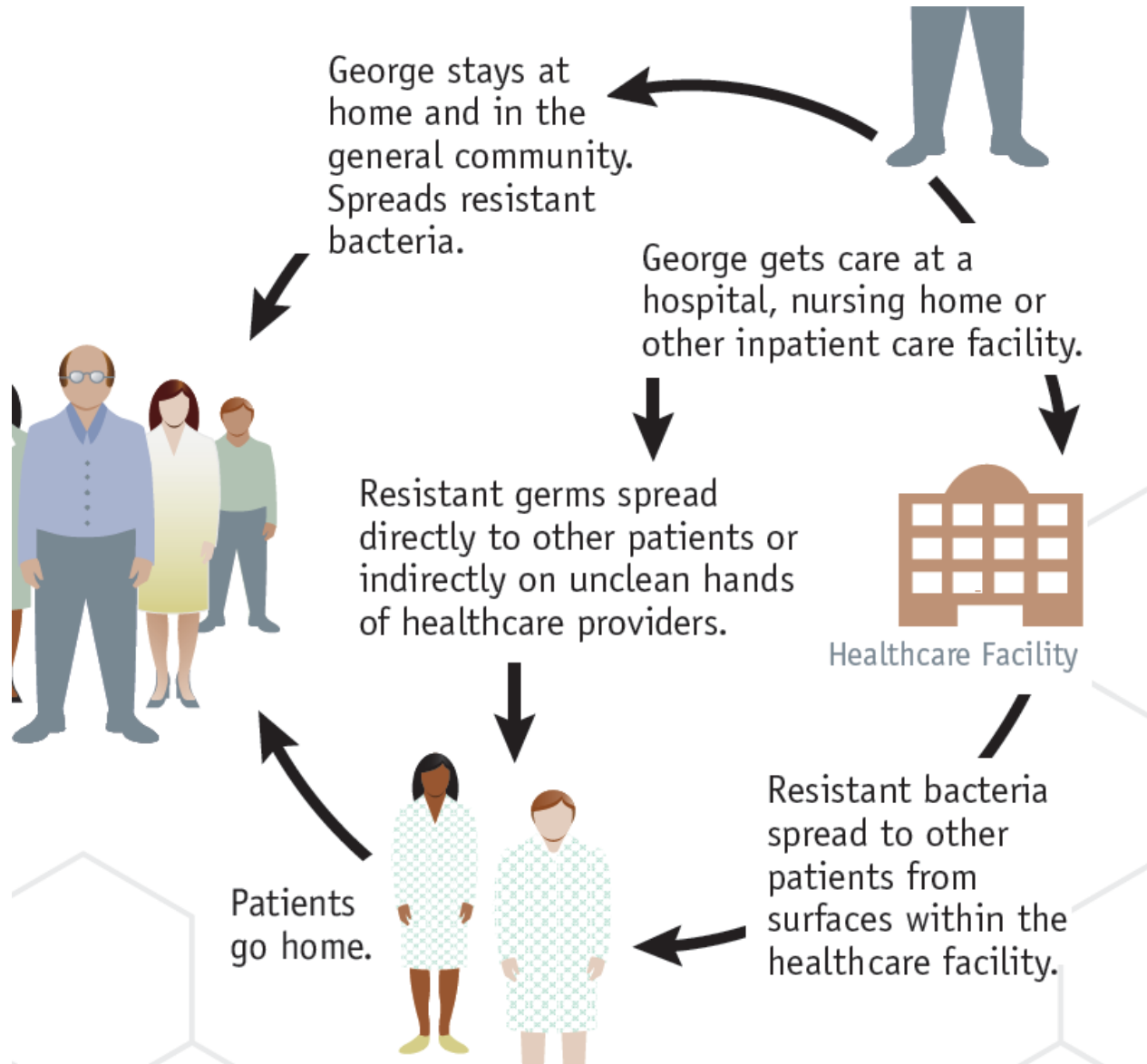


4.

Some bacteria give
their drug-resistance to
other bacteria, causing
more problems.



Spread of Antimicrobial Resistance





Carbapenem-resistant
Enterobacteriaceae
(CRE)

CRE—one of many MDROs



THREAT LEVEL
URGENT



This bacteria is an immediate public health threat that requires urgent and aggressive action.

CARBAPENEM-RESISTANT ENTEROBACTERIACEAE



9,000

DRUG-RESISTANT
INFECTIONS
PER YEAR



600

DEATHS

CARBAPENEM-
RESISTANT
KLEBSIELLA SPP.

7,900



1,400

CARBAPENEM-
RESISTANT
E. COLI



**CRE HAVE BECOME RESISTANT TO ALL
OR NEARLY ALL AVAILABLE ANTIBIOTICS**



Members of Family of Enterobacteriaceae

More Common Genera of *Enterobacteriaceae*

- **Escherichia**
- **Enterobacter**
- **Klebsiella**
- **Proteus**
- **Providencia**
- **Salmonella**
- **Serratia**
- **Shigella**

Other Genera of *Enterobacteriaceae*

Alishewanella
Alterococcus
Aquamonas
Aranicola
Arsenophonus
Azotivirga
Blochmannia
Brenneria
Buchnera
Budvicia
Buttiauxella
Cedecea
Citrobacter
Cronobacter
Dickeya
Edwardsiella
Erwinia
Ewingella
Grimontella
Hafnia
Kluyvera

Leclercia
Leminorella
Moellerella
Morganella
Obesumbacterium
Pantoea
Pectobacterium
Phlomobacter
Photorhabdus
Poodoomaamaana
Plesiomonas
Pragia
Rahnella
Raoultella
Samsonia
Sodalis
Tatumella
Trabulsiella
Wigglesworthia
Xenorhabdus
Yersinia
Yokenella

Case Definition

CLSI Break Points for Reporting CRE

MIC ($\mu\text{g/ml}$)			
	Susceptible	Intermediate	Resistant
Ertapenem	<1	1	≥ 2
Meropenem	≤ 1	2	≥ 4
Imipenem	≤ 1	2	≥ 4
Doripenem	≤ 1	2	≥ 4

Carbapenemase-producing CRE (CP-CRE)

Five Known Types

KPC (*Klebsiella pneumoniae* carbapenemase) ★

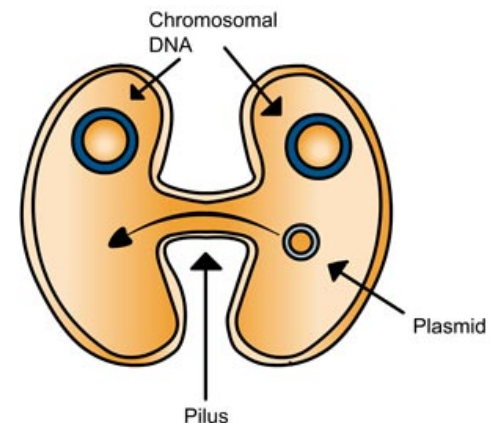
NDM (New Delhi metallo- β -lactamase)

IMP (Imipenemase)

VIM (Verona integron-encoded metallo- β -lactamase) ★

OXA-48 (Oxacillinase)

Bacterial Conjugation



Clinical Symptoms

Pneumonia, urinary tract infections, and serious bloodstream or wound infections

Common signs and symptoms may include:

- Severe urinary tract infections
- High fever
- Bloodstream infections
- Sepsis
- Septic shock



Transmission



Colonized patients are thought to be a source of transmission

Spread thru **direct contact** on hands of healthcare workers or contaminated surfaces

Immunocompromised, ICU care, indwelling medical devices, history of antibiotic treatment lead to a **greater risk** for infection or colonization

Interactive Dashboards

Interactive iDashboard Gallery: Carbapenem-resistant *Enterobacteriaceae* (CRE) Surveillance Data

iDashboard Demonstration

<https://healthwebaccess.tn.gov/idashboards/?guestuser=guest&dashID=815&c=0>

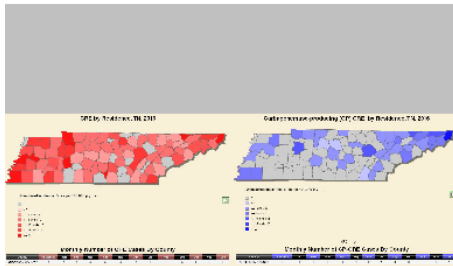
Department of Health HAI Website

<https://www.tn.gov/health/cedep/hai.html>

Composite CRE Gallery

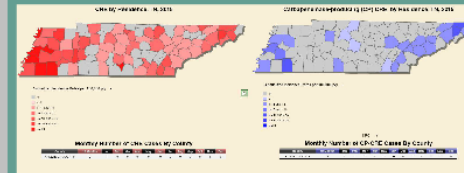


Statewide Surveillance of Carbapenem-resistant Enterobacteriaceae (CRE) in Tennessee



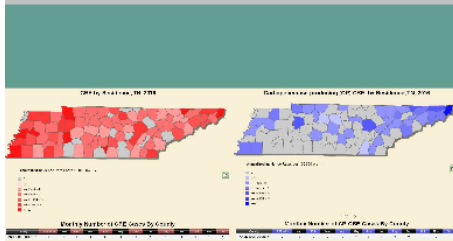
2017 Distribution of CRE

- Incidence Rates
- 30 Day and 90 Days CRE counts



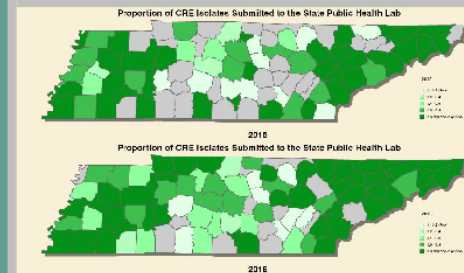
2016 Distribution of CRE

- Incidence Rates
- Case Counts
- Monthly Case Counts
- Organism Trends



2015 Distribution of CRE

- Incidence Rates
- Case Counts
- Monthly Case Counts
- Organism Trends



Isolate Submission

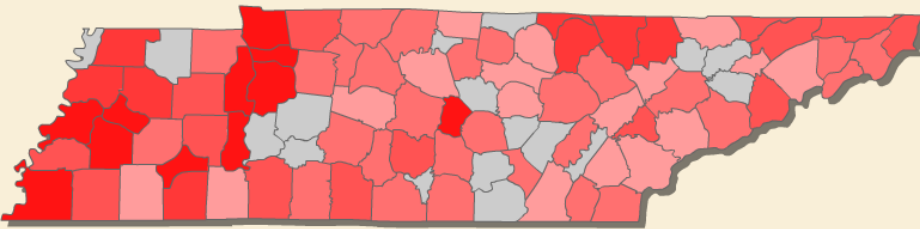
- Proportion of CRE isolates submitted to the State Public Health Lab

Dashboard Detail

Select a Genus **ENTEROBACTER,ES**

Select a CP Gene **KPC,NDM**

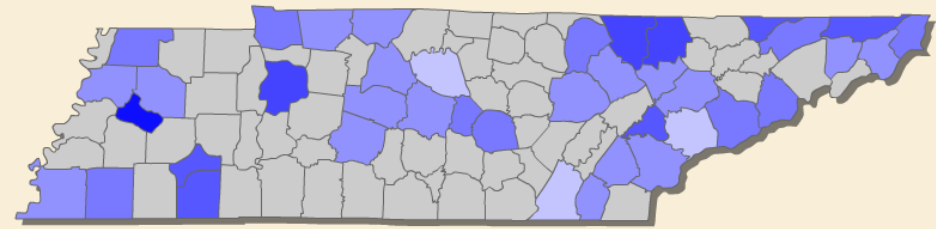
CRE by Residence, TN, 2017



Number of CRE Cases By County

County	Year to Date*	Last 30 Days*	Last 90 Days*
ANDERSON COUNTY	3	0	0

KPC,NDM Carbapenemase-producing (CP) CRE, by Residence, TN, 2017

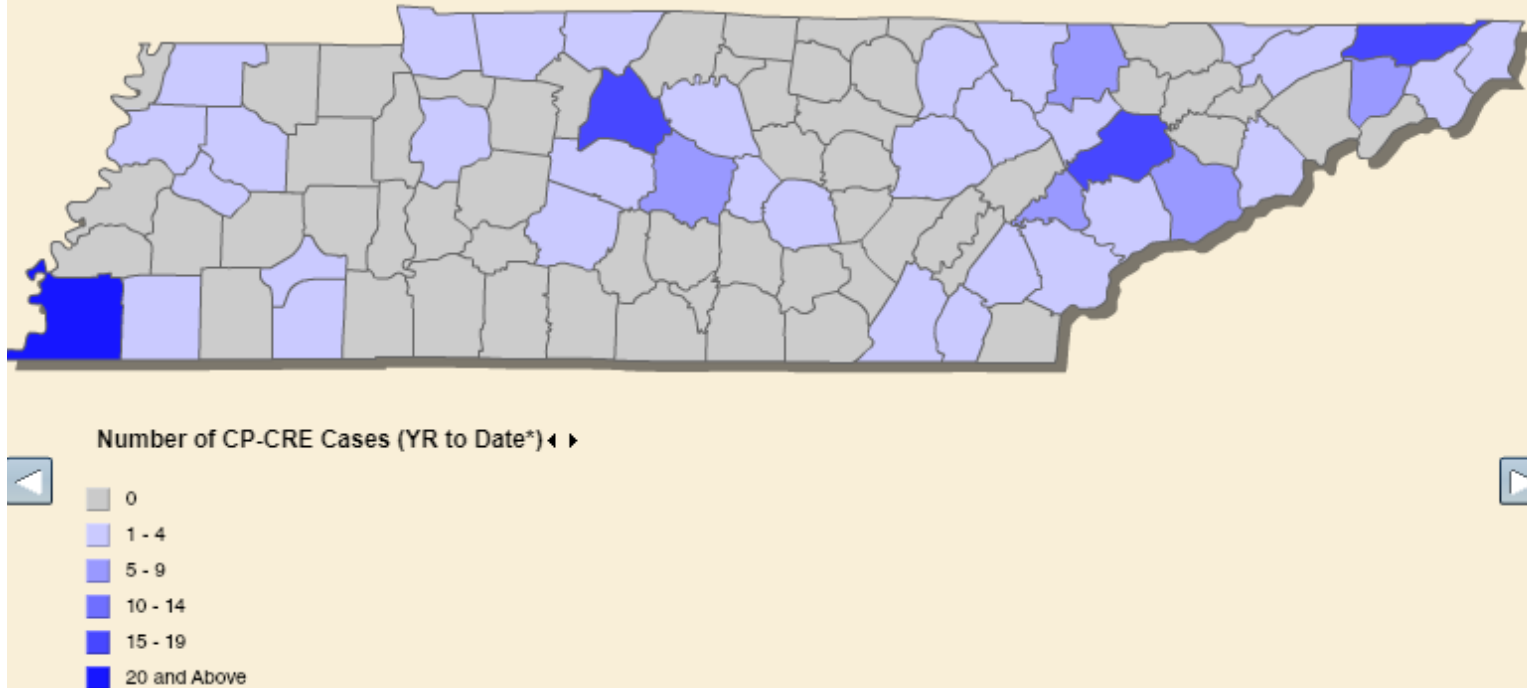


Number of KPC,NDM CP-CRE Cases By County

County	Year to Date*	Last 30 Days*	Last 90 Days*
ANDERSON COUNTY	1	0	0

Dashboard Detail

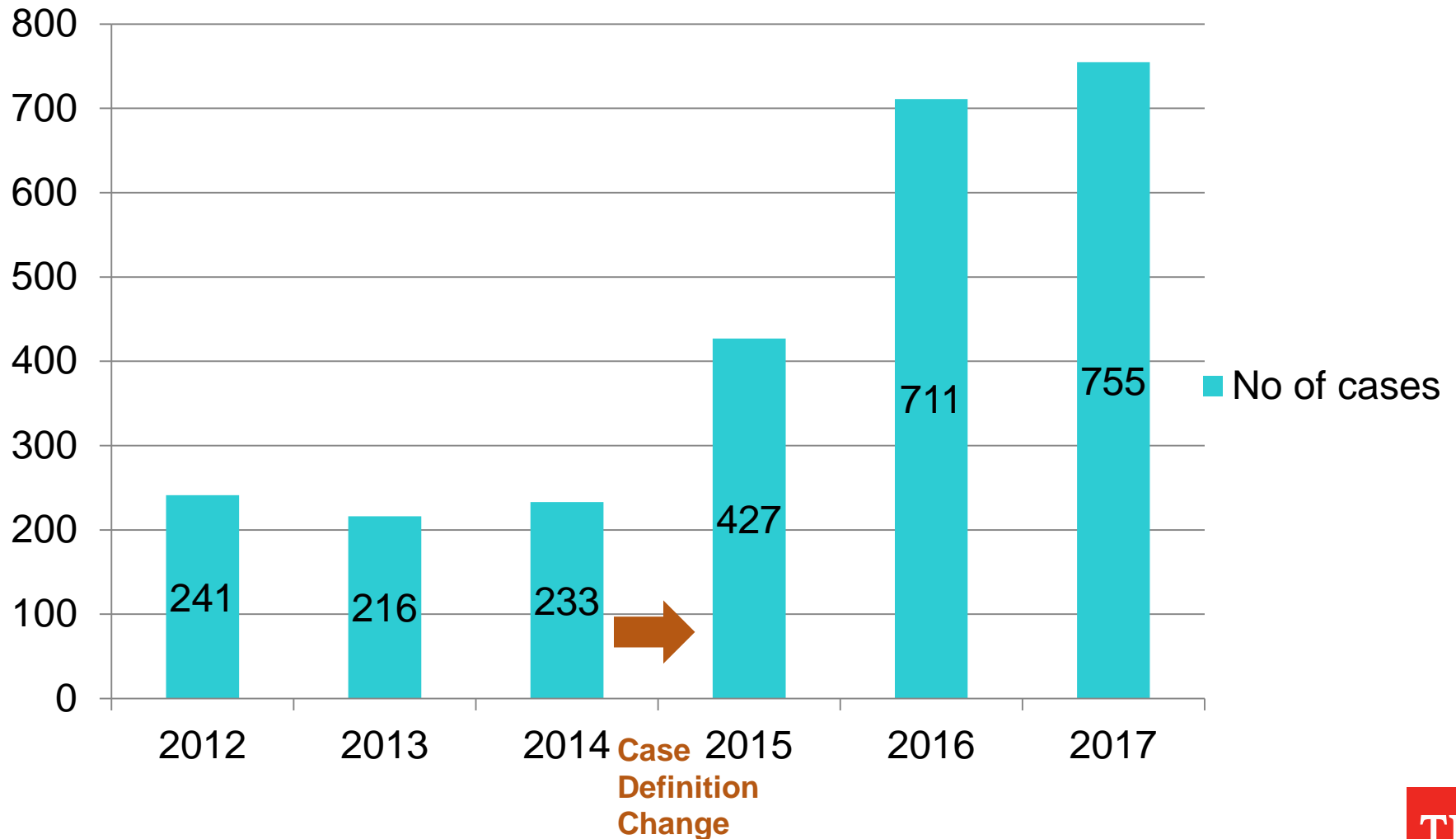
KPC,NDM Carbapenemase-producing (CP) CRE, by Residence, TN, 2017



Number of KPC,NDM CP-CRE Cases By County

County	Year to Date*	Last 30 Days*	Last 90 Days*
SHELBY COUNTY	42	1	7

Tennessee CRE cases reported by Year, 2012–2017



KPC gene detection rate among tested isolates, 2017 (n=572)

755 total cases for 2017

572 isolates submitted

76% isolate submission

Result	Frequency	Percent
Detected	224	39.2%

CRE Reporting & Isolate Submission

Report within 1 week using PH-1600 (paper or electronic). Include antimicrobial susceptibility results when reporting.

Isolate submission required to the State Lab

Reasons for Surveillance

- Implement timely prevention measures**
- Monitor impact of prevention strategies**
- Identification of disease trends and characterize strains**
- Identify geographical and temporal changes in prevalence**
- Detect and investigate outbreaks**

2018 Reportable Diseases Change

Updated January 9, 2018

2018 List of Reportable Diseases in Tennessee For Healthcare Providers


The diseases, events, and conditions reportable to Tennessee Department of Health (TDH) by healthcare providers are listed below for 2018. Laboratories in healthcare facilities should refer to Page 2 of this document. The reporting form (PH-1600) and associated documentation may be faxed directly to the local or regional health office (see <https://www.tn.gov/health/health-program-areas/localdepartments.html>) or the Communicable and Environmental Diseases and Emergency Preparedness (CEDEP) Division at (615) 741-3857. The PH-1600 also is available for completion online at <https://redcap.health.tn.gov/redcap/surveys/?s=XTJTN4MD3D>. More information about reporting is available on the Reportable Diseases website at <https://apps.health.tn.gov/ReportableDiseases>. For questions, contact CEDEP at (615) 741-7247 or (800) 404-3006.

Disease Outbreaks (e.g., foodborne, healthcare-associated, waterborne) !

Anaplasmosis


Anthrax !

Babesiosis

Birth Defects 


Botulism: Foodborne !, Wound !

Botulism: Infant

Brucellosis 

California/LaCrosse Serogroup Virus Infection

Campylobacteriosis

Candida auris (includes rule out) 

Carbapenem-Resistant *Enterobacteriaceae*, (all genera)

Hansen's Disease (Leprosy)

Healthcare Associated Infections: 

Catheter-Associated Urinary Tract Infections

Central Line Associated Bloodstream Infections

Clostridium difficile

Dialysis Events


Healthcare Personnel Influenza Vaccination

Methicillin-Resistant *Staphylococcus aureus*

Surgical Site Infections


Ventilator Associated Events

Hemolytic Uremic Syndrome


Hepatitis, Viral- Type A 

Hepatitis, Viral- Type B: Acute

Hepatitis, Viral- Type B: Perinatal (age ≤ 24 months), Pregnant Female (each pregnancy)

Poliomyelitis 

Psittacosis


Q Fever 

Rabies: Animal, Human !

Ricin Poisoning !

Rubella 

St. Louis Encephalitis Virus Infection

Salmonellosis: Typhoid Fever 

Salmonellosis: All other species

Shiga toxin-producing *Escherichia coli*

Shigellosis

Smallpox !

Spotted Fever Rickettsiosis

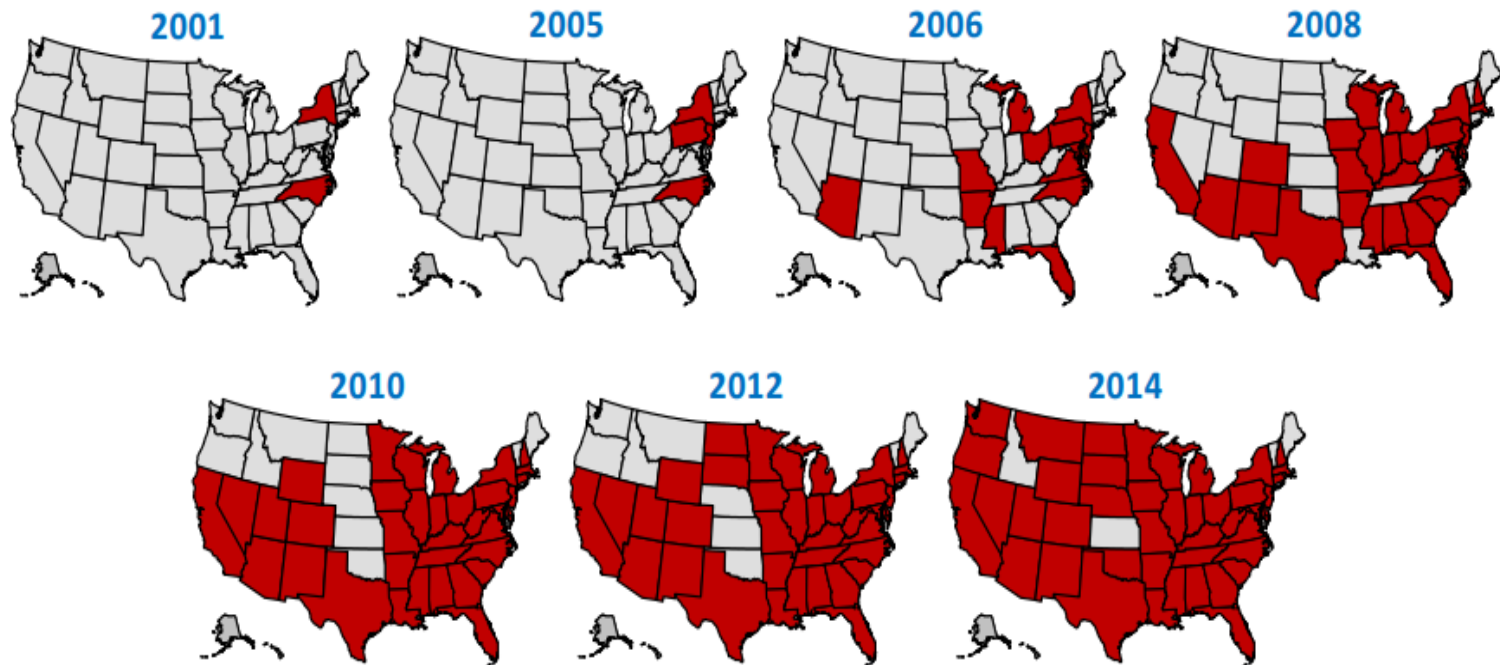
Staphylococcus aureus: Enterotoxin B



Tiered Containment Strategy

Why is Containment Critical?

KPC, the first type of CRE found in the U.S., spread from 2 states in 2001 to 45 states, DC, and Puerto Rico in 13 years.



● States with *Klebsiella pneumoniae* carbapenemase (KPC)-producing Carbapenem-resistant Enterobacteriaceae (CRE) confirmed by CDC

Containment Strategy

- **Interim Guidance for a Health Response to Contain Novel or Targeted MDROs**



<https://www.cdc.gov/hai/outbreaks/docs/Health-Response-Contain-MDRO.pdf>

Goals

- **Provide specific, standardized recommendations for public health response to single cases:**
 - **Determine if transmission is occurring**
 - **Identify affected patients**
 - **Ensure appropriate control measures are implemented**
 - **Better characterize organism to guide future responses**

Response Tiers

- **Tier 1**
 - **Resistance mechanisms novel to the U.S. (i.e., not or only very rarely identified in the U.S.) or poorly understood**
 - **Organisms for which no current treatment options exist (pan-resistant)**
- **Tier 2**
- **Tier 3**

Response Tiers

- **Tier 1**
- **Tier 2**
 - **MDROs primarily found in healthcare settings but not found regularly in the region; these organisms might be found more commonly in others areas of the U.S.**
- **Tier 3**

Response Tiers

- **Tier 1**
- **Tier 2**
- **Tier 3**
 - **MDROs targeted by the facility/region that are already established in the U.S. and have been identified before in the region but are not thought to be endemic**

Tiered Response Following MDRO Detection

	Tier 1	Tier 2	Tier 3
Lab lookback	Yes	Yes	Yes
Prospective surveillance	Yes	Yes	Yes
Healthcare roommate screening	Yes	Yes	Yes
Broader healthcare contact screening	Yes	Sometimes	No
Household contact screening	Yes	Sometimes	No
Environmental sampling	Sometimes	No	No
Healthcare personnel screening	Sometimes	No	No

Yes



No



Sometimes



Tiered Response Following MDRO Detection

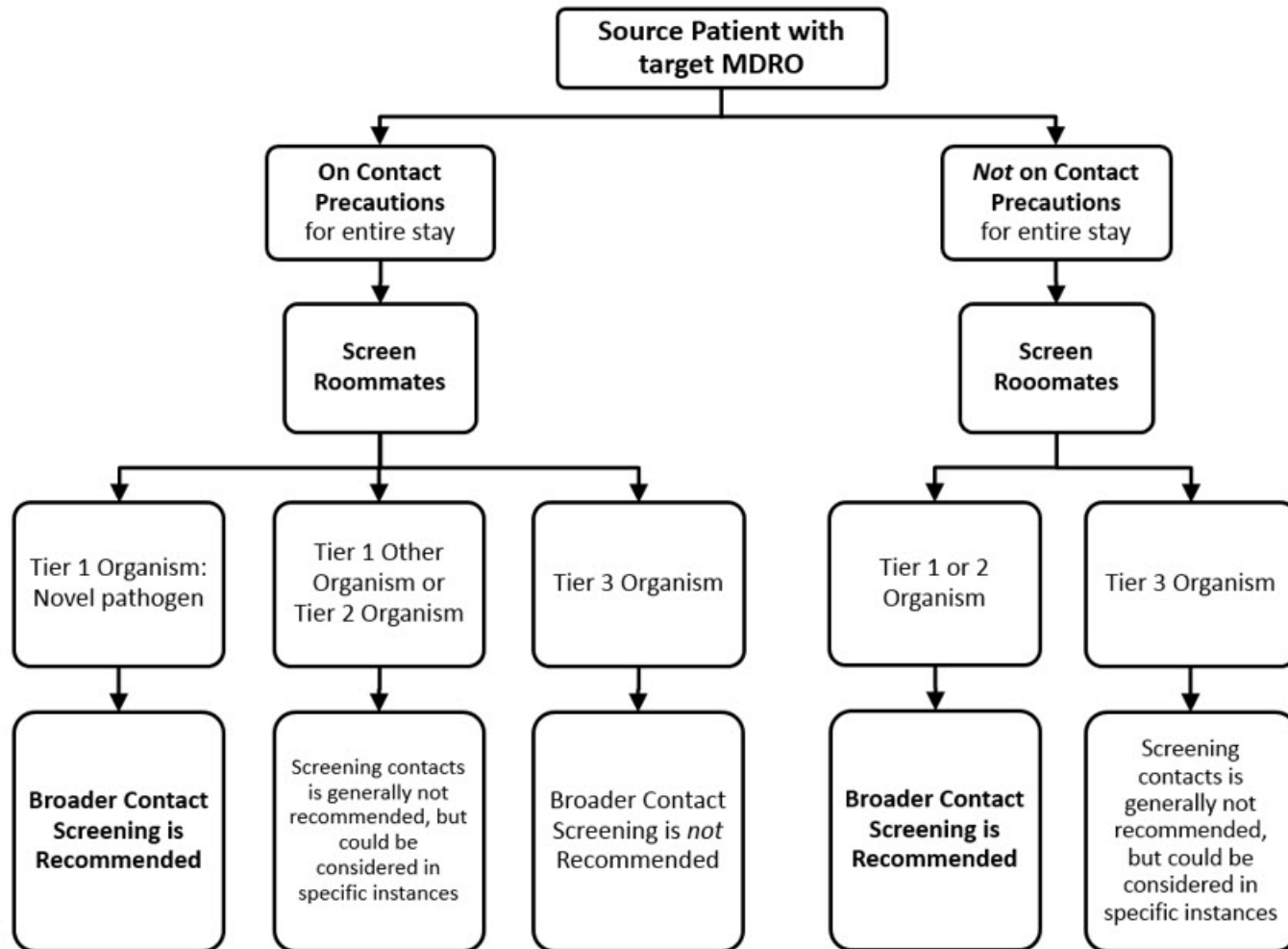
Today's Exercise!



	Tier 1	Tier 2	Tier 3
Lab lookback	Yes	Yes	Yes
Prospective surveillance	Yes	Yes	Yes
Healthcare roommate screening	Yes	Yes	Yes
Broader healthcare contact screening	Yes	Sometimes	No
Household contact screening	Yes	Sometimes	No
Environmental sampling	Sometimes	No	No
Healthcare personnel screening	Sometimes	No	No

Yes  No  Sometimes 

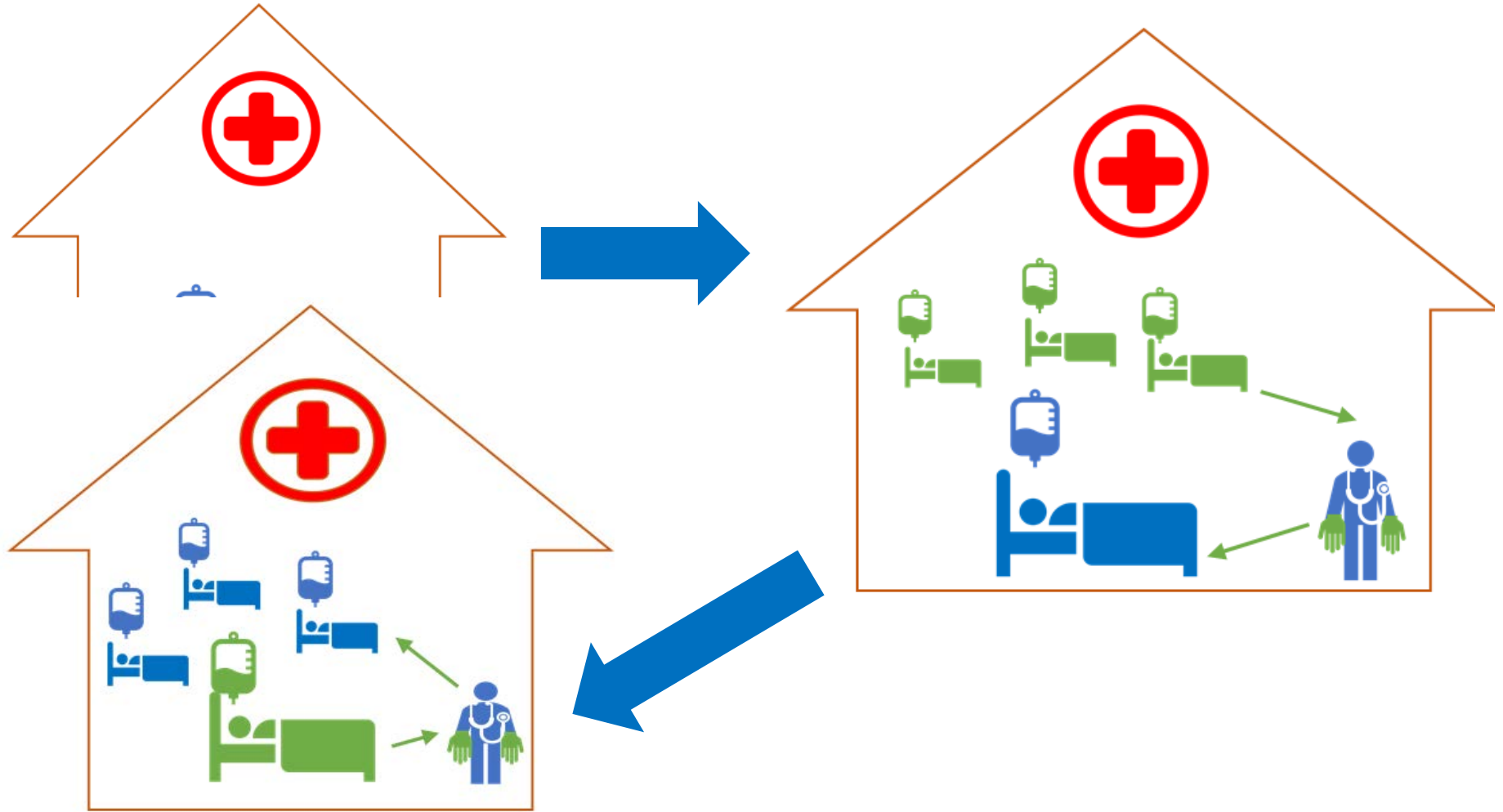
Approach to Screening Healthcare Contacts





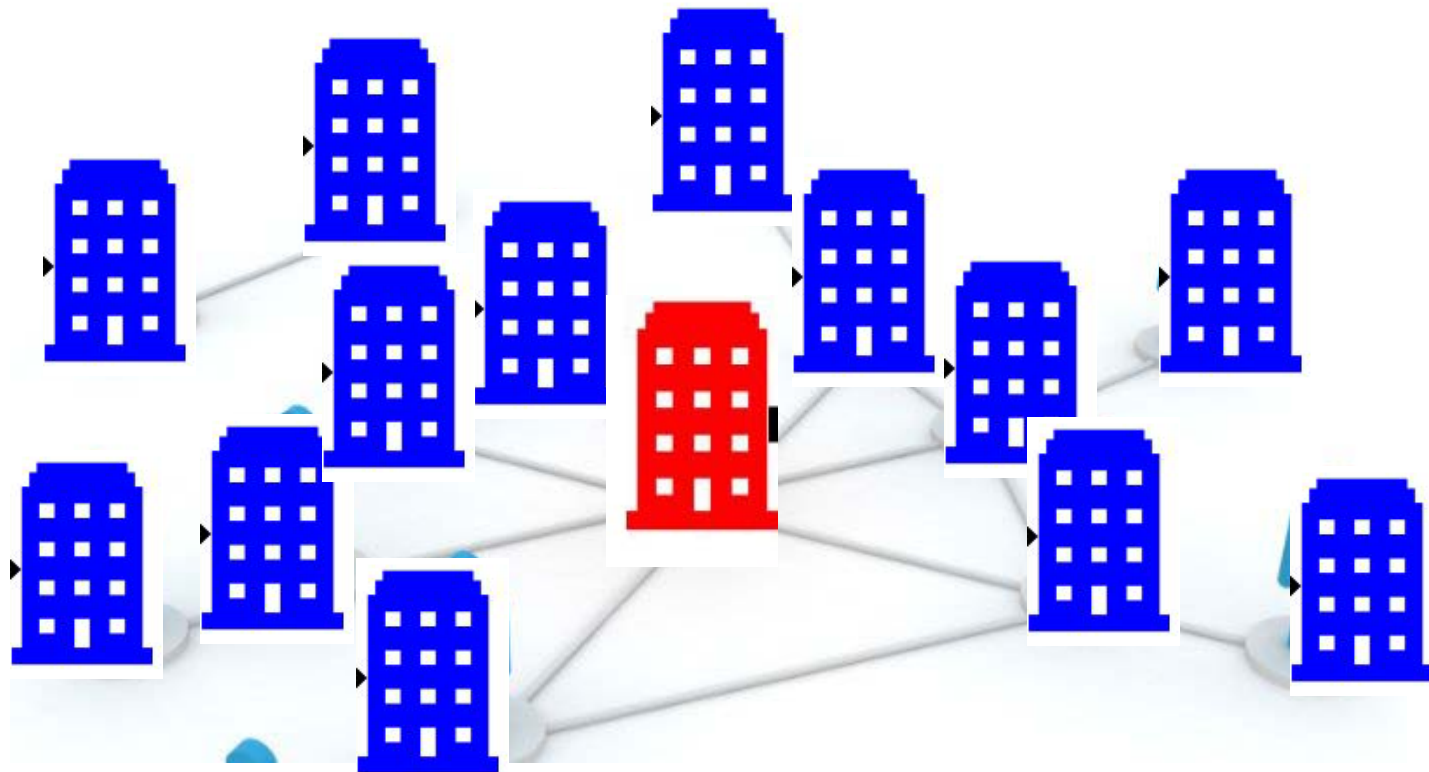
Patient Sharing Network and Antimicrobial Resistant Organisms

How Antimicrobial Resistance Spreads

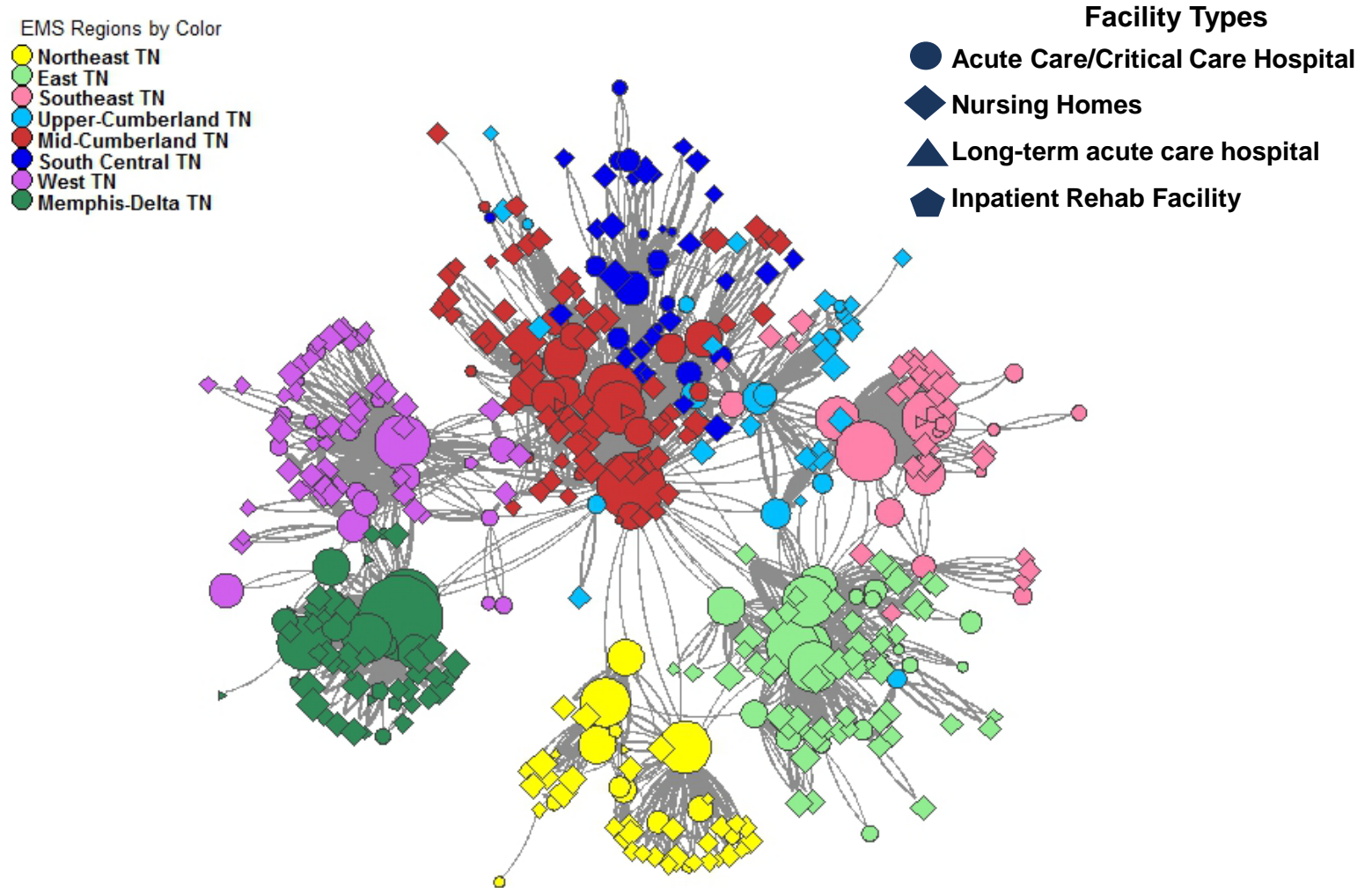


What is Social Network Analysis?

Social network analysis (SNA) is the mapping and measuring of relationships between people, groups, or organizations



Patient Sharing Between TN Facilities within 365 days





www.cdc.gov/HandHygiene

Questions?

Marion.Kainer@tn.gov

Or

Pamela.talley@tn.gov

Or

HAI.health@tn.gov