



# Prevention & Antibiotic Stewardship: Implementing a Comprehensive Public Health Approach to Prevent and Control Antibiotic Resistance

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Centers for Disease Control and Prevention

# CDC's Work in Antibiotic Resistance

Laboratory & Diagnostics



DETECT & RESPOND

Communications & Guidance



PREVENT & CONTAIN

Insights for Practice



INNOVATE

Epidemiology & Surveillance



Improved Antibiotic Use

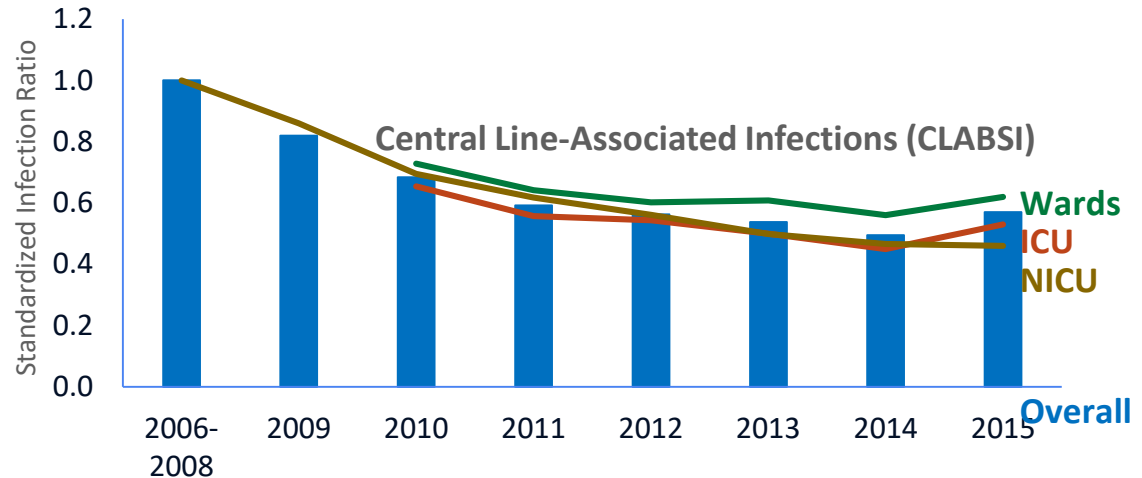


Research & Development



# National Progress in Preventing Healthcare-Associated Infections

- CDC, CMS, and AHRQ continue to collaborate to prevent HAIs
- Trends show national progress in HAI prevention for CLABSI, SSI, and CAUTI
- Agencies will continue to work toward goals outlined by HHS



Source: CDC's National Healthcare Safety Network (NHSN)

## Prevention of *C. difficile*, MRSA, and Other MDROs: Need for Regional Prevention Approach

All state health departments are being funded by CDC to prevent healthcare-associated infections and antibiotic resistance.

### ■ Traditional Approach

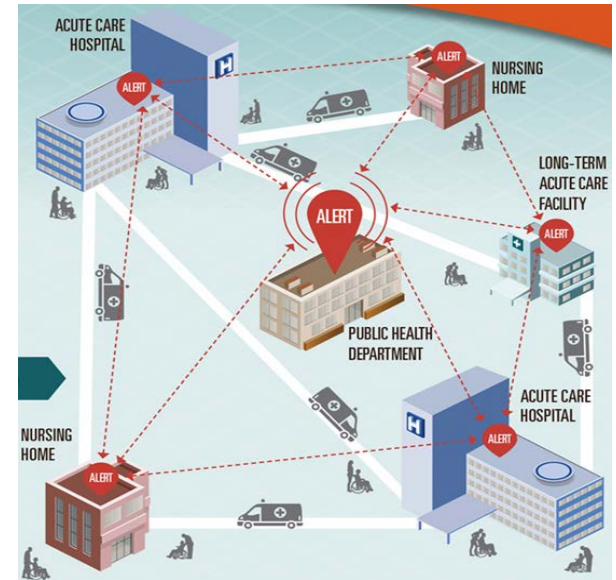
- Promotion of prevention efforts independently implemented by individual health care facilities
- Does not account for inter-facility spread through movement of colonized/infected patients
- Not effective for CDI and MDROs

### ■ Regional Approach

- Recognizes that individual facilities are components of integrated and dynamic networks connected via patient movement
- Occurrences in one healthcare facility may affect many other healthcare facilities

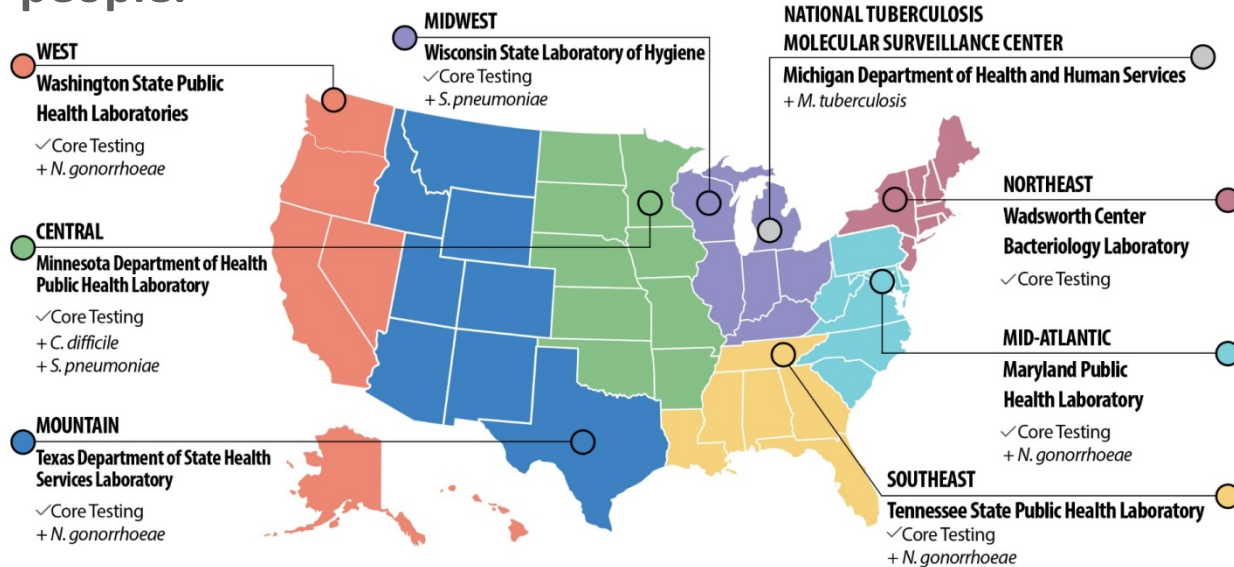
### Prevention and Stewardship

- In 27 states and 4 cities, CDC is aggressively expanding CRE, *C. difficile*, and other MDRO prevention and antibiotic stewardship programs



# Antibiotic Resistance Laboratory Network

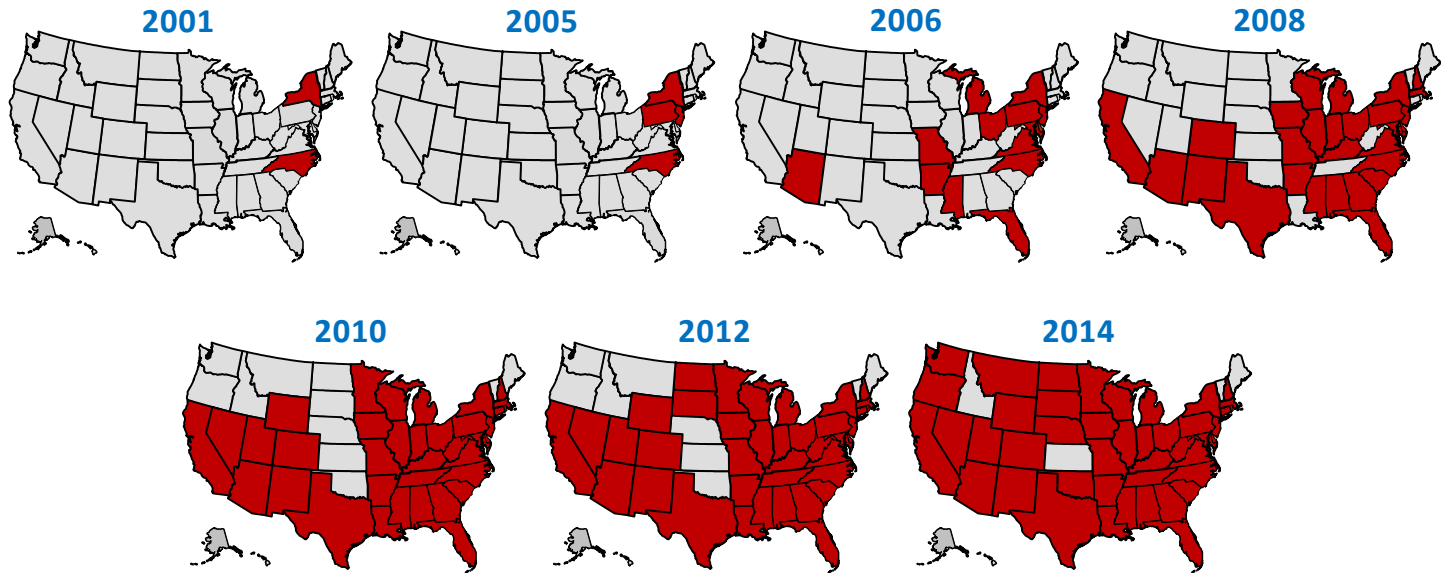
Nationwide lab capacity to detect AR in healthcare, food, and community. Tracks resistance to identify outbreaks faster, stop spread, and protect people.



- CDC lab expertise and coordination
- 7 regional labs
- 1 National TB Molecular Surveillance Center
- 57 state and local labs

# Why We Need a Containment Strategy

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.



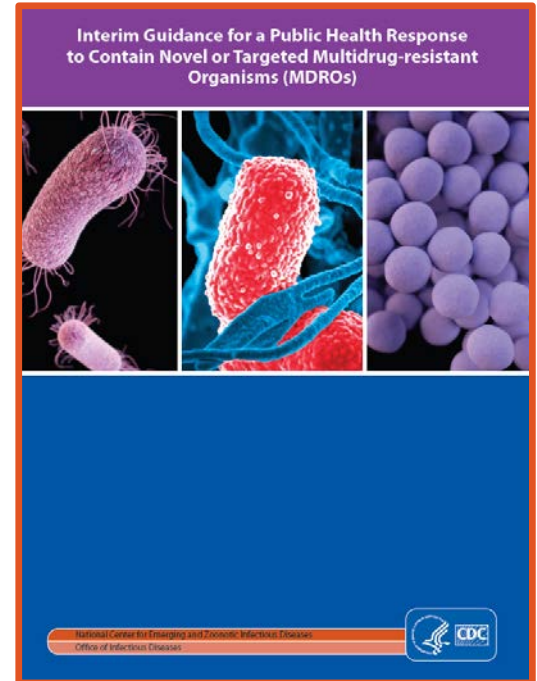
● States with *Klebsiella pneumoniae* carbapenemase (KPC)-producing Carbapenem-resistant Enterobacteriaceae (CRE) confirmed by CDC

# CDC's Containment Strategy

Systematic approach to slow spread of novel or rare multidrug-resistant organisms or mechanisms—at a single case—through an aggressive response.

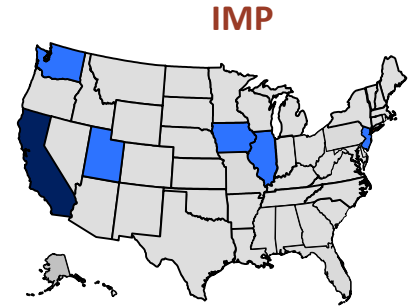
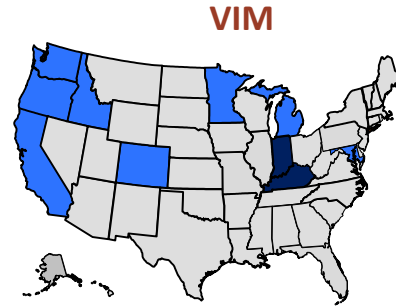
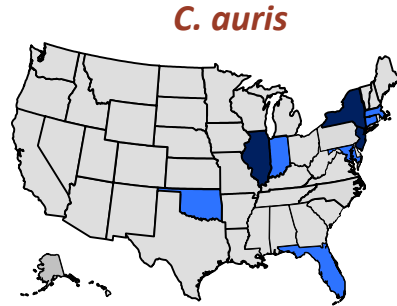
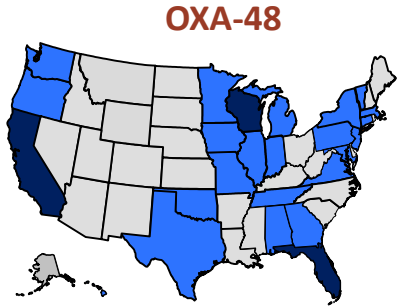
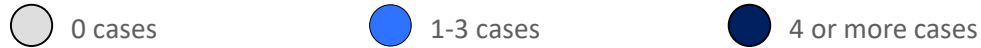
- **Targeted threats:** *mcr*, carbapenemase-producing organisms, pan-resistant organisms, *Candida auris*
- **Emphasis on settings** historically linked to amplification (e.g., LTC, LTAC, vSNF)
- **Main components:** Detection, infection control assessments, colonization screenings
- **Response tiers** based on threat

Guidance available on CDC's website:  
[www.cdc.gov/hai/outbreaks/mdro](http://www.cdc.gov/hai/outbreaks/mdro)



# CDC's Containment Strategy in Action

CDC and states have successfully contained many emerging threats, like *C. auris* and types of CRE, to single or few cases.



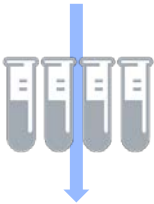


# CDC & FDA Antibiotic Resistance Isolate Bank

New innovations can support earlier diagnoses and more effective treatment options that can slow antibiotic resistance.



CDC uses bacteria samples (isolates) from health departments, labs, and outbreak and surveillance activities.



CDC analyzes and sequences the bacteria's resistance and makes the data and sample available.



**Researchers** can use the bacteria and data to challenge, develop new diagnostic tests and antibiotics.

**Laboratorians** can validate lab tests to improve patient care.

## BY THE NUMBERS

as of Sept. 1, 2017

CDC curated 14 panels from its 450,000+ isolate collection

55,000 isolates shared since July 2015

571 unique customers

637 orders processed

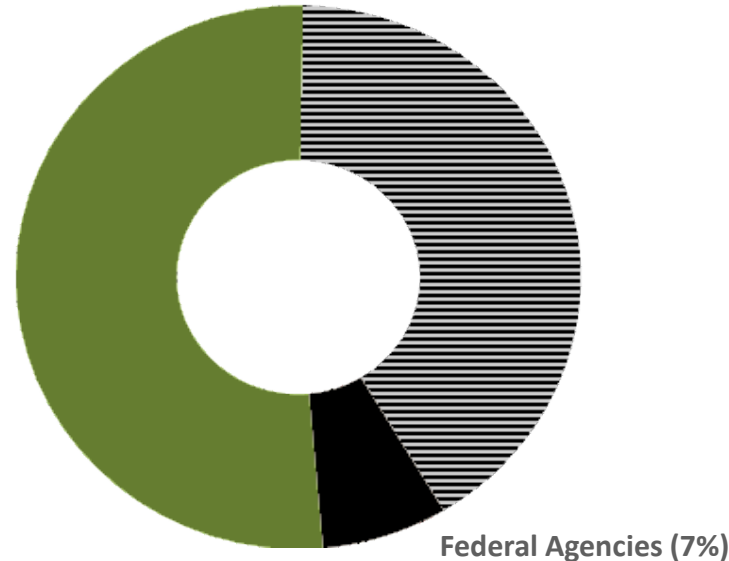
# CDC & FDA AR Isolate Bank Customers

**Clinical & Commercial Labs (52%)**  
Validating lab testing, treatment to improve patient care

**Researchers & Developers (41%)**  
Improving diagnostics, pharmaceuticals to improve patient care

“The isolates helped us challenge our diagnostic tests to ensure they can detect a variety of resistance targets. We also used the panels to validate automated sensitivity instruments when we adopted new breakpoints.”

– Diagnostic Developer



# Accelerating & Implementing Innovations to Combat AR

## Industry Partners



### Synergies from CDC and FDA AR Isolate Bank, like:

- *C. auris* diversity panel used to challenge EPA disinfectants
- Environmental samples used to study antibiotics in pesticides
- Isolates used for proof-of-concept testing for a new rapid diagnostic test

## Leaders in Applied Research



### Studies on AR in healthcare, food, and community, like:

- New ways to detect AR and improve abx use
- Domestic and international transmission, colonization, and prevention of AR
- Microbiome disruption
- AR threats in water systems, environment
- Improving data and its use to combat AR

## Prevention Networks



### Piloting and evaluating evidence-based prevention strategies in healthcare, like:

- Developing ways to model AR and HAI transmission
- Improving basic infection control interventions
- Assessing how infectious disease and primary care docs manage antibiotic stewardship and use

## Academic & Healthcare Investigators

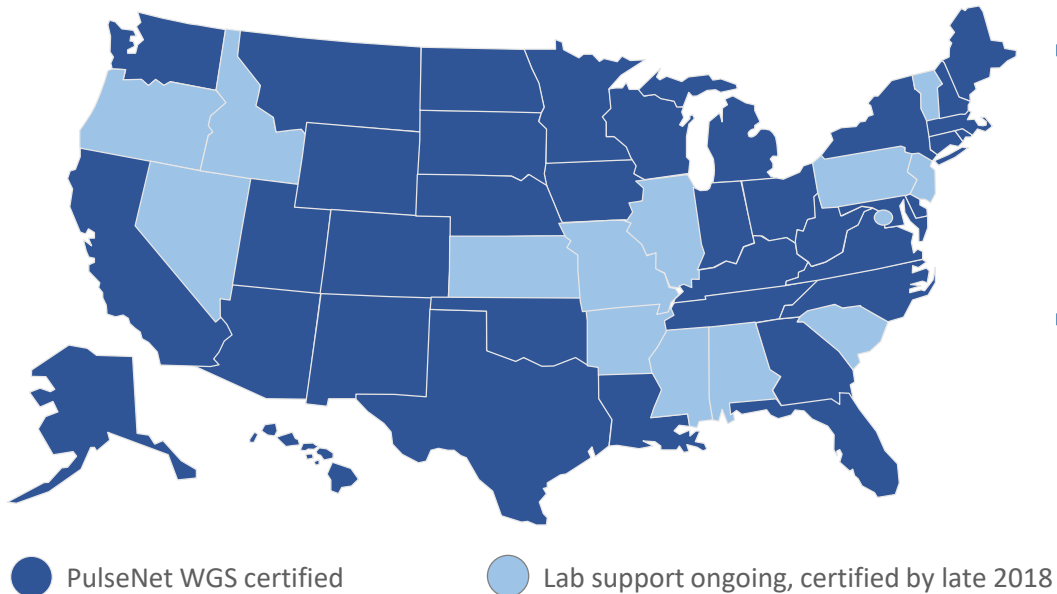


### Discovering and scaling up new ways to protect people:

- Domestic and international HAI prevention research
- Growing research portfolio on AR and the environment
- Healthcare information technology development
- Veterinary healthcare quality improvement

# Resistant Infections from Food: Whole Genome Sequencing

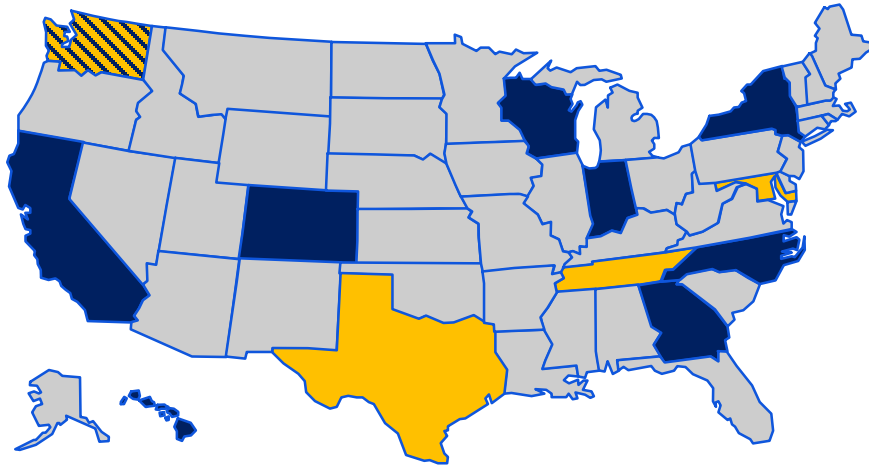
Rapidly identifying and responding to drug-resistant foodborne bacteria and outbreaks by using whole genome sequencing (WGS) and increasing lab testing nationwide.





- As of Sept. 1, 43 labs in 37 states are PulseNet WGS certified for *Salmonella*, *Listeria*, STEC and *Campylobacter*.
  - By late 2018: 100% certified
  
- Since Oct. 2016, CDC and states have accelerated sequencing to include 26% of *Salmonella*, with a goal of 90% in 2019.
  - By early 2019: Sequencing deployed for other bacteria

# AR in the Community: Lab Capacity for Gonorrhea Resistance Testing

Local and regional labs are strategically positioned to enhance surveillance and response.



 AR Lab Network Regional Labs conduct advanced susceptibility testing for isolates collected nationwide

 SURRG local labs rapidly conduct susceptibility testing of isolates to inform outbreak response

**THEN** 6,000 isolates/year, test results available in 1–3 months for surveillance

**NOW** 20,000 isolates/year  
WGS of 1,500 isolates/year by regional labs  
Rapid susceptibility testing (1–2 weeks) by local labs to inform outbreak response

**SOON** Actionable data to inform surveillance, treatment guidelines, outbreak response

# AR in the Community: Tuberculosis (domestic)

## Extending the TB Medical Exam



- Expanding to include students, skilled worker, long-term visitors
- Identify more cases overseas, treat to cure, and reduce number of imported cases

## Innovation in TB Treatment



- Randomized trial using smartphones to monitor and ensure therapy is completed
- Improved treatment practices can reduce rates of drug-resistant TB

## Ensuring the TB Treatment Supply



- U.S. stockpile to protect patients from interrupted TB treatment
- U.S. TB programs have reported intermittent drug supply issues to FDA and CDC in the past

# Examples of CDC's Global Work to Combat AR



## Innovation & Infection Control in Vietnam

- Piloting shorter-course preventive therapy to reduce TB disease and slow development of resistant TB
- **Studying latent TB** management by offering testing and treatment before traveling to the United States.
- **Establishing national AR and HAI surveillance** network of 16 sites to generate critical data
- **Developing national infection control** expertise through a national Technical Advisory Group to reduce HAIs and improve containment



## Improving TB Diagnostics in Mexico

- Linking patients diagnosed with TB to care and treatment



## First National TB Program in China

- Strengthening the Chinese TB surveillance system and collaborating on lab quality assurance programs



## Strengthening HAI/AR Programs in India

- **Implementing HAI and AR surveillance** in 30+ sites across country to better understand AR burden
- **Initiating programs** to prevent and reduce central line associated bloodstream infections
- **Assessing stewardship** programs to improve antibiotic use

# Transformative Infrastructure to Combat AR

## Detect

Then

- Few state labs can detect CRE
- CDC is national reference lab
- Slow detection of new threats



Now

- All states, 6 large cities, & PR detect local CRE
- CDC, regional labs, TB center test, track trends
- Routine discovery of AR



## Respond

- Few states have AR experts for outbreaks, infection control
- CRE outbreaks go undetected



- All states, 6 large cities, & PR armed with dedicated AR staff
- Dramatic improvement in response to CRE outbreaks



## Prevent

- Few states have local staff for prevention, infection control
- Lack of coordination between facilities to stop spread



- State programs lead prevention coordination between facilities
- Greater understanding of transmission
- Greater focus on abx use



## Innovate

- Few states have local staff for prevention, infection control
- Lack of coordination between facilities to stop spread



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