Addressing Antimicrobial Resistance: Investing in Prevention and Measuring Success

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CDC seeks to protect the U.S. and its citizens from AR threats.

This means supporting a robust infrastructure domestically and globally that can:

- Improve the detection of AR threats, especially those that are novel, rare, and/or pose a significant risk to morbidity and mortality.

- Prevent and contain the transmission of AR threats when they are identified in healthcare settings and in the community.

- Improve the use of antibiotics and antifungals wherever they are used and needed.

- Support public health innovations that can improve our collective ability to detect, prevent the emergence of, or contain AR threats.

- Raise awareness among healthcare workers, the public, policymakers, and sub–populations about the risk of AR and what they can do to address it.

CDC's 2013 and 2019 AR Threats Reports and 2022 COVID Impact Report
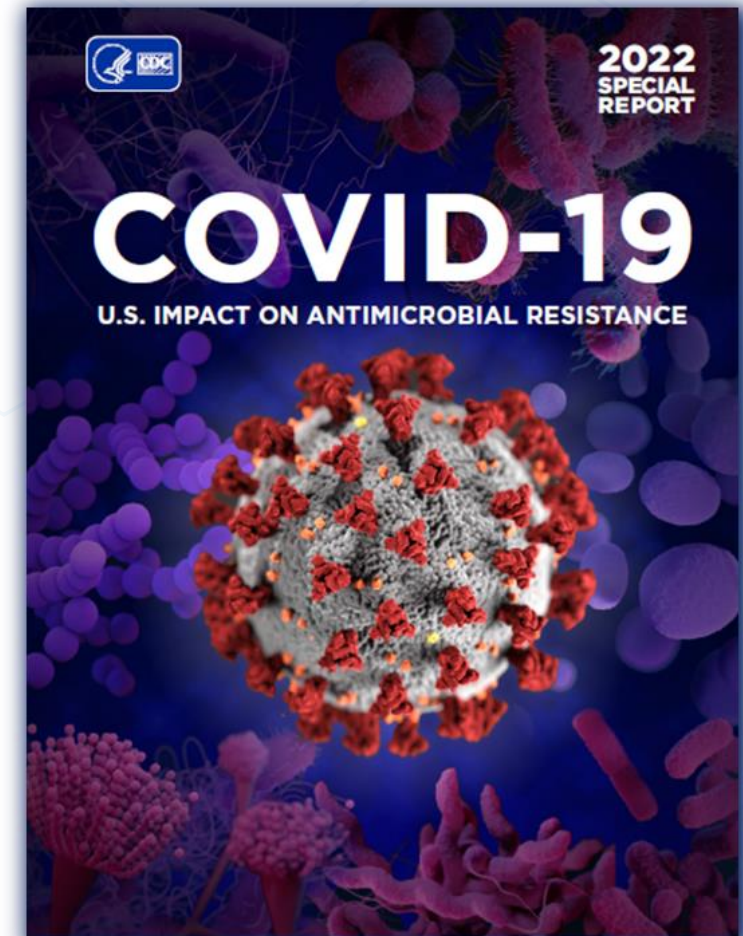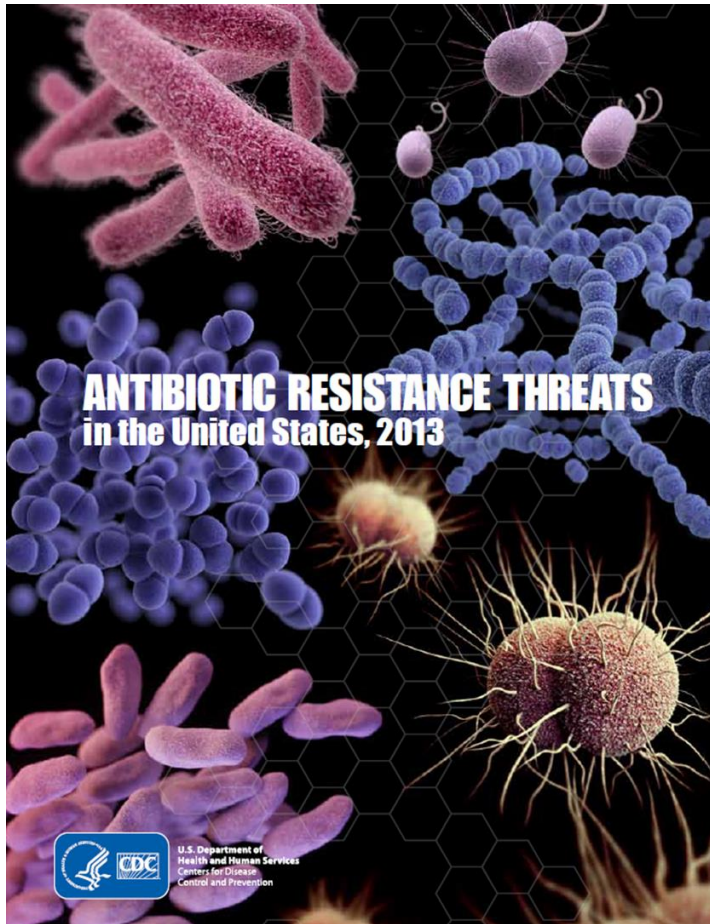
Monitoring AR in the U.S. relies on multiple data sources.

Data on Pathogens

- Standardized technology for lab capacity in 50 states, 5 local jurisdictions, Puerto Rico, and 7 regions to rapidly identify new antimicrobial resistance and trends.
- Phenotypic and genotypic test results, including whole genome sequencing, to identify resistance for a specific pathogen by each relevant antimicrobial.

Data on Human Infections

- Robust systems to track resistant infections: from healthcare facilities through the National Healthcare Safety Network (NHSN), enteric infections through PulseNet, gonorrhea infections through the Gonococcal Isolate Surveillance Project (GISP) sites

Data on Risks

- Active surveillance in 10 Emerging Infection Program sites with a catchment area of approximately 44 million people to monitor resistance across populations and measure risk by population and community.

Keeping a Pulse on Top U.S. AR Threats

CDC uses multiple data sources and systems to not only track antimicrobial resistance in the U.S. but to also estimate the burden, mortality, and costs of antimicrobial resistance. CDC and health departments use these critical data to prevent spread and protect people.

CDC has established a list of antimicrobial-resistant pathogens that pose a significant risk to morbidity or mortality.

THREAT LEVEL **URGENT**

THREAT LEVEL **SERIOUS**

THREAT LEVEL **CONCERNING**

Urgent Threats

- Carbapenem-resistant *Acinetobacter*

- *Candida auris (C. auris)*

- *Clostridioides difficile (C. difficile, C. diff)*

- Carbapenem-resistant Enterobacterales (CRE)

- Drug-resistant *Neisseria gonorrhoeae (N. gonorrhoeae)*

Serious Threats

- Drug-resistant *Campylobacter*

- Drug-resistant *Candida*

- ESBL-producing Enterobacterales

- Vancomycin-resistant *Enterococci* (VRE)

- Multidrug-resistant *Pseudomonas aeruginosa (P. aeruginosa)*

- Drug-resistant nontyphoidal *Salmonella*

- Drug-resistant *Salmonella* serotype Typhi

- Drug-resistant *Shigella*

- Methicillin-resistant *Staphylococcus aureus (S. aureus)*

- Drug-resistant *Streptococcus pneumoniae (S. pneumoniae)*

- Drug-resistant tuberculosis (DR TB)

Concerning Threats

- Erythromycin-resistant Group A *Streptococcus*

- Clindamycin-resistant Group B *Streptococcus*

Watch List

- Azole-resistant *Aspergillus fumigatus (A. fumigatus)*

- Drug-resistant *Mycoplasma genitalium* (Mgen)

- Drug-resistant *Bordetella pertussis*

CDC builds capacity through the domestic AR Lab Network.

- Transforms the nation's public health infrastructure of regional and state labs with validated testing methods and high-quality technology
- Enhances testing capacity in all 50 states, 5 local jurisdictions, and Puerto Rico
- Enables faster detection for rapid and improved public health response
- Provides communication channels to engage clinical laboratory partners
- Allows for real-time, actionable data and alert system

ARLABnetwork

Pathogen Identification

1,071,105 sample characterizations

PCR / WGS

399,000 whole-genome sequences

**Colonization**

366,681 colonization screenings

Alerts

47,000 alerts sent (CEMB ~38K, MDB ~9K, GC ~1K)

As of Sept. 1, 2023

Global Antimicrobial Resistance Laboratory and Response Network
Improving lab detection and response globally for high-impact AR threats

- Healthcare-associated infections (HAIs)– carbapenem-resistant Enterobacterales
    - Global Action in Healthcare Network (GAIHN)
    - Antibiotic Resistance in Communities and Hospitals (ARCH)
- Enterics – Salmonella (Typhi and nontyphoidal); drinking, surface, and wastewater
    - PulseNet International (PNI)
    - Global Water, Sanitation, and Hygiene (WASH)
- Fungi – Candida species, *C. auris,* and *A. fumigatus*
    - World Health Organization's (WHO) Global Antimicrobial Resistance and Use Surveillance System (GLASS)
- Invasive bacterial and respiratory infections – *S. pneumoniae, N. meningitidis, B. pertussis*
- Sexually transmitted diseases – *N. gonorrhoeae*
    - WHO's Enhanced Gonococcal Antimicrobial Surveillance Program (EGASP)
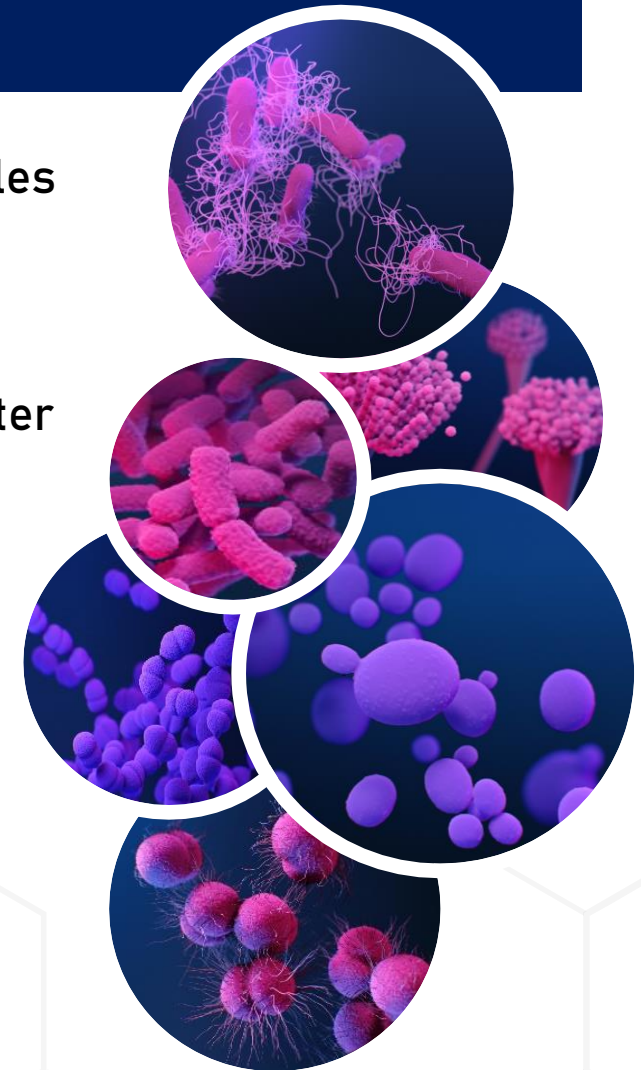
Recent advances in AR surveillance and monitoring

- HL7 electronic reporting from labs provides automated real-time data sharing and improves accuracy of data transmission.

- Automated reporting of AR microbiology lab data and antibiotic medication administration/use (AU) data from acute care facilities to the National Healthcare Safety Network (NHSN) removes time and effort of manual data collection and submission.

- Electronic ordering for test requests and reporting of results with public health laboratories to decrease turnaround times for results and action.

- Whole genome sequencing of enteric (gut) pathogens through PulseNet provides ability to accurately predict resistance.

- Development of standard protocols and interpretation of wastewater testing for specific antimicrobial-resistant pathogens and AR genes from healthcare settings and the community to provide early detection and signals of AR emergence and spread.

Limitations and gaps to be addressed

- Interoperable surveillance systems across One Health sectors to assist with data comparisons.

- More extensive AR data tracking and sharing (e.g., long-term care facilities, commercial/private microbiology labs).

- Measurements of health equity to better identify drivers of risk among patient populations most affected by AR pathogens – high risk, vulnerable, underserved (e.g., cancer patients, young and elderly, uninsured).

- A focus on colonization with development of effective methods to stop transmission in and out of healthcare settings.

- Determine best use for sequencing data – define purpose, evaluate expense and need, identify best platforms for interpretation and reporting.

- Improve global data sharing for accurate and timely information on identified threats and new emergence.

Looking ahead to the next CDC AR Threats Report

- **Format** – transition from a print-only format to an interactive, web-based platform

- **Content** – will include AR data on CDC's bacterial and fungal pathogens, as well as general AR information

- **Updates** – facilitate more regular updates of pathogen-specific information

- **Connections** – serve as an AR data hub, connecting to other pathogen content on CDC.gov and resources for different audiences

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