

CDC's Work in Antibiotic Resistance - U.S. & Abroad

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The Threat of Antibiotic Resistance in the United States



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

New National Estimate*

Antibiotic-resistant bacteria and fungi cause
at least an estimated:



2,868,700
infections



35,900
deaths



Clostridioides difficile is related to antibiotic use
and antibiotic resistance: *



223,900
cases



12,800
deaths

New Threats List

Updated urgent, serious, and concerning threats—totaling 18

5 urgent threats

2 new threats

NEW:
Watch List with **3** threats



Antibiotic resistance remains a significant One
Health problem, affecting humans, animals, and
the environment.

* *C. diff* cases from hospitalized patients in 2017

www.cdc.gov/DrugResistance/Biggest-Threats

Current Antibiotic Resistance Threats in the U.S.

THREAT LEVEL URGENT

Urgent Threats

- Carbapenem-resistant *Acinetobacter*
- *Candida auris*
- *C. difficile*
- Carbapenem-resistant *Enterobacteriaceae*
- Drug-resistant *Neisseria gonorrhoeae*

THREAT LEVEL SERIOUS

Serious Threats

- Drug-resistant *Campylobacter*
- Drug-resistant *Candida*
- ESBL-producing *Enterobacteriaceae*
- Vancomycin-resistant *Enterococci*
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant nontyphoidal *Salmonella*
- Drug-resistant *Salmonella* serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus*
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant Tuberculosis

THREAT LEVEL CONCERNING

Concerning Threats

- Erythromycin-resistant Group A *Streptococcus*
- Clindamycin-resistant Group B *Streptococcus*

CDC's 2019 Watch List

- Infrequently found in the United States or not well understood
- CDC and public health experts are closely monitoring

AZOLE-RESISTANT *A. FUMIGATUS*



DRUG-RESISTANT *M. GENITALIUM*



DRUG-RESISTANT *B. PERTUSSIS*



A Complex Web: Everything Is Connected

- Antibiotic resistance, when germs defeat the antibiotics designed to kill them, can develop and spread across settings. It can affect our progress in health care, food production, and life expectancy.
- Antibiotic resistance is a One Health problem—the health of people is connected to the health of animals and the environment (soil, water).



Fighting Antibiotic Resistance Where it Happens



Improving antibiotic use and infection prevention, with innovative and proven practices to control spread.



Rapidly identifying antibiotic-resistant foodborne bacteria to stop and solve outbreaks and improve prevention.



Detecting, preventing, tracking, and treating antibiotic-resistant pathogens in the community.



Improving international collaboration and capacities for surveillance, infection control, prevention, stewardship, and public health research.



Exploring unanswered questions about AR and humans, animals, and the environment (e.g., surface water and soil).



Infection Prevention in Hospitals is Working

CDC's 2019 AR Threats Report: **PREVENTION WORKS.**

↓ **18%** fewer deaths from antibiotic resistance overall since 2013 report

↓ **28%** fewer deaths from antibiotic resistance in hospitals since 2013 report

AND DECREASES IN INFECTIONS CAUSED BY:

↓ **41%** Vancomycin-resistant *Enterococcus*

↓ **33%** Carbapenem-resistant *Acinetobacter*

↓ **29%** Multidrug-resistant *Pseudomonas aeruginosa*

↓ **25%** Drug-resistant *Candida*

↓ **21%** Methicillin-resistant *Staphylococcus aureus* (MRSA)

STABLE Carbapenem-resistant Enterobacteriaceae (CRE) & drug-resistant tuberculosis (TB disease cases)

CDC Actions to Combat Antibiotic Resistance (AR)*



U.S. Department of
Health and Human Services
Centers for Disease
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Every 4 hours, CDC's AR Lab Network detected a resistant germ that required a public health investigation (*as of 2018*)

106,000+

bacteria tested and 2,238 alerts about unusual resistance

NEARLY 13,000

swabs tested to detect resistant germs in healthcare—many launched a containment response

WHOLE GENOME SEQUENCING

15,300

tuberculosis, *C. difficile*, and gonorrhea germ samples

101,511

foodborne germ samples since 2016 (e.g., *Salmonella* via PulseNet)



CDC invested \$300M+ in 59 state & local health departments to detect and prevent resistant threats

500+

local AR experts

8

SURRG sites to enhance response to drug-resistant gonorrhea outbreaks

CDC Supports Innovations

158

public health research projects

NEARLY \$110M

to 96 institutions for innovations, therapeutics, and diagnostics

125,000+ **GERM SAMPLES**

sent by CDC & FDA AR Isolate Bank



*As of Fiscal Years 2016-2019

CDC Actions to Combat Antibiotic Resistance (AR)*



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28

countries fighting antibiotic resistance together with CDC

26

infection control experts from CDC give technical assistance and support globally

300+

partners engaged globally through the AMR Challenge

84% of U.S. hospitals have adopted all seven of CDC's *Core Elements of Hospital Antibiotic Stewardship*

Antibiotic prescribing in outpatient settings declined (2011-2016)

↓ 5%

Of this, prescribing to children has dropped

↓ 13%

2M+

impressions from CDC education initiatives

26,400+

clinicians registered for CDC's free training course on improving antibiotic use

500+

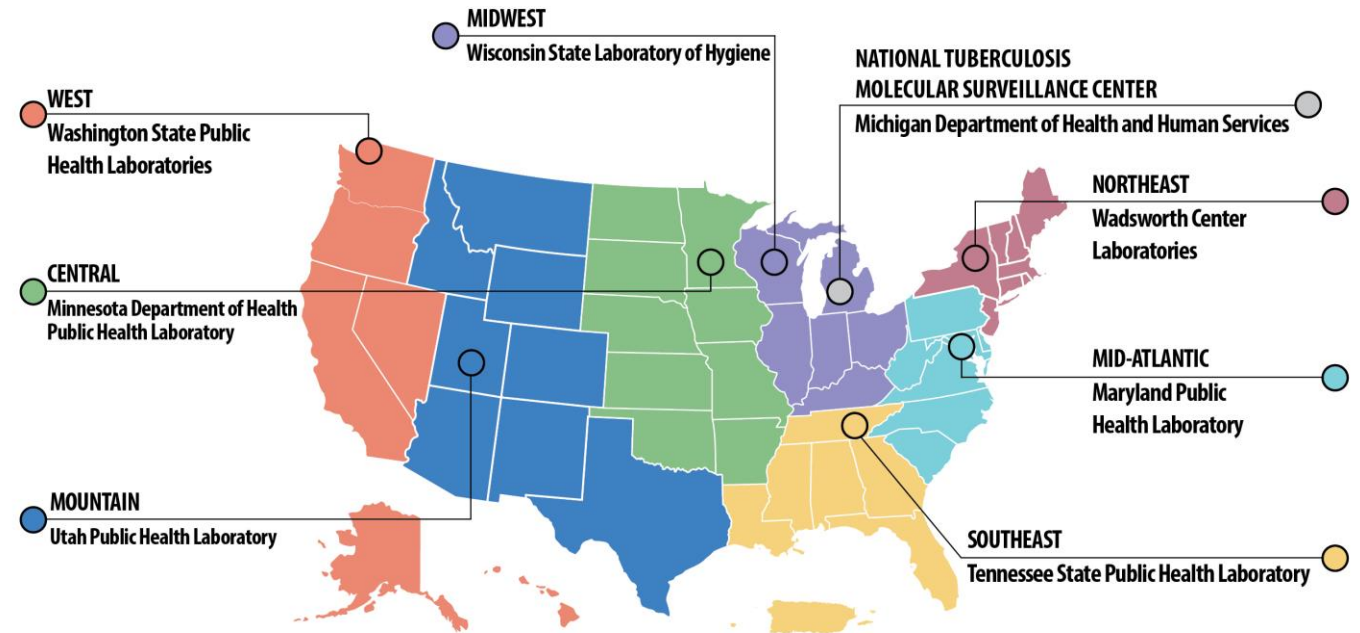
times the TB Emergency Drug Stockpile has been used to continue patient therapy



*As of Fiscal Years 2016-2019

CDC's AR Lab Network

- Transform the national lab infrastructure with regional and local labs with gold-standard methods and technology
- Enhanced testing capacity in all 50 states, four local jurisdictions, and Puerto Rico
- Faster detection for rapid and improved public health response
- Communication channels to engage clinical laboratory partners
- Real-time, actionable data to combat AR threats



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Antibiotic Resistance Spreads Easily Across the Globe

Resistant bacteria and fungi can spread across the countries and continents with people, animals, and goods.



One billion people cross through international borders each year. This includes 350 million travelers arriving in the United States through more than 300 points of entry.



Detect Resistant Threats



Prevent & Contain Resistant Germs



Improve Antibiotic Use

Examples of CDC's Global Work to Combat AR



Enhancing Infection Control in Vietnam (PATH)

- **Working** to strengthen national infection prevention and control in collaboration with PATH.
- **Strengthening** AR data collection, analysis, and surveillance in healthcare facilities.



Researching Across One Health In Chile

- **Analyzing** the effect of antibiotic-resistant pathogens in water on humans in Chile.



Improving Detection of AR Pathogens in Guatemala (Washington State University)

- **Developing** and testing a period prevalence survey of multi-drug resistant organism colonization in communities and hospitals in collaboration with Washington State University.



Supporting HAI/AR Surveillance in India

- **Evaluating** hospital-acquired infections in healthcare facilities as a feasible, useful, and acceptable metric for HAI surveillance in low- and middle-income countries.
- **Supporting** an expert in India to combat AR locally.

In addition to the work shown here, CDC is leveraging expertise gained from its work domestically to collaborate with global partners on pilot projects and on outbreak responses of resistant germs around the world.

The Road Ahead on Antibiotic Resistance



Domestic Gaps

- Greater implementation of programs for infection prevention, antibiotic stewardship across the One Health spectrum.
- Increased collaboration between public health and health care to prevent the spread of germs and improve antibiotic use.
- Leverage use and resistance data to drive change in communities, states, and the nation.



Global Gaps

- Improved detection of known and emerging AR threats worldwide.
- Robust infection prevention everywhere to stop spread.
- Improved use of and access to antibiotics worldwide.
- Improved access to vaccines and safe water/sanitation.



Innovation Gaps

- New antibiotics, vaccines, diagnostics, and therapeutics to identify, prevent or treat.
- Better strategies for preventing spread of AR pathogens; Better strategies to improve antibiotic use wherever antibiotics are used.
- Understand AR in the environment and impact on human and animal health.
- Understand how the microbiome can be leveraged to prevent and treat infection.

AR & COVID-19 Connection

- **Healthcare infection control is critical to fighting AR and SARS-CoV-2 infections**
 - No clear evidence that COVID-19 patients are more susceptible to bacterial/fungal infections—similar frequency as patients with influenza-like illness (ILI). **However, we are seeing sporadic outbreaks of AR infections in COVID units & higher rates of hospital onset infections**
 - COVID-19 creates perfect storm for AR infections **in healthcare settings:** length of stay, crowding, sick patients, antibiotic use, infection control issues
- **Antibiotic use fluctuated, appears stable but remains too high**
 - Hospitals: Spiked in early 2020 but flattened as pandemic continued
 - Outpatient, nursing homes: Significant drops from previous years
- Highlights continued importance of infection control and antibiotic stewardship—**both are dependent on the resiliency of these programs**

CDC AR Investments Support U.S. through Pandemic

- **500+ experts** in infection prevention and control, HAI, AR, laboratorians responding domestically
- **AR Lab Network in 50 states, several cities, territories** to provide COVID testing and identify AR outbreaks
- Data collection systems, like the National Healthcare Safety Network, **gather COVID-19 and AR data**
- CDC **antibiotic stewardship tools** for frontline workers
- Infection control **experts responding globally** to COVID-19
- Building on foundational innovations for AR **sewage surveillance** to detect COVID-19 in wastewater
- **Leverage antibiotic stockpile** for continuity of TB treatment due to drug shortages



CDC funding 2016-2020:

\$373M+

across 59 state & local health departments for detection/prevention

Nearly \$115M

to 100+ institutions for innovations, therapeutics and diagnostics