

Antibiotic Use and Stewardship in the United States, 2023 Update: Progress and Opportunities

At a glance

- Antibiotic stewardship is a core strategy to combat antimicrobial resistance.
- CDC tracks antimicrobial use and stewardship implementation data across healthcare settings to evaluate progress and ensure equitable access to quality health care.

Introduction

Antibiotic stewardship is the effort to optimize how antibiotics are used and is a core strategy to combat antimicrobial resistance. In 2023, the Office of Antibiotic Stewardship at the Centers for Disease Control and Prevention (CDC) issued new and updated guidance and resources to support the implementation of antimicrobial and diagnostic stewardship in health care.

Health Equity in Antibiotic Prescribing

- In 2021, the CDC launched an [agency-wide strategy](#) to integrate health equity principles into public health programs, policies, data systems and funding structures.
- In 2022, the Office of Antibiotic Stewardship conducted a review of published studies to identify antibiotic prescribing health inequities.¹
 - The review revealed several gaps in knowledge and found that antibiotic prescribing rates and appropriateness varied by patient and clinician factors, such as patient race and insurance status and clinician type.
 - Findings emphasize the importance of integrating health equity into antibiotic stewardship policies, practices and research.
 - A renewed focus on antibiotic stewardship expertise and interventions will help optimize the diagnosis and treatment of infections, ensure patient safety and combat antimicrobial resistance.

New antibiotic stewardship guidance

As the landscape of healthcare delivery changes, antibiotic stewardship guidance is evolving to support stewardship implementation, and ensure appropriate treatment of infections for all patients across the healthcare spectrum.

Leveraging health systems to expand and enhance antibiotic stewardship in outpatient settings

Health systems are an important stakeholder to expand antibiotic stewardship expertise and implementation in outpatient settings. The Pew Charitable Trusts and Intermountain Healthcare, in consultation with CDC, convened partners to discuss approaches for health system-led outpatient stewardship activities. A commentary describing key takeaways from the discussion highlights benefits of health-system led stewardship efforts, including the ability to standardize practices across multiple facilities and leverage centralized resources to support stewardship. The commentary also describes



examples of health-system led stewardship activities within the context of the [Core Elements of Outpatient Antibiotic Stewardship framework](#).²

Antibiotic stewardship in outpatient telemedicine: adapting CDC Core Elements to optimize antibiotic use

The landscape of healthcare delivery is evolving rapidly, especially during the COVID-19 pandemic. This has led to the expansion of the role of telemedicine, including for common infections managed in outpatient settings. CDC performed a narrative review of studies describing antibiotic prescribing and stewardship in outpatient telemedicine to support the application of the *Core Elements of Outpatient Antibiotic Stewardship*.³ Considerations for technology-driven quality improvement approaches and adapting existing stewardship practices to telemedicine are discussed. Additional implementation research is necessary to inform the application of effective, sustainable and equitable antibiotic stewardship interventions and ensure the delivery of high-quality care across the spectrum of outpatient telemedicine.

Core Elements of Antibiotic Stewardship for Health Departments

State and local health departments play an important role in guiding antibiotic stewardship efforts in various healthcare settings and promoting appropriate antimicrobial use in their communities. CDC, through the American Rescue Plan Act, provided more than \$120 million in supplemental funding to 62 state and local health departments to provide access to stewardship expertise and provide recommended stewardship implementation activities. CDC developed the [Core Elements of Antibiotic Stewardship for Health Departments](#) to outline the structure of a state and local health department antibiotic stewardship program and provide recommended stewardship implementation activities. State and local health departments can select and adapt stewardship strategies to meet local healthcare needs.

Core Elements of Hospital Sepsis Programs

CDC released the intended [Core Elements of Hospital Sepsis Programs](#) to optimize the hospital management and outcomes of sepsis. Antibiotic stewardship programs play an important role in improving treating patients with sepsis, including implementing protocols to administer antibiotics quickly in cases of suspected sepsis and review antibiotics after they are started so that healthcare providers can tailor or stop therapy if unnecessary.

Antibiotic use and stewardship data for action

Outpatient surveillance data

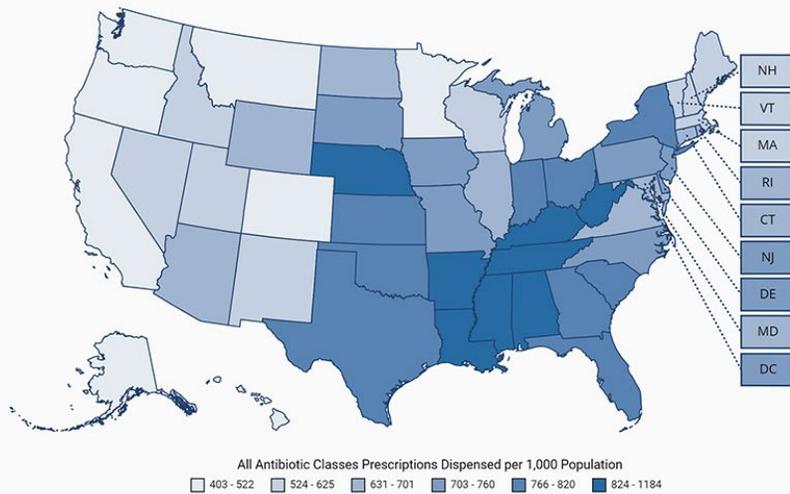
CDC monitors [outpatient antibiotic prescription data](#) using a variety of data sources to better understand trends in outpatient antibiotic prescribing, identify where interventions are most needed and measure progress. [Download the CSV file for outpatient antibiotic prescription data](#).



OUTPATIENT PRESCRIPTION RATE OF ALL ANTIBIOTIC CLASSES DISPENSED IN U.S. PHARMACIES BY STATE MAP

YEAR 2022

This map displays prescription rates of all antibiotic classes per 1,000 population dispensed in outpatient pharmacies across U.S. states in 2022.



Outpatient prescription rates of all antibiotic classes dispensed in US.

Hospital surveillance data

The Antimicrobial Use (AU) Option of the CDC's National Healthcare Safety Network (NHSN) is a surveillance resource that can provide actionable data for antibiotic stewardship programs. Programs can use the data to measure AU across hospitals and before, during and after stewardship interventions. 2,947 acute care hospitals across the United States have submitted at least one month of data to the AU Option as of August 2023. Of those hospitals, 2,751 reported from July 2022– June 2023.

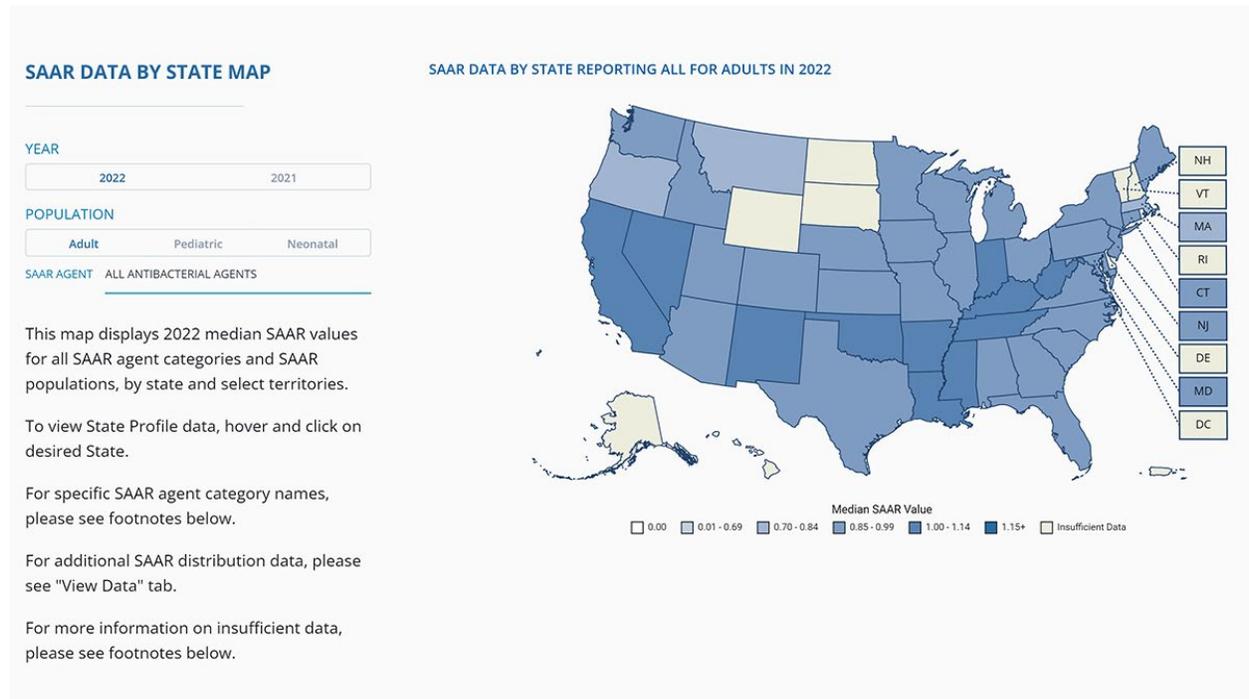
In 2017, the NHSN Antimicrobial Use and Antimicrobial Resistance (AUR) Module reporting was identified as one option to meet the Public Health Registry reporting element within the Centers for Medicare and Medicaid Services (CMS) Medicare Promoting Interoperability (PI) Program for eligible hospitals and critical access hospitals (CAHs). This option continues to be available in calendar year 2023; facilities reporting to the NHSN AUR Module will receive 5 bonus points.

In 2023, CMS [finalized changes](#) to the Medicare Promoting Interoperability Program for eligible hospitals and CAHs that include a new AUR Surveillance measure under the Public Health and Clinical Data Exchange Objective. To earn credit for calendar year 2024, eligible hospitals and CAHs must demonstrate active engagement with CDC's NHSN to submit AUR data for the electronic health record (EHR) reporting period, or else claim an applicable exclusion. Learn more about the [Promoting Interoperability Program](#).

Benchmarking measure of antibiotic use Standardized Antimicrobial Administration Ratio (SAAR)
The NHSN AUR module Standardized Antimicrobial Administration Ratio (SAAR) is a risk-adjusted antibiotic use benchmarking measure that can help inform stewardship efforts by enabling hospitals to see how their antibiotic use compares to other facilities. The [2022 NHSN AU Option Report](#) provides a summary of SAAR distributions and percentages of use within the SAAR antimicrobial agent categories in adult, pediatric and neonatal patient care locations.



Visit [CDC's Antimicrobial Resistance & Patient Safety Portal](#) to view the [latest data on inpatient antibiotic use](#). Download the [CSV file for this data](#).



SAAR data for adults in 2022

Hospital antibiotic stewardship core elements

CDC's [Core Elements of Hospital Antibiotic Stewardship](#) provides a framework for implementation of antibiotic stewardship programs. The implementation of [antibiotic stewardship programs in acute care hospitals](#) is assessed through the [NHSN Patient Safety Component Annual Hospital Survey \[PDF – 19 pages\]](#). Staff in hospitals complete annual surveys. Survey questions relating to antibiotic stewardship gauge a hospital's uptake of CDC's Core Elements of Hospital Antibiotic Stewardship Programs (ASPs). The percentage of hospitals meeting all 7 Core Elements increased to 97% in 2022. Additionally, the percentage of hospitals meeting 6 of the 7 Core Elements was 2%. [Download the CSV file for antibiotic stewardship programs in acute care hospitals data](#).



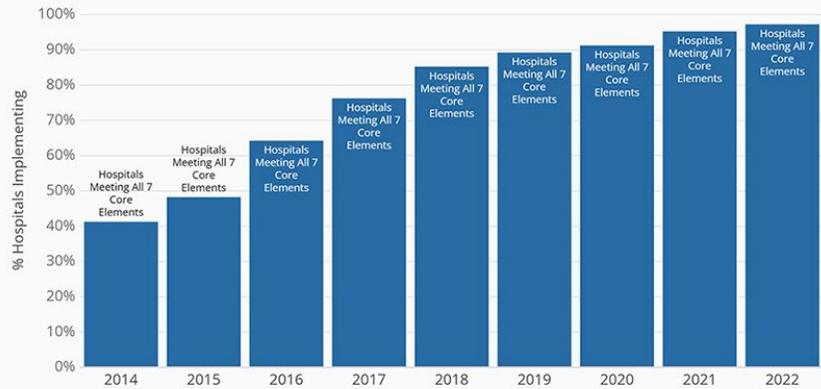
CHANGES OVER TIME IN HOSPITAL ANTIBIOTIC STEWARDSHIP (AS)

CORE ELEMENT ALL 7 CORE ELEMENTS

STATE ALL STATES

This graphic shows the change over time from 2014 to 2022 in hospital implementation of antibiotic stewardship programs by state and Core Element.

HOSPITALS IMPLEMENTING ALL 7 CORE ELEMENTS IN ALL STATES OVER TIME



Hospitals that implemented all 7 core elements in all states

With robust national uptake of the Core Elements, CDC released [Priorities for Hospital Core Element Implementation](#) (Priorities) in Fall 2022 to enhance the quality and impact of hospital antibiotic stewardship programs. Key actions in six of the seven core elements were identified and are a subset of especially effective stewardship implementation approaches that are supported by evidence and/or recommended by stewardship experts. In 2022, the percentage of hospitals meeting all six Priorities was 10% and hospitals meeting five of the six Priorities was 24%. Download [CSV file for hospital priority element reporting data](#).



HOSPITAL ANTIBIOTIC STEWARDSHIP IMPLEMENTATION BY PRIORITY ELEMENT

STATE ALL STATES

YEAR

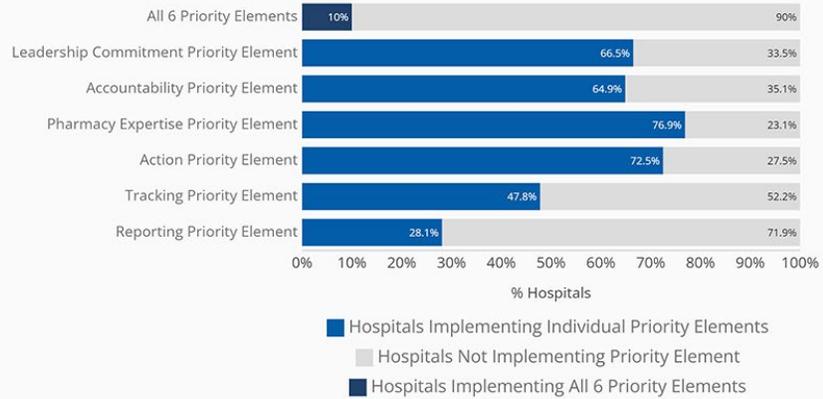
2022

2021

The graphic shows the percent of acute care hospitals that report implementation of Priority Elements of hospital antibiotic stewardship programs for the nation in 2022. Visit the [United States Profile](#) to learn more about Antibiotic Stewardship reporting by geography.

[Priorities for Hospital Core Element Implementation | Antibiotic Use | CDC](#)

HOSPITAL PRIORITY ELEMENT REPORTING IN ALL STATES



Hospital priority element reporting

Long-term care surveillance data

Healthcare providers commonly prescribed antibiotics to residents in long-term care settings. The increasing uptake of the Core Elements of Antibiotic Stewardship highlights how long-term care facilities are incorporating stewardship as a resident care priority. This is especially important in light of [CMS regulations](#) that require nursing homes to implement an antibiotic stewardship program that includes a system to monitor antibiotic use.

Similar to hospitals, CDC monitors the uptake of the [Core Elements of Antibiotic Stewardship in Nursing Homes](#) through the NHSN [Long Term Care Facility Component—Annual Facility Survey \[PDF – 6 pages\]](#). Staff who work in long-term care facilities, including certified skilled nursing facilities/nursing homes, complete annual surveys. Survey questions relating to antibiotic stewardship gauge a facility's uptake of CDC's Core Elements of antibiotic stewardship.

Visit CDC's Antimicrobial Resistance & Patient Safety Portal to view the [latest data on the uptake of the Core Elements in long-term care facilities](#). Download [CSV file for this data](#).



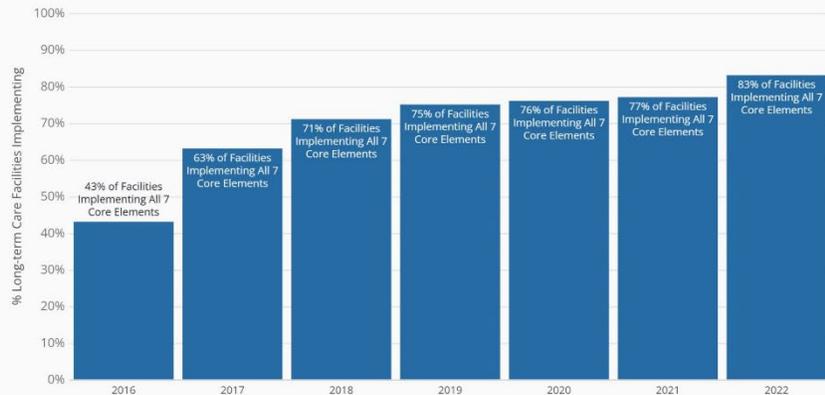
LONG-TERM CARE ANTIBIOTIC STEWARDSHIP CHANGES OVER TIME

CORE ELEMENT ALL 7 CORE ELEMENTS

STATE ALL STATES

This graphic shows the change over time in long-term care implementation of antibiotic stewardship by state and Core Element from 2016 to 2022. Click on the bar in the graphic to see the number of facilities reporting the implementation of the Core Elements by year.

LONG-TERM CARE FACILITIES IMPLEMENTING ALL 7 CORE ELEMENTS IN ALL STATES OVER TIME



Long term care facilities implementing all 7 core elements

Findings from CDC studies

Several studies supported by CDC's Office of Antibiotic Stewardship assessed variation in antibiotic prescribing in different healthcare settings and populations, and highlighted opportunities and implementation strategies to improve antibiotic use.

Regional variation in outpatient antibiotic prescribing for acute respiratory tract infections in a commercially-insured population, United States, 2017

CDC analyzed acute respiratory tract infection (ARTI) outpatient visits for individuals younger than 65 years old using the 2017 IBM® MarketScan® Commercial Database. After controlling for clinical factors, including patient age, comorbidities, prescriber specialty, care setting, and ARTI diagnosis, the study found that patients in the Southern United States were the most likely to receive an inappropriate antibiotic prescription for an ARTI in multivariate models. These findings indicate that **higher antibiotic prescribing in the South is likely due, in part, to non-clinical factors** such as regional differences in clinicians' prescribing habits and patient expectations. Better defining these factors can inform regional and local stewardship interventions.⁴

Implementation of an Antibiotic Stewardship Initiative in a Large Urgent Care Network

Rates of inappropriate antibiotic prescribing are higher in urgent care centers compared with other outpatient settings. Researchers conducted a CDC-funded study at Intermountain Healthcare and the University of Utah to characterize the **impact of a multifaceted antibiotic stewardship intervention** on antibiotic prescribing in urgent care. Findings showed an **improvement in antibiotic prescribing for respiratory conditions** from a baseline of 47.8% to 33.3% during the intervention period. Among conditions for which antibiotics are not recommended, such as acute bronchitis or the common cold,



antibiotic prescribing decreased from a baseline of 18.7% to 7.5%. CDC suggests using the approaches in this study as a model for health systems to improve antibiotic prescribing in urgent care settings.⁵

Comparison of outpatient antibiotic prescriptions among older adults in IQVIA Xponent® and publicly available Medicare Part D data, 2018

This CDC study compared outpatient antibiotic prescriptions among adults 65 years and older using two nationally representative data sources that public health organizations and researchers can leverage to improve antibiotic use. The distributions of antibiotic prescriptions by geography, antibiotic class, and prescriber specialty were similar in the Centers for Medicare and Medicaid Services (CMS) [Part D Prescriber Public Use Files](#) and the proprietary IQVIA Xponent® dataset. This finding suggests that **public health organizations and healthcare systems can use the publicly available CMS Part D data** to track antibiotic use and guide antibiotic stewardship interventions **to improve prescribing for older adults.**⁶

Characteristics of patients associated with any outpatient antibiotic prescribing among Medicare Part D enrollees, 2007–2018

CDC assessed the association of patient characteristics with receiving an antibiotic prescription for adults 65 years and older using the National Health Interview Survey data linked with Medicare part D. The analysis showed variation in antibiotic prescribing by race and ethnicity, sex, geography, and health status in an older adult population with continuous healthcare coverage. This study highlights the **importance of integrating health equity science in data analyses** and incorporating a health equity perspective in efforts to improve antibiotic prescribing for older adults.⁷

Comparison of antibiotic prescribing between physicians and advanced practice clinicians

Antibiotic prescribing practices among physicians and advanced practice clinicians (APCs, physician associates/assistants and nurse practitioners) were compared for respiratory conditions using national survey data from 2010 through 2018. **APCs prescribed antibiotics more frequently than physicians** (58% compared to 52%). No differences in selection of guideline recommended first-line agents were observed, suggesting similar quality of antibiotic selection between these two groups. APCs now account for about 2 out of 5 antibiotic prescriptions in the United States and should be included in stewardship education and in outpatient stewardship program development and leadership. **Improving antibiotic prescribing by all clinicians, including APCs, is important for ensuring high quality, equitable health care.**⁸

Be Antibiotics Aware campaign updates

Spotlight

Through the award-winning national educational efforts, [Be Antibiotics Aware and Get Ahead of Sepsis](#), CDC educates the public and healthcare professionals about the importance of antibiotic stewardship to ensure appropriate and timely antibiotic use in sepsis management.

CDC's *Be Antibiotics Aware: Smart Use, Best Care* national educational effort provides resources for healthcare professionals and patients and their families to optimize antibiotic use to help combat antimicrobial resistance. In November and December 2022, *Be Antibiotics Aware* advertisements during U.S. Antibiotic Awareness Week generated more than 14 million impressions and 1 million link clicks to



the CDC website. Webpage views almost doubled from 26 million+ views in June 2022 to 45 million+ views in June 2023, a 73% increase. As of June 2023, the partner toolkit has garnered 122k views, an 18% increase from June 2022.

New online resources

- [U.S. Antibiotic Awareness Week \(USAAW\) Partner Toolkit](#)
- Dental Stewardship Resources
- Treatment for Common Illnesses Patient Resources
 - [Common Cold](#)
 - [Bronchitis](#)
- Updated [online antibiotic stewardship training course](#) includes multiple healthcare professional educational modules with free continuing education credits.
- An [Outpatient Antibiotic Use Metrics Table](#) provides an overview of recommended antibiotic use metrics that health systems can leverage to track and report antibiotic use in outpatient settings.
- The "[Advancing Health Equity through Antimicrobial Stewardship workshop](#)" is a healthcare professional educational program developed by the Society for Healthcare Epidemiology (SHEA) to identify and address health inequities as they relate to antibiotic stewardship and antimicrobial resistance.

The path forward

Antibiotic use and stewardship data highlight progress and opportunities to improve prescribing practices and optimize patient safety. New partnerships with healthcare professional organizations and guidance for telemedicine, health systems and sepsis programs will support allocation of resources to align with changes in healthcare delivery. CDC commits to incorporating health equity science into stewardship program research and activities to ensure that antibiotic prescribing is optimized for all patients, in all healthcare settings and across all regions of the United States. CDC funding for state and local health departments has led to expansion of antibiotic stewardship expertise and infrastructure to support improvements in antibiotic prescribing, especially in settings and regions with limited access to stewardship resources.

Past reports

- [2017 Report: Antibiotic Use in the United States](#)
- [2018 Report: Antibiotic Use in the United States](#)
- [2020 Report: Antibiotic Use in the United States](#)
- [2021 Report: Antibiotic Use in the United States](#)
- [2022 Report: Antibiotic Use in the United States](#)

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