Federal Action Needed to Address Antibiotic Resistance in Older Americans

New research shows significant mortality, health care costs in this at-risk population

Overview

According to the most recent antibiotic resistance report from the Centers for Disease Control and Prevention (CDC), in 2017 six common antibiotic-resistant pathogens (including methicillin-resistant *Staphylococcus aureus*) caused an estimated 30,000 deaths in the U.S. and resulted in $4.6 billion in health care costs.[1] New research published by The Pew Charitable Trusts, University of Utah, and Infectious Diseases Society of America revealed that over one-third of those deaths and costs came from the Medicare-aged population (65 years and older)—a disproportionate figure given that Americans 65 and older made up 15% of the U.S. population that year.[2]

An age-related decline in the ability to fight off disease makes older Americans particularly vulnerable to antibiotic-resistant infections.[3] Additionally, older adults are more likely to have multiple chronic conditions, which places them at a higher risk for severe infections.[4] Finally, many older adults receive care at long-term care facilities, such as nursing homes, where infections can easily spread due to the close living quarters, frequent socializing, and group activities.[5] And that older, higher-risk population is increasing: Americans 65 and older have been the fastest-growing age group in the past decade, thanks to the aging Baby Boom cohort—those born from 1946 through 1964.[6]

The COVID-19 pandemic has demonstrated the deadly impact that an infectious disease outbreak can have on the older population.[7] In 2020, adults ages 65 and older accounted for 8 of 10 COVID-19 deaths in the U.S. and were at a greater risk for both hospitalization and death than younger adults.[8] Although COVID-19 is a virus and not a bacteria, the disproportionate risk that pathogens in general pose to older people underscores the importance of understanding how antibiotic-resistant infections affect this population. That understanding should inform public health activities that help prevent infections, minimize health care costs, and save lives.

Federal policies and investment are needed not only to protect all Americans from the public health threat of antibiotic-resistant infections, but also to reduce the disproportionate burden of these infections on older Americans for which the health care costs are mostly borne by Medicare. Congress and federal agencies such as the Centers for Medicare & Medicaid Services need to prioritize actions and investments that will strengthen the existing arsenal against antibiotic-resistant infections by spurring the development of new antibiotics and slowing the emergence of these infections by reducing inappropriate antibiotic use, which is a primary driver of antibiotic resistance in hospitals, nursing homes, and the community.

Six Antibiotic-Resistant Pathogens Included in This Study:

CDC Antibiotic Resistance Threat Level

- Urgent threats
- Serious threats
- Concerning threats
- Watch list

Carbapenem-resistant *Acinetobacter* can survive for a long time on surfaces and frequently contaminates health care facilities. The resulting infections are difficult to treat because they are resistant to most existing antibiotics, and only a few antibiotics in development could potentially be effective against them.

Carbapenem-resistant *Enterobacteriaceae* (CRE) is most often a problem in health care settings, primarily with patients who use medical devices such as catheters. CRE infections do not respond to commonly used antibiotics, and some bacteria in this family are resistant to all available antibiotics.

Extended-spectrum beta-lactamase (ESBL)-producing *Enterobacteriaceae* is a family of bacteria *(Enterobacteriaceae)* that commonly causes infections both inside and outside health care facilities, often in otherwise healthy people. ESBLs are enzymes that break down and destroy commonly used antibiotics, rendering them ineffective.

Methicillin-resistant *Staphylococcus aureus* (MRSA) spreads both inside and outside health care facilities and can cause a range of illnesses, including pneumonia and infections of the skin, wounds, and bloodstream. Although treatments for MRSA infections exist, many recommended first-line drugs based on established practice guidelines no longer work.

Multidrug-resistant *Pseudomonas aeruginosa* is resistant to many antibiotics, making this bacteria difficult to combat. These infections typically occur in hospitalized patients or people with weakened immune systems.

Vancomycin-resistant *Enterococcus* (VRE) is most common in individuals who have spent time in a health care facility such as an intensive care unit or long-term care hospital. This pathogen can cause bloodstream, surgical site, and urinary tract infections.

Antibiotic-Resistant Infections and Older Americans

The study generated national estimates of the clinical and economic impact of resistant infections on hospitalized patients ages 65 and older. The researchers utilized data from the Veterans Health Administration on patients admitted between January 2007 and December 2018 to estimate the number of deaths resulting from infections caused by six common antibiotic-resistant pathogens and the associated health care costs generated by the hospitalization of these patients. The researchers then generalized these findings to the broader U.S. population 65 and older, generating national estimates for 2017 by multiplying pathogen-specific estimates by national case counts from hospitalized U.S. patients.

Overall, this study estimated that in 2017, infections caused by six antibiotic-resistant pathogens resulted in more than 11,000 deaths (see Figure 1) and nearly $1.9 billion in health care costs among these older Americans (see Figure 2). The majority of these deaths and costs were associated with community-onset infections—meaning those acquired somewhere other than in a health care setting—which caused more than 9,000 deaths and $1.1 billion in health care costs.

The six antibiotic-resistant pathogens evaluated in this study were also assessed in a 2019 CDC report that evaluated the impact of these infections on all Americans (not just those over age 65) in the same year, 2017.[9] The report estimated that infections resulted in nearly 30,000 deaths and $4.6 billion in health care costs.[10] This means that over one-third of the deaths and costs resulting from these antibiotic-resistant infections in 2017 occurred among older Americans, highlighting the significant burden these infections pose to this at-risk population (see Figure 3).

Community-Onset vs. Hospital-Onset Infections

Community-onset infections are presumed to have been acquired outside of health care facilities. For this study, researchers defined these infections as an antibiotic-resistant pathogen identified by a positive culture on the day before admission or during the first three days of a hospital stay.

Hospital-onset infections are presumed to have been acquired in a hospital during a patient's stay. For this study, researchers defined these infections as an antibiotic-resistant pathogen identified by a positive culture between day four and discharge from a hospital stay.

Invasive vs. Noninvasive Infections

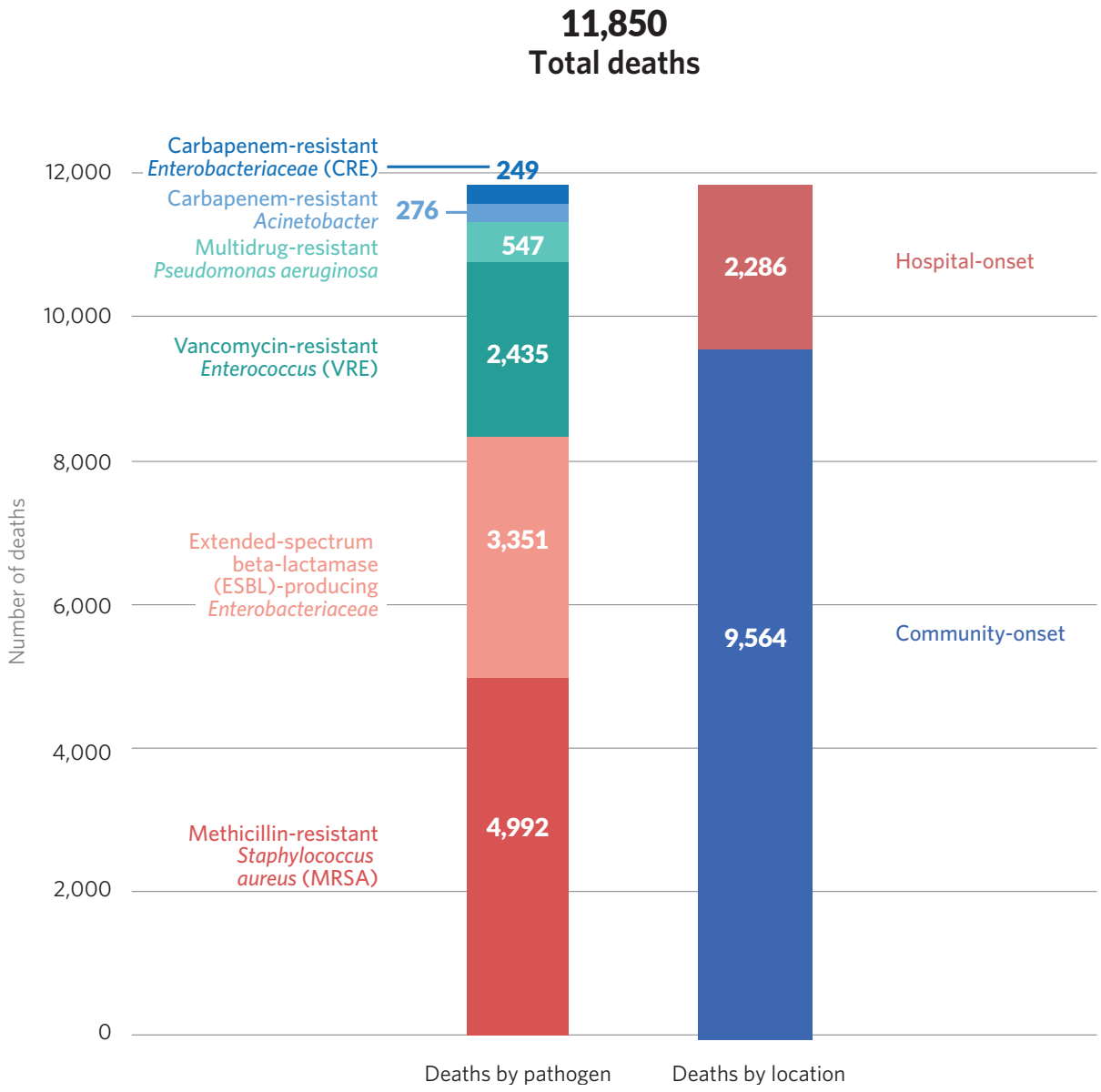
Invasive infections infiltrate an area of the body that normally does not contain bacteria, such as the bloodstream, bones and bone marrow, lymph nodes, cerebrospinal fluid, pleural fluid, and synovial fluid. These infections are typically more severe than noninvasive infections.

Noninvasive infections occur in an area of the body that normally contains bacteria. This includes urine, sputum, and wounds.

Figure 1

Deaths Caused by Six Common Antibiotic-Resistant Infections, 2017

U.S. adults ages 65 and over

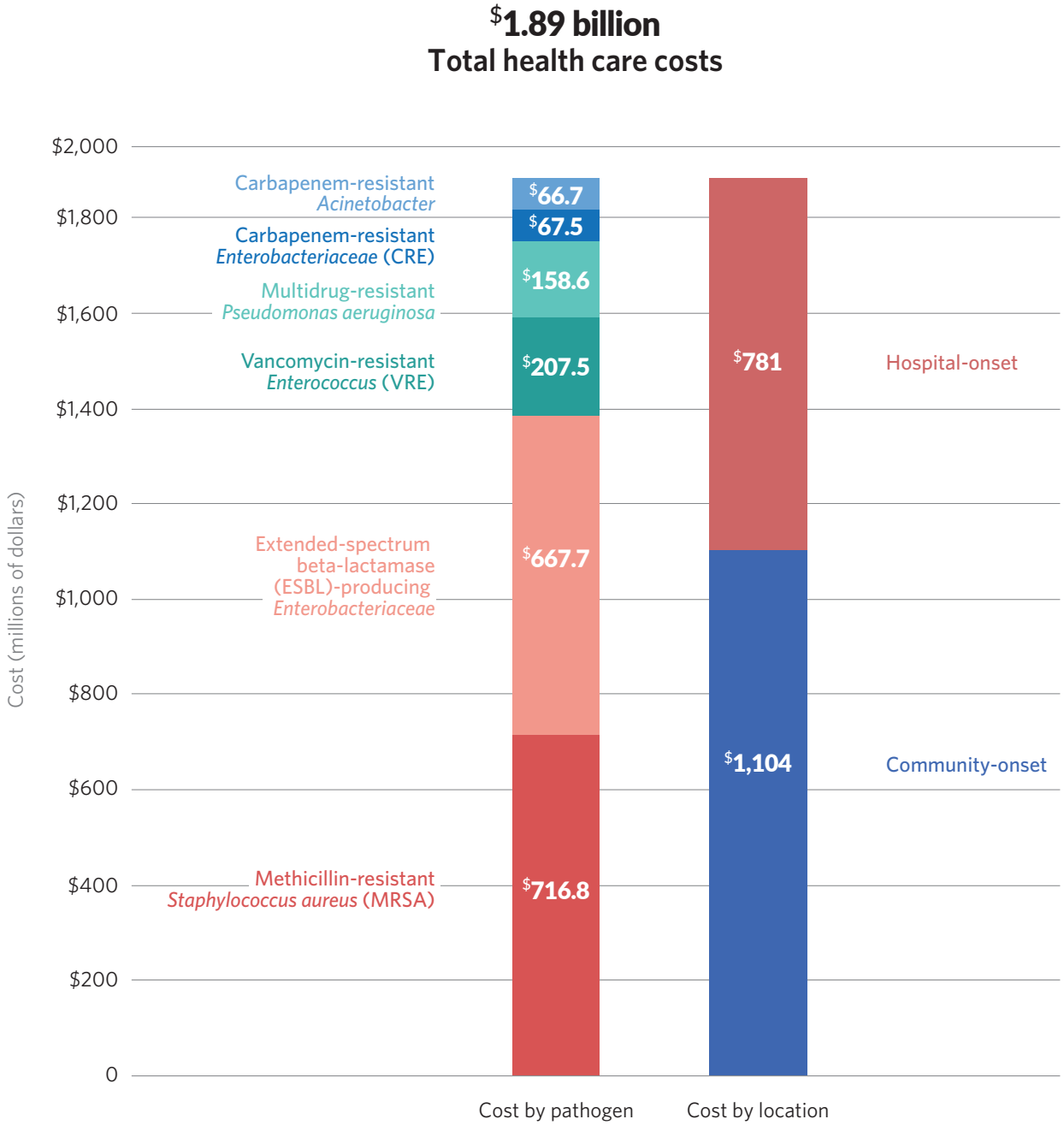


Source: R.E. Nelson et al., "Mortality, Length of Stay, and Healthcare Costs Associated With Multidrug-Resistant Bacterial Infections Among Elderly Hospitalized Patients in the United States," *Clinical Infectious Diseases* (Oct. 7, 2021), https://academic.oup.com/cid/article-lookup/doi/10.1093/cid/ciab696.

Figure 2

Health Care Costs Associated With Six Common Antibiotic-Resistant Infections, 2017

U.S. adults ages 65 and over

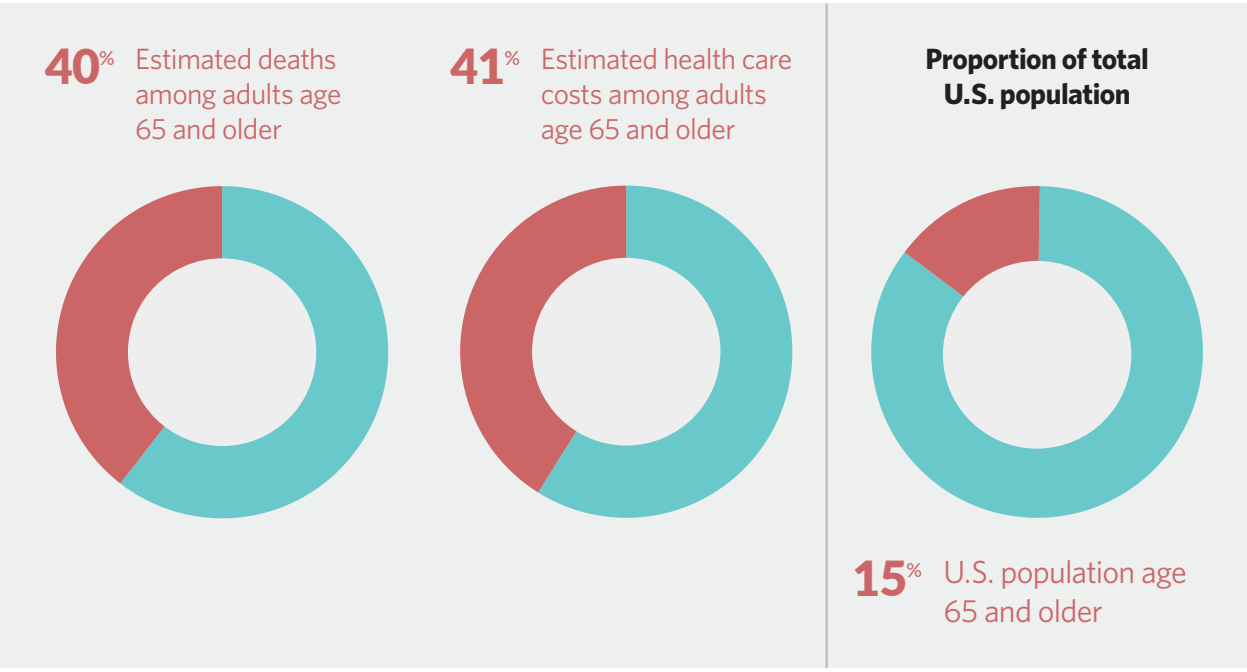


Source: R.E. Nelson et al., "Mortality, Length of Stay, and Healthcare Costs Associated With Multidrug-Resistant Bacterial Infections Among Elderly Hospitalized Patients in the United States," *Clinical Infectious Diseases* (Oct. 7, 2021), https://academic.oup.com/cid/article-lookup/doi/10.1093/cid/ciab696.

Figure 3

Deaths and Health Care Costs Associated With Six Common Antibiotic-Resistant Infections, 2017

Older Americans compared with adults under age 65



Sources: Data for all age groups from Centers for Disease Control and Prevention, "Antibiotic Resistance Threats in the United States, 2019"; data for the 65 and older population from R.E. Nelson et al., "Mortality, Length of Stay, and Healthcare Costs Associated With Multidrug-Resistant Bacterial Infections Among Elderly Hospitalized Patients in the United States," *Clinical Infectious Diseases* (Oct. 7, 2021), https://academic.oup.com/cid/article-lookup/doi/10.1093/cid/ciab696.

Key Targets for Addressing Antibiotic Resistance in Older Americans

The burden of infection, assessed in the newly published research, varied depending on the type of pathogen, where the infection may have been acquired (community- or hospital-onset), and where in the body the infection occurred (invasive or noninvasive infection). The greatest risk of mortality and highest health care costs were observed when invasive infections were acquired in hospitals: An estimated 15%-27% of these patients died from these six pathogens (see Figure 4), which also led to an additional $23,301-$54,494 in health care costs to manage each case of infection (see Figure 5).

Methicillin-resistant *Staphylococcus aureus* and extended-spectrum beta-lactamase-producing *Enterobacteriaceae*

CDC has designated these two pathogens to be serious threats to the health of Americans.[11] And, indeed, the study revealed that methicillin-resistant *Staphylococcus aureus* (MRSA) and extended-spectrum beta-lactamase (ESBL)-producing *Enterobacteriaceae* infections were significant contributors to both total deaths and health care costs among older adults in 2017—a consequence of the high number of infections associated with these pathogens. The study estimated that MRSA infections resulted in nearly 5,000 deaths (42% of total deaths) and nearly $717 million (38% of the total) in health care costs in this population. MRSA also had the highest per-infection cost of all pathogens studied among community-onset invasive infections. Infections caused by ESBL-producing *Enterobacteriaceae* resulted in nearly 3,400 deaths (28% of total deaths) and about $668 million (35% of the total) in health care costs.

This study highlights the burden of mortality and health care costs of these infections among older patients and the need for public health stakeholders to target reductions in infections from these pathogens in particular.

Carbapenem-resistant *Acinetobacter*

Carbapenem-resistant *Acinetobacter,* which has been classified as an urgent threat by CDC, is another key target for public health stakeholders to consider when they look at antibiotic resistance within the older population.[12] Although infections caused by this pathogen occurred less frequently in 2017 than MRSA and ESBL-producing *Enterobacteriaceae,* and so were a much smaller proportion of national mortality and health care costs, at the level of individual infections this pathogen posed a serious threat to older patients: Invasive infections (both community- and hospital-onset) caused by carbapenem-resistant *Acinetobacter* had the highest risk of death among adults 65 and older. Additionally, carbapenem-resistant *Acinetobacter* was associated with a significant per-infection cost burden, particularly with hospital-onset infections.

Although there have been decreases in carbapenem-resistant *Acinetobacter* cases in recent years, it will be critical that efforts continue to reduce the threat of this pathogen, particularly among older Americans.

Figure 4

30-Day Mortality Associated With Invasive Antibiotic-Resistant Infections, 2017

U.S. adults ages 65 and older

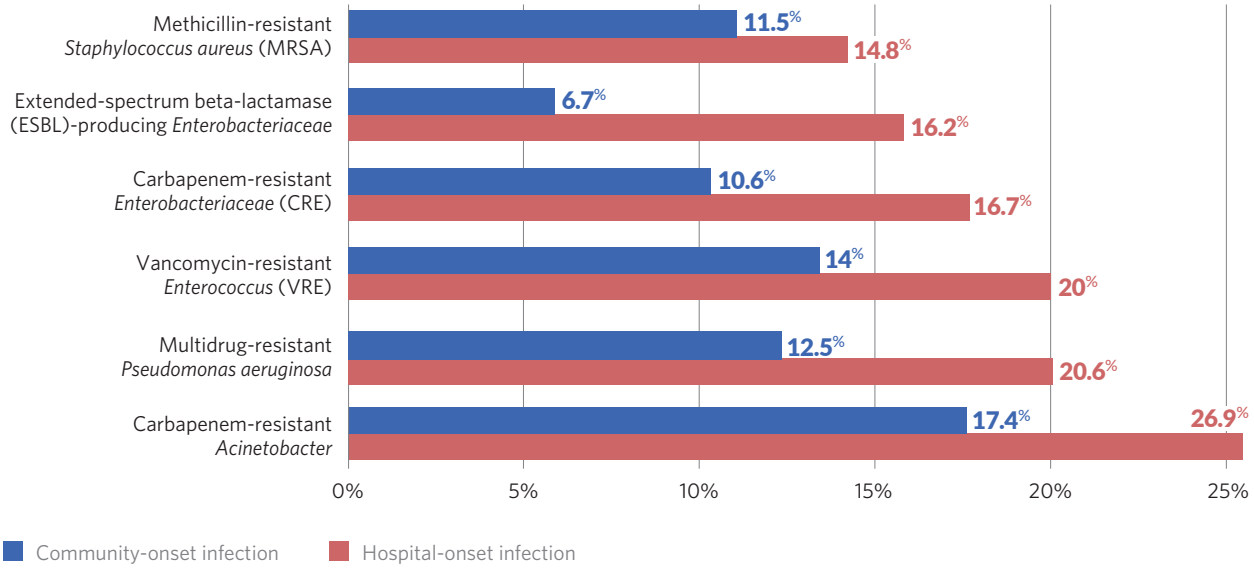
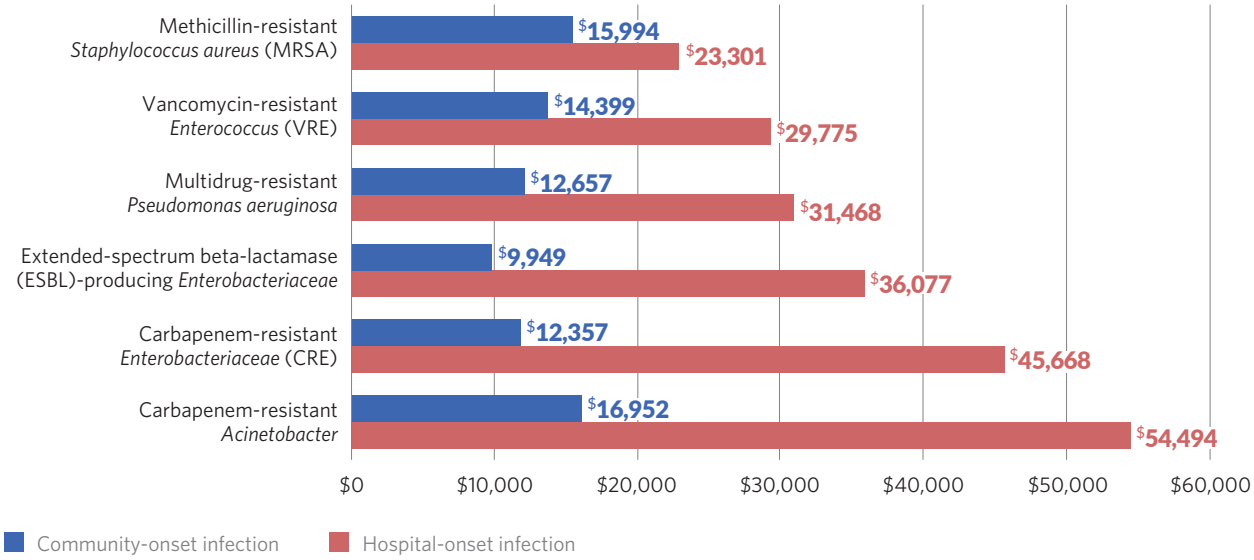


Figure 5

Average Health Care Costs Associated With Invasive Antibiotic-Resistant Infections, 2017

U.S. adults ages 65 and older



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Actions to Combat Antibiotic Resistance Through Innovation and Stewardship

Preventing the emergence and spread of antibiotic-resistant bacteria benefits all Americans. And—amid a pandemic that has been a reminder of the significant impact an infectious disease outbreak can have, especially on older individuals, and of the importance of early action—this study highlights the specific threat that antibiotic-resistant bacterial infections pose to older adults. Public health stakeholders must prioritize implementing policies to combat the threat of antibiotic resistance within this older population.

Policies are needed to ensure that antibiotics are used appropriately (i.e., only to treat bacterial infections and, when needed, that the right antibiotic is prescribed at the correct dose and duration of therapy) and to spur the development of new antibiotics that can treat resistant infections. Because antibiotic use is the primary driver of the development of antibiotic resistance, antibiotic stewardship programs (ASPs)—which aim to ensure that antibiotics are prescribed appropriately and only when needed—are critical to minimizing the spread of resistance. However, even with appropriate prescribing, bacteria will eventually become resistant to available therapies, so a robust pipeline of new antibiotics to address emerging resistance will be important to ensuring that patients have access to effective treatments.

The federal government has a critical role to play in addressing the threat that antibiotic resistance poses to older Americans. Specifically:

- The Centers for Medicare & Medicaid Services (CMS) should advance policies that incentivize tracking antibiotic use and resistance data and reporting it to public health authorities. Tracking and reporting this data enables facilities and public health agencies to identify patterns of resistance and inappropriate prescribing, as well as to implement and evaluate efforts to address these concerns. One such surveillance system used by public health authorities to support efforts to combat antibiotic resistance is CDC's National Healthcare Safety Network (NHSN). Most recent data shows that more than 1,900 hospitals (over 38% of acute care hospitals actively reporting any data into NHSN) voluntarily submit antibiotic use data and more than 900 (over 18% of acute care hospitals reporting data) submit antibiotic resistance data.[13]
- CMS should develop and implement quality measures around antibiotic prescribing and resistance in nursing homes. Quality measures enable CMS to assess the quality of care in nursing homes, provide consumers with information about care in these facilities, and help nursing homes engage in quality improvement efforts.
- CMS should also advance policies to improve antibiotic prescribing in outpatient facilities by incorporating antibiotic stewardship activities into existing quality measure and value-based reimbursement programs for outpatient health care providers. The majority of deaths and health care costs identified in this study were caused by community-onset infections. Ensuring the appropriate use of antibiotics in outpatient health care facilities will help minimize the spread of resistance within the community.
- Congress must ensure adequate funding to support health care facilities in implementing ASPs. CMS has required hospitals and long-term care facilities that participate in Medicare and Medicaid to implement ASPs since 2020 and 2017, respectively. However, as the COVID-19 pandemic has highlighted, many of these facilities—particularly long-term care facilities—lack the resources necessary to support this type of public health activity. Funding to federal agencies, such as CDC, would help ensure that these facilities are able to implement high-quality ASPs that minimize the development of antibiotic resistance and protect their patients.
- Congress should also enact a package of economic incentives that includes the PASTEUR Act to spur development of urgently needed antibiotics. Although developing new antibiotics is resource-intensive,

the return on investment for these therapies is low. This is due, in part, to stewardship strategies aimed at ensuring appropriate use of novel therapies; because higher use leads to faster emergence of resistance, stewardship is necessary for public health. However, stewardship leads to a limited volume of sales, and companies struggle to sustain operations as a result. Enacting comprehensive economic incentive measures will make it financially feasible for companies to re-enter the antibiotic development market and help ensure a robust pipeline of new therapies for patients in need.

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Endnotes

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For further information, please visit:

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