Massachusetts Department of Public Health

**2020 Statewide Antibiogram Report**

**Bureau of Infectious Disease and Laboratory Sciences**

Massachusetts Department of Public Health

305 South Street

Jamaica Plain, MA 02130

Tel: (617) 983-6550

Fax: 617-887-8789

**Acknowledgements:**

Tessa Valleroy, MPH

Lamyaa Shaban, PhD, MSc, MPH

Joe Gerth, MPH

Leslie Fowle, MPH, CIC, CPH

MaryKate Martelon, MPH

Larry Madoff, MD

Catherine Brown, DVM, MSc, MPH

**Requests for additional data can be emailed to:** dph-antibiogram@state.ma.us

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# Introduction

## Overview

 The Massachusetts Department of Public Health 2020 Statewide Antibiogram Report represents cumulative antimicrobial susceptibility data submitted by acute care hospitals across Massachusetts. These data were prepared with consideration to the Clinical and Laboratory Standards Institute (CLSI) guidelines(CLSI, 2022).

## Purpose

 Antimicrobial resistance (AR) is a pressing public health concern. According to the Center for Disease Control and Prevention’s (CDC) 2019 AR Threats Report, over 2.8 million antimicrobial-resistant infections occur annually in the United States, resulting in more than 35,000 deaths a year (CDC, 2019). The COVID-19 pandemic only worsened these trends across measured categories (CDC, 2024). As such, antimicrobial stewardship and infection prevention are vital tools for preventing the development of antimicrobial resistances and slowing their spread. The purpose of the Statewide Antibiogram Reports is to promote stewardship and infection control efforts by presenting healthcare providers, public health professionals, and the public with information on resistance patterns seen across the state of Massachusetts. **The data in this report are not intended for use in clinical decision making.**

 Data for this report were only collected from acute care hospitals. Given this, as well as the impact of the COVID-19 pandemic on infectious disease screening, treatment, and surveillance, it is important to note that these data do not represent the full extent of antimicrobial resistance in Massachusetts.

## Data Description

 Cumulative antimicrobial susceptibility data were submitted by 66 acute care facilities across Massachusetts in 2020, including antimicrobial susceptibility testing for bacterial isolates from cultures for both inpatients and outpatients. Data is separated between tables for Gram-Positive Organisms and Gram-Negative Organisms; there is one row for each organism, and the total number of isolates included for each organism is listed in the N column. For each organism and antimicrobial pair, the percentage of isolates susceptible to the antimicrobial appears above the total number of isolates tested for susceptibility to that antimicrobial.

# Gram-Negative Organisms 2020

Massachusetts Department of Public Health

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|  |
| --- |
| **Percent Susceptibilities\*** |
| Gram-NegativeOrganisms | N | Amikacin † | Amoxicillin + Clavulanate | Ampicillin | Ampicillin + Sulbactam | Aztreonam | Cefazolin | Cefepime | Cefotaxime | Cefotetan | Cefoxitin | Ceftazidime | Ceftriaxone | Cefuroxime | Ciprofloxacin | Doripenem | Ertapenem | Gentamicin | Imipenem | Levofloxacin | Meropenem | Moxifloxacin | Nitrofurantoin † | Piperacillin + Tazobactam | Tetracycline | Ticarcillin + Clavulanate | Tigecycline | Tobramycin | Trimethoprim + Sulfamethoxazole |
| *A. baumannii* | 955 | 97 | R | R | 82 | R | R | 67 | 26 | R | R | 60 | 20 | R | 75 | 100 | R | 87 | 97 | 79 | 79 | \_\_ | \_\_ | 64 | 83 | \_\_ | 58 | 89 | 76 |
| 191 | 676 | 743 | 46 | 642 | 488 | 815 | 46 | 925 | 259 | 816 | 741 | 735 | 333 | 157 | 641 | 908 |
| *E. cloacae* | 4390 | 100 | R | R | R | 79 | R | 94 | 82 | R | R | 78 | 76 | 00 | 93 | 100 | 93 | 97 | 95 | 92 | 99 | 70 | 42 | 80 | 90 | 90 | 92 | 97 | 89 |
| 2716 | 1908 | 3748 | 228 | 2240 | 3878 | 366 | 3972 | 228 | 2764 | 4339 | 1009 | 3902 | 3615 | 382 | 3579 | 4091 | 1562 | 41 | 908 | 2328 | 4320 |
| *E. coli* | 88686 | 100 | 81 | 55 | 66 | 92 | 86 | 95 | 94 | 98 | 92 | 93 | 90 | 81 | 79 | 100 | 100 | 91 | 100 | 78 | 100 | 90 | 95 | 96 | 74 | 81 | 100 | 91 | 77 |
| 57446 | 28565 | 83712 | 71305 | 40652 | 77804 | 77089 | 4401 | 5006 | 24305 | 51622 | 82476 | 8623 | 81350 | 4401 | 55441 | 87394 | 18825 | 79911 | 70971 | 8907 | 80822 | 86166 | 31196 | 1265 | 20843 | 52102 | 85929 |
| *K. aerogenes* | 1713 | 100 | R | R | R | 83 | R | 97 | 86 | R | R | 80 | 79 | 01 | 96 | 100 | 97 | 99 | 85 | 95 | 99 | 99 | 17 | 83 | 94 | 97 | 98 | 99 | 98 |
| 968 | 702 | 1525 | 100 | 782 | 1523 | 100 | 1511 | 100 | 964 | 1691 | 432 | 1485 | 1338 | 100 | 1296 | 1500 | 758 | 34 | 258 | 809 | 1660 |
| *K. oxytoca* | 3224 | 99 | 93 | R | 68 | 92 | 58 | 97 | 95 | 100 | 97 | 96 | 94 | 90 | 96 | 100 | 100 | 97 | 100 | 96 | 99 | 89 | 83 | 95 | 92 | \_\_ | 99 | 96 | 94 |
| 2260 | 926 | 2327 | 1549 | 2692 | 2722 | 192 | 349 | 639 | 1835 | 3168 | 329 | 2980 | 192 | 1942 | 3194 | 689 | 2854 | 2789 | 375 | 2595 | 3109 | 1323 | 648 | 1888 | 3190 |
| *K. pneumoniae* | 19928 | 100 | 91 | R | 80 | 87 | 86 | 93 | 95 | 100 | 94 | 90 | 89 | 90 | 89 | 100 | 84 | 94 | 100 | 89 | 99 | 72 | 35 | 92 | 83 | 91 | 96 | 92 | 87 |
| 14023 | 6124 | 14215 | 10032 | 17001 | 17282 | 1162 | 1110 | 6102 | 11369 | 19455 | 1986 | 17357 | 927 | 12979 | 19651 | 4231 | 17728 | 16542 | 1709 | 17206 | 19298 | 7140 | 204 | 5280 | 12118 | 19209 |
| *P. aeruginosa* | 13760 | 97 | R | R | R | 76 | R | 88 | R | R | R | 88 | R | R | 80 | 100 | R | 89 | 89 | 75 | 88 | \_\_ | 00 | 86 | R | 81 | R | 95 | R |
| 11486 | 3199 | 12873 | 9590 | 12087 | 465 | 13617 | 2982 | 11956 | 11002 | 1728 | 13177 | 236 | 10362 |
| *S. maltophilia* | 1157 | 05 | R | R | R | R | 00 | 06 | R | \_\_ | \_\_ | 43 | R | \_\_ | 37 | \_\_ | R | 05 | R | 85 | R | \_\_ | 00 | R | R | \_\_ | \_\_ | 00 | 94 |
| 416 | 394 | 361 | 287 | 416 | 416 | 1135 | 394 | 55 | 1140 |
| *S. marcescens* | 2636 | 100 | R | R | R | 95 | R | 99 | 90 | R | R | 93 | 91 | R | 92 | 100 | 99 | 99 | 98 | 92 | 100 | 99 | R | 87 | 27 | \_\_ | 94 | 94 | 97 |
| 1713 | 1218 | 2213 | 115 | 1533 | 2317 | 2373 | 115 | 1717 | 2604 | 118 | 2280 | 2173 | 115 | 1033 | 884 | 322 | 1551 | 2401 |

N is the total number of isolates included for each organism. Only the first microbial isolate of a given species from a single patient per facility for the year is included.

For each organism and antimicrobial pair, the percentage of isolates susceptible to the antimicrobial appears above the total number of isolates tested for susceptibility to that antimicrobial.

(\_\_) in the data box indicates that either data was not reported for a given antimicrobial agent-organism combination or fewer than the standard recommendation of 30 isolates has been reported.

R in the data box indicates that the species or organism group is intrinsically resistant to the antimicrobial agent being tested.

† Amikacin (for *P. aeruginosa*) and Nitrofurantoin were tested against urine isolates only.

\*Data was compiled from Massachusetts Virtual Epidemiologic Network (MAVEN), current as of 06/09/2025, and are subject to change.

# Gram-Positive Organisms 2020

Massachusetts Department of Public Health

Bureau of Infectious Disease and Laboratory Sciences

|  |
| --- |
| **Percent Susceptibilities\*** |
| Gram-PositiveOrganisms | N | Ampicillin | Ampicillin + Sulbactam | Azithromycin | Cefazolin | Cefotaxime | Cefotaxime ¥ | Ceftriaxone £ | Ceftriaxone ¥ | Ciprofloxacin† | Clindamycin | Daptomycin | Erythromycin | Gentamicin | Levofloxacin | Linezolid | Moxifloxacin | Nitrofurantoin† | Oxacillin | Penicillin € | Penicillin § | Quinupristin + Dalfopristin | Rifampin | Tetracycline† | Tigecycline | Trimethoprim + Sulfamethoxazole | Vancomycin |
| *ALL S. aureus* | 24942 | 05 | 74 | \_\_ | 69 | \_\_ | \_\_ | \_\_ | \_\_ | 76 | 74 | 99 | 47 | 99 | 79 | 100 | 86 | 99 | 67 | \_\_ | \_\_ | 100 | 99 | 91 | 100 | 96 | 100 |
| 1224 | 1992 | 6342 | 10848 | 24942 | 13595 | 20018 | 16161 | 17527 | 21064 | 21064 | 17875 | 22616 | 2652 | 17296 | 20837 | 7875 | 24942 | 24942 |
| *MRSA* | 10662 | 03 | 00 | \_\_ | 00 | \_\_ | \_\_ | \_\_ | \_\_ | 51 | 67 | 100 | 14 | 92 | 73 | 97 | \_\_ | 99 | 00 | 98 | \_\_ | \_\_ | 73 | 21 | 100 | 05 | 90 |
| 553 | 637 | 1586 | 6063 | 10651 | 4132 | 8082 | 7261 | 7870 | 8172 | 8003 | 2143 | 3369 | 343 | 5769 | 2753 | 2475 | 9522 |
| *MSSA* | 17584 | 03 | 99 | \_\_ | 100 | \_\_ | \_\_ | \_\_ | \_\_ | 89 | 77 | 100 | 63 | 95 | 19 | 95 | \_\_ | 16 | 00 | 16 | \_\_ | \_\_ | \_\_ | 24 | 100 | 00 | 36 |
| *1810* | *1321* | *4703* | *11221* | *17580* | *6761* | *13858* | *12355* | 1369 | 1359 | 1364 | 638 | 480 | 598 | 284 | 668 | 1569 |
| *E. faecalis* | 9522 | 100 | 98 | \_\_ | R | R | R | R | R | 69 | 00 | 99 | 09 | 85 | 53 | 100 | 61 | 99 | 00 | \_\_ | \_\_ | R | 99 | 87 | 100 | R | 100 |
| 9326 | 104 | 4751 | 2263 | 5275 | 5274 | 1924 | 7670 | 8239 | 8239 | 6858 | 8448 | 6688 | 10562 | 3172 | 10651 |
| *E. faecium* | 1609 | 22 | \_\_ | \_\_ | R | R | R | R | R | 14 | 00 | 92 | 03 | 97 | 91 | 100 | 96 | 100 | 100 | \_\_ | \_\_ | 100 | 98 | 93 | 100 | R | 100 |
| 1559 | 521 | 668 | 778 | 974 | 230 | 12997 | 12146 | 12146 | 11451 | 16026 | 1502 | 10080 | 17441 | 5333 | 17425 |
| *S. pneumoniae* | 1009 | 63 | 00 | \_\_ | \_\_ | 98 | 90 | 97 | 91 | \_\_ | 77 | 31 | 51 | 66 | 99 | 98 | 100 | \_\_ | 00 | 95 | 69 | \_\_ | \_\_ | 71 | 100 | 79 | 100 |
| 126 | 34 | 85 | 171 | 760 | 394 | 645 | 174 | 745 | 107 | 835 | 388 | 388 | 34 | 779 | 475 | 564 | 47 | 562 | 840 |

N is the total number of isolates included for each organism. Only the first microbial isolate of a given species from a single patient per facility for the year is included.

For each organism and antimicrobial pair, the percentage of isolates susceptible to the antimicrobial appears above the total number of isolates tested for susceptibility to that antimicrobial.

Antibiotics used at various concentrations: (¥) Concentration is ≤ 0.5μg/ml, (£) Concentration is ≤ 1μg/ml, (€) Concentration is ≤ 2 μg/ml for *S. pneumoniae* and is ≤ 8 μg/ml for *Enterococcus* spp, (§) Concentration is ≤ 0.06μg/ml.

(\_\_) in the data box indicates that either data was not reported for a given antimicrobial agent-organism combination or fewer than the standard recommendation of 30 isolates has been reported.

R in the data box indicates that the species or organism group is intrinsically resistant to the antimicrobial agent being tested.

†Nitrofurantoin, Ciprofloxacin (for Enterococcus spp), Levofloxacin (for Enterococcus spp) and Tetracycline (for Enterococcus spp) were tested against urine isolates only.

\*Data was compiled from Massachusetts Virtual Epidemiologic Network (MAVEN), current as of 06/09/2025, and are subject to change.

Hospitals That Reported 2020 Antibiogram Data1

|  |  |  |
| --- | --- | --- |
| Athol Memorial Hospital | Holyoke Medical Center | Shriners Hospital for Children - Boston |
| Baystate Franklin Medical Center | Lahey Health - Addison Gilbert Hospital | Signature Healthcare - Brockton Hospital |
| Baystate Medical Center | Lahey Health – Beverly Hospital | South Shore Hospital |
| Baystate Noble Hospital | Lahey Health - Lahey Hospital & Medical Center (Burlington) | Southcoast Health - Charlton Memorial Hospital |
| Baystate Wing Hospital | Lahey Health – Lahey Medical Center, Peabody | Southcoast Health - St. Luke's Hospital |
| Berkshire Health Systems - Berkshire Medical Center | Lahey Health – Winchester Hospital | Southcoast Health - Tobey Hospital |
| Beth Israel Deaconess Hospital - Milton | Lowell General Hospital - Main Campus | Steward Health Care - Carney Hospital |
| Beth Israel Deaconess Hospital - Needham | Lowell General Hospital - Saints Campus | Steward Health Care - Good Samaritan Medical Center |
| Beth Israel Deaconess Hospital - Plymouth | Martha's Vineyard Hospital | Steward Health Care - Holy Family Hospital (Methuen) |
| Beth Israel Deaconess Medical Center | Massachusetts Eye and Ear Infirmary | Steward Health Care - Holy Family Hospital at Merrimack Valley (Haverhill) |
| Boston Children's Hospital | Massachusetts General Hospital | Steward Health Care - Morton Hospital |
| Boston Medical Center | MelroseWakefield Healthcare - Lawrence Memorial Hospital of Medford | Steward Health Care - Nashoba Valley Medical Center |
| Brigham and Women’s Faulkner Hospital | MelroseWakefield Healthcare - MelroseWakefield Hospital | Steward Health Care - Saint Anne's Hospital  |
| Cambridge Health Alliance - Cambridge Hospital | Mercy Medical Center | Steward Health Care - St. Elizabeth's Medical Center |
| Cambridge Health Alliance - Everett Hospital | MetroWest Medical Center - Framingham Union Hospital | Sturdy Memorial Hospital |
| Cambridge Health Alliance - Somerville Hospital | MetroWest Medical Center - Leonard Morse Hospital | The Veteran’s Administration Boston Healthcare System |
| Cape Cod Healthcare - Cape Cod Hospital | Milford Regional Medical Center | Tufts Medical Center |
| Cape Cod Healthcare - Falmouth Hospital | Nantucket Cottage Hospital | UMass Memorial Health Care – Clinton Hospital |
| Cooley Dickinson Hospital | New England Baptist Hospital | UMass Memorial Health Care – HealthAlliance Hospital Leominster |
| Emerson Hospital | Newton-Wellesley Hospital | UMass Memorial Health Care – Marlborough Hospital |
| Harrington Memorial Hospital | North Shore Medical Center - Salem Hospital | UMass Memorial Health Care – UMass Memorial Campus |
| Heywood Hospital | Saint Vincent Hospital | UMass Memorial Health Care – UMass University Campus |

1 Hospitals that reported 2020 antibiogram data in accordance with regulations (105 CMR 300.000) by the reporting deadline.

# Antimicrobial Susceptibility Testing Guidelines

Antimicrobial susceptibility testing is conducted in microbiology laboratories. Microbiologists utilize standardized guidelines, such as those distributed by the Clinical and Laboratory Standards Institute (CLSI. 2025) to determine whether a bacterial isolate is susceptible, intermediate, or resistant to an antimicrobial. These guidelines are updated periodically. The extent to which clinical microbiology laboratories across Massachusetts can implement the most recently updated guidelines within a particular time period varies.

# References

CDC. (2019). *Antibiotic Resistance Threats in the United States.* Atlanta, GA: U.S. Department of Health and Human Services, CDC.

CDC. (2024). *Antimicrobial Resistance Threat in the United States, 2021-2022.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

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CLSI. (2022). Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data; Approved Guideline—Fifth Edition. In *CLSI document M39-A5.* Wayne, PA: Clinical Laboratory Standards Institute.