NORTH DAKOTA

ANTIBIOTIC USE AND STEWARDSHIP REPORT

2025

NORTH Dakota | Health & Human Services
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Introduction

Antibiotic stewardship remains a cornerstone of public health efforts to combat antimicrobial resistance and improve patient safety. Tracking and reporting antibiotic use are essential components of clinical stewardship programs and are critical to operationalizing health and human services department-led initiatives. In 2023, U.S. outpatient settings saw 236.4 million antibiotic prescriptions dispensed—equivalent to approximately 7 prescriptions for every 10 people[1]. At least 28% of these prescriptions were deemed unnecessary, highlighting persistent gaps in prescribing appropriateness[1]. By monitoring prescribing patterns, we can define current practices, identify opportunities for improvement, set measurable targets, and evaluate the impact of interventions.

North Dakota Health and Human Services (ND HHS) is working to expand its capacity to collect and analyze antibiotic use data, a timely advance given the increasing emphasis on understanding how prescribing varies across patient demographics and clinical contexts. Research continues to show that prescribing decisions are influenced not only by clinical factors but also by patient characteristics such as race, ethnicity, geographic location, and health care access[2–5]—factors that must be addressed to ensure equitable and effective stewardship.

This report serves as a guide for creating stewardship opportunities to improve antimicrobial prescribing, optimize patient safety, and prevent the emergence of resistance.

Antibiotic Use in Health Care

OUTPATIENT ANTIBIOTIC PRESCRIBING

North Dakota Health and Human Services has access to outpatient data from IVQIA™ via the Center for Disease Control (CDC), Centers for Medicaid and Medicare (CMS) Part D Public Use Files, and North Dakota Medicaid. Data available thru the National Healthcare Safety Network (NHSN) is also analyzed.

IQVIA™ OUTPATIENT ANTIBIOTIC PRESCRIBING DATA

The CDC works with IQVIA™, a contract research organization, that tracks outpatient antibiotic prescriptions filled at community pharmacies to provide this information to states. This data does not include prescriptions filled at federal facilities. The information in this section details results from IQVIA™ data.

Based on the CDC's IQVIA outpatient antibiotic prescribing data, North Dakota has consistently maintained lower outpatient antibiotic prescribing rates than the national average from 2019 through 2023. In 2020, the state experienced a significant 21.5% drop in antibiotic prescriptions, aligning with the national decline during the first year of the COVID-19 pandemic. This reduction was particularly notable across four major antibiotic classes, each showing double-digit decreases. However, from 2021 onward, prescribing rates began to rise annually, with a 3% increase in 2023, reflecting a steady rebound from the sharp declines seen in 2020[6]. Notably, the use of commonly prescribed antibiotic classes such as penicillin and cephalosporin continue to rise, while macrolide and fluroquinolone usage is declining. Even though total antibiotic prescriptions are increasing, providers are writing for more narrower spectrum, first-line agents than previous years. Unfortunately, the lack of data on prescription indications still limits the ability to assess the appropriateness of these antibiotics.

Figure 1. Details the change in outpatient antibiotic prescriptions from 2019-2023.

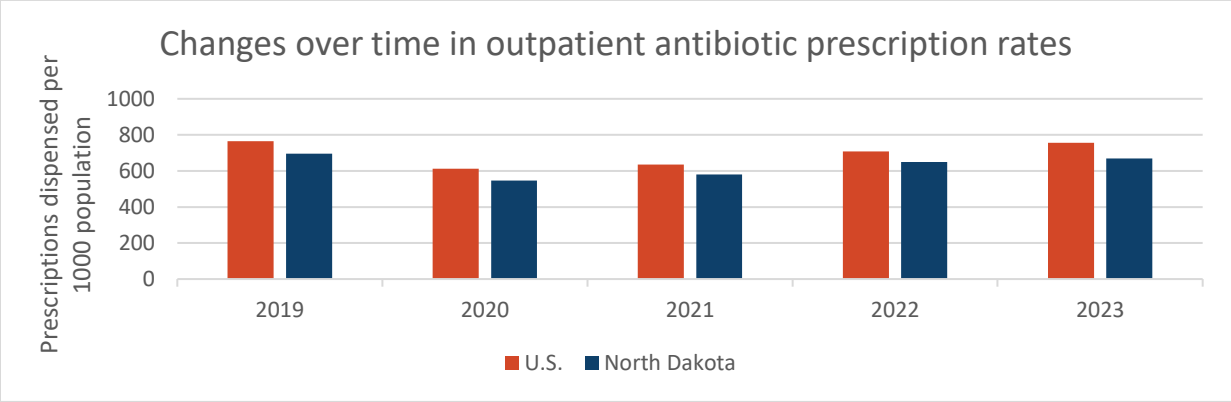
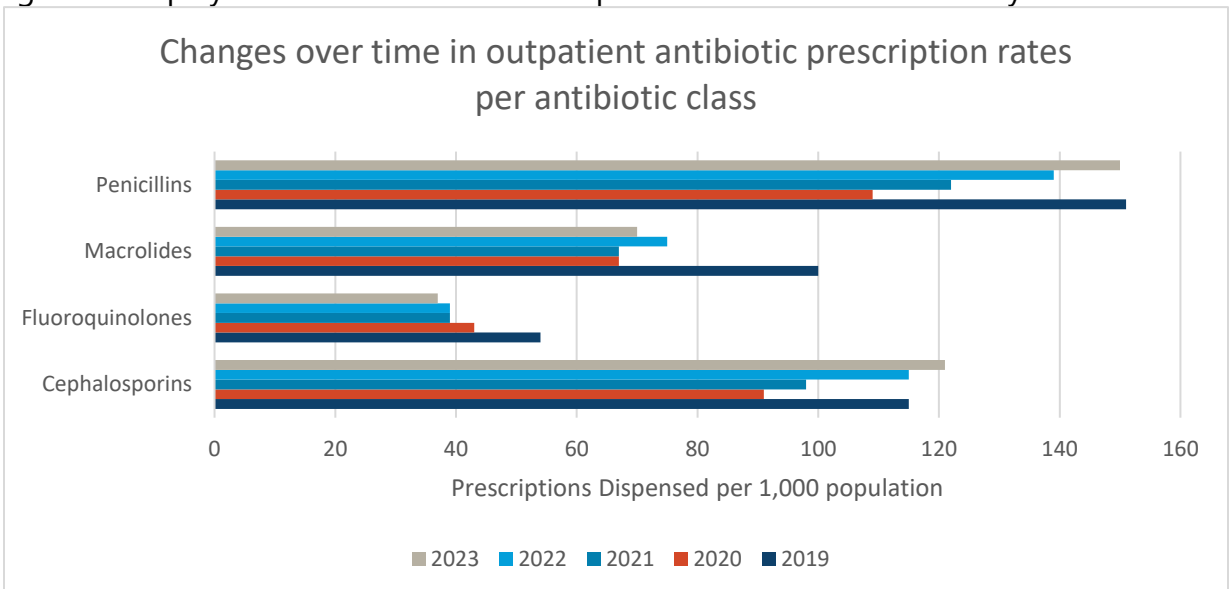


Table 1. North Dakota's outpatient antibiotic rate by drug class and percent changed compared to previous year.

Rate is outpatient antibiotic prescriptions per 1,000 population

Drug Class	2019	2020 Rate (% change)	2021 Rate (% change)	2022 Rate (% change)	2023 Rate (% change)
All Classes	696	547 (-21.4%)	581 (+6%)	649 (+11.7)	669 (+3%)
Cephalosporins	115	91 (-20.8%)	98 (+7.7%)	115 (+17.3%)	121 (+5.2%)
Fluoroquinolones	54	43 (-20.8%)	39 (-10%)	39 (0%)	37 (-5.2%)
Macrolides	100	67 (-33%)	67 (0%)	75 (+11.9)	70 (-6.7%)
Penicillin	151	109 (-27.8%)	122 (+12%)	139 (13.9%)	150 (+7.9%)

Figure 2: Displays the rate antibiotics were prescribed in North Dakota by antibiotic class



In 2023, North Dakota saw a 5.7% decrease in Fluoroquinolone prescribing.

OUTPATIENT ANTIBIOTIC PRESCRIBING FOR MEDICARE BENEFICIARIES

This section summarizes the data from the CMS Medicare Part D Prescriber Public Use Files. These files contain information on prescription drugs provided to Medicare beneficiaries enrolled in Part D, by physicians and other health care providers. The CMS Medicare Part D files does have a two-year lag period; thus, the most recent data is from 2023. These files show the number of prescribers that have written prescriptions for Medicare beneficiaries, total number of prescriptions, geographic information, prescriber specialty, among other data. In Table 2, data is summarized for high and low volume prescribers in North Dakota for calendar year 2023. The number of Medicare providers increased by 35 providers (2%) in 2023 versus 2022. This also increased the number of antibiotics prescribed to 140,090 which equates to a 6.7% increase in the number of antibiotics prescribed in 2023 to Medicare Part D participants[7].

Table 2. Summary of North Dakota Medicare Beneficiaries antibiotic prescribing in 2023, including all, high, and low-volume prescribers.

Antibiotic Prescribing for North Dakota Beneficiaries	All prescribers who prescribed at least one antibiotic	High Volume Prescribers	Low-Volume Prescribers
Number of prescribers	1,928	192	1,736
Number of prescription claims (% of total volume)	140,090	51,262 (37%)	88,828 (63%)

Both the CDC and medical literature consider high volume prescribers as those that are in the top 10% of total antibiotics prescribed per prescriber[8,9]. In 2023, North Dakota had 192 prescribers in the top 10%, who wrote for 51,262 prescriptions or 37% of the total antibiotic scripts for Medicare Part D beneficiaries. Among the 1,928 total prescribers, 192 are classified as high-volume, with the remaining 1,736 considered low-volume. Urology and Infectious Disease show the highest concentration of high-volume prescribers, with over 80% of their prescriptions coming from this group[7]. In contrast, Family Practice and Internal Medicine contribute significantly to the overall prescription volume, with high-volume prescribers accounting for around half of their specialty's claims. Nurse practitioners and physician assistants also play a major role in total

prescribing, though a smaller proportion of them are high-volume prescribers. These findings highlight the uneven distribution of antibiotic prescribing and suggest that targeted stewardship efforts could focus on high-volume prescribers within key specialties.

Table 3 High-volume prescribers by specialties in 2023

Specialty	All prescribers claims (n=140,090)	High Volume Prescribers Claims (n=51,262)	% Of Claims by High Volume prescribers	Number of high-volume prescribers/Number of prescribers
Family Practice	28,519	15,159	53.2%	56/293 (19%)
Nurse Practitioners	37,717	10,661	28.3%	45/529 (8.5%)
Physician Assistants	18,248	6,299	34.5%	24/244 (9.8%)
Internal Medicine	10,386	5,106	49.2%	20/108 (18.5%)
Urology	3,579	3,021	84.4%	8/15 (53.3%)
Infectious Disease	2,408	1,983	82.3%	7/11 (63.6%)
Others	41,641	11,016	26.5%	35/738 (4.7%)

OUTPATIENT ANTIBIOTIC PRESCRIBING FOR MEDICAID ENROLLEES

North Dakota Medicaid has provided de-identified prescribing data and enrollment numbers to be used in tracking and reporting antibiotic use via a data use agreement. From the data provided, durations of therapy for antibiotic prescriptions were trended from 2021 thru 2024 (Figure 3). This data shows improvement in the length antibiotics are being prescribed for and trending to match guidelines that are continually recommending shorter courses of antibiotics.

This data also provided information on which provider specialty is writing for antibiotics. The limitation with this data is the number of visits wasn't provided for each provider type, thus it wouldn't be a fair comparison between each provider type, but we can look at trends for prescribing within each provider type. The data shows that from 2021-2023, in all groups except dentists, the number of antibiotic prescriptions written

increased, but in 2024 many of the groups saw decreases in the number of antibiotics prescribed. Hopefully prescribing peaked in 2023 and will continue to see decreased antibiotic use in the future. The data also aligns with Medicare Part D data, that nurse practitioners and family medicine providers are writing for larger numbers of antibiotics and may benefit from stewardship interventions (Figure 4).

Figure 3. Average duration of therapy per year by antibiotic class

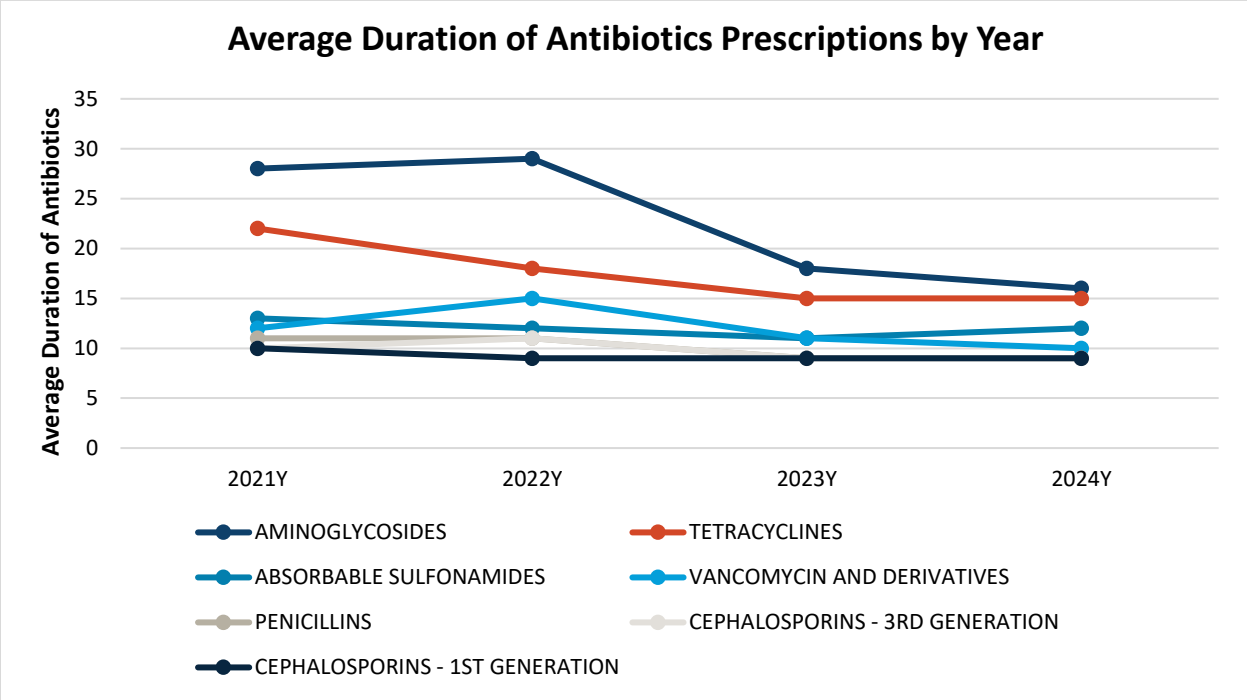
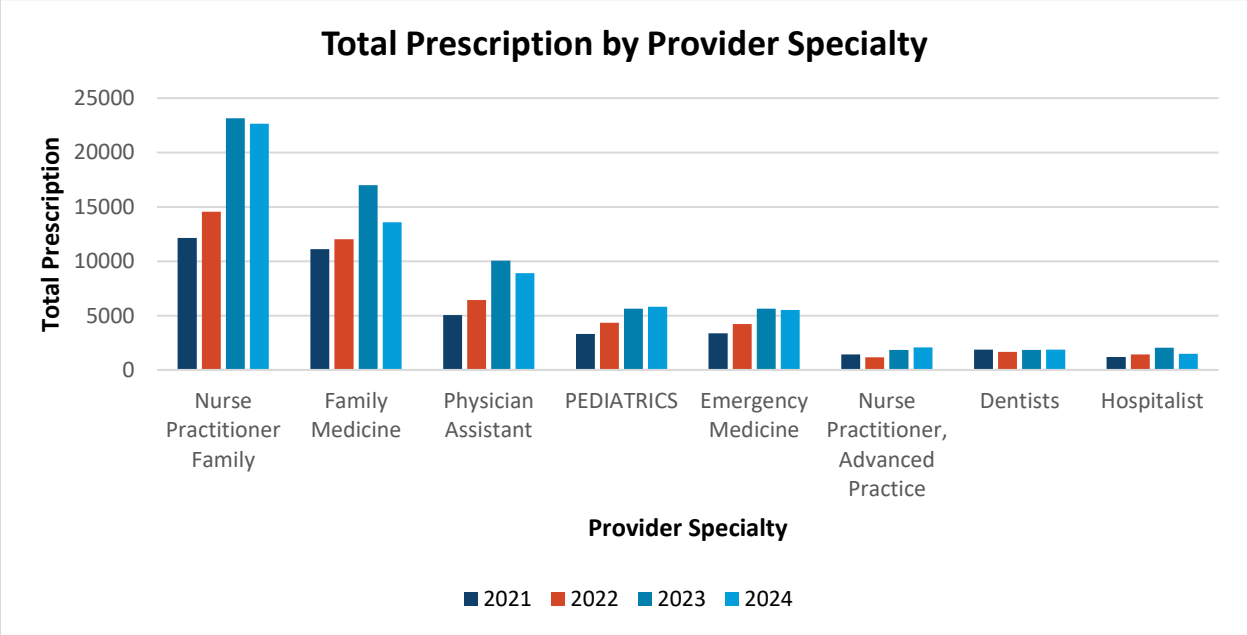


Figure 4. Medicaid antibiotic prescriptions by provider specialty



ANTIBIOTIC ADMINISTRATION IN HOSPITALS

NHSN's Antimicrobial Use (AU) Option is used by the CDC to track antimicrobial use in hospitals. In 2024, it became a requirement for hospitals who partake in CMS's Promoting Interoperability Program to report their antimicrobial use to NHSN[8]. Within NHSN, hospitals are able to review usage for the whole facility or individual mapped locations within their facilities. The AU module also allows comparison of antimicrobial usage via the standardized antibiotic administration ratio (SAAR). The SAAR is a metric for comparing observed to predicted days of antimicrobial therapy, which is derived by comparing the facility administration rate to a baseline or "expected" administration rate generated from a national dataset. It is adjusted for factors that may affect antibiotic prescribing such as care unit type, teaching hospital status, and pediatric versus adult care. The interpretation of a SAAR value depends on if it is greater or less than one. If the SAAR value is less than one, it indicates fewer antimicrobials were administered than expected, while if the SAAR value is greater than one, there was more antimicrobials administered than expected. The SAAR values allow facilities to compare themselves to similar facilities and to pinpoint units that may be targets for stewardship activities.

The requirement to share AU with NHSN has helped increase the number of facilities reporting at least one month of data from twelve in 2022 to twenty-one in 2024. Due to the increase of facilities reporting, NHSN was able to calculate a Median SAAR value for North Dakota for the first time with 2023 data. North Dakota's median SAAR value for 2023 is 0.972 which is lower to the national median SAAR of 0.988. This allows us to compare North Dakota's SAARs to other states in the U.S. just like facilities compare their SAAR number nationally to other facilities of similar size. SAAR data for hospitals reporting to NHSN in 2024 are listed in Table 4. The limitation to the SAAR data in this table is it cannot be compared hospital to hospital as bed size ranges from 20 beds to over 350 beds. Facility type is also different (critical access hospitals vs. acute care hospitals).

Table 4: 2024 SAAR numbers for hospitals

Facility	2024 SAAR Value
Statewide (21 total hospitals)	0.93
Hospital 1	0.96
Hospital 2	0.841
Hospital 3	0.97
Hospital 4	0.982
Hospital 5	0.972
Hospital 6	0.985
Hospital 7	1.133
Hospital 8	0.887
Hospital 9	0.623
Hospital 10	0.896
Hospital 11	1.258
Hospital 12	0.432
Hospital 13	0.613
Hospital 14	0.932
Hospital 15	0.627
Hospital 16	0.855
Hospital 17	0.873
Hospital 18	0.308
Hospital 19	0.444
Hospital 20	1.048
Hospital 21	0.143

** Data was retrieved from NHSN database on Aug. 6, 2025. Access to this data is made possible thru a data use agreement that allows us to look at overall trends and provide data to hospitals if requested. **

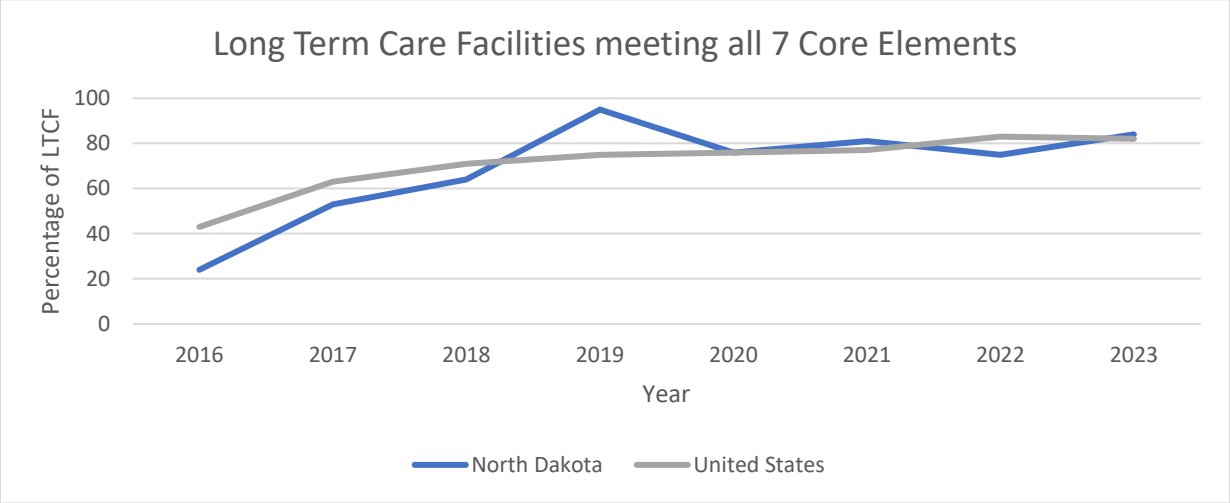
Antibiotic Stewardship

NURSING HOME CORE ELEMENTS OF ANTIBIOTIC STEWARDSHIP

The CDC recommends nursing homes take steps to improve antibiotic prescribing and decrease inappropriate antibiotic use. Studies have shown that 40-75% of antibiotics prescribed in nursing homes may not be needed or are inappropriately prescribed[9]. With an estimated 70% of residents in a nursing home receiving one or more antibiotics when followed over a year[9], increasing stewardship in this setting will help reduce adverse events, prevent emergence of resistance, and most importantly potentially have better outcomes for the residents.

Long Term Care Facilities (LTCF) are able to report core element uptake in their facilities through NHSN. Participation varies by state and the year. Thus, data in Figure 5 may not represent all LTCFs in United States, but it does provide an estimate of the uptake of core elements in LTCFs. In 2016, when the core elements were developed, only 24% of LTCFs in North Dakota reported that they met all seven of the elements, which is well below the national average. In the years since, we have seen great improvement rising above the national average in 2018 and peaking at 95% in 2019. But, focus on stewardship has waned since the pandemic. In response in late 2022, HHS started helping LTCFs refocus on antibiotic stewardship. Educational webinars, staff education, educational games and site visits have helped address this deficiency and improved LTCFs meeting all seven core elements to 84% of all facilities in North Dakota, which is higher than the national rate.

Figure 5. Percentage of Long-Term Care Facilities self-reporting core element participation



HOSPITAL CORE ELEMENTS OF ANTIBIOTIC STEWARDSHIP

Inappropriate antibiotic use in hospitals plays a significant role in the development of antibiotic resistance. Studies indicate that approximately 30% of antibiotic use in U.S. acute care hospitals is unnecessary or suboptimal[10,11]. In addition, around 20% of hospitalized patients experience serious adverse effects from antibiotics, placing many patients at risk for adverse events without any benefit[12]. Even patients who are not receiving antibiotics can be affected by the spread of resistant organisms and Clostridioides difficile infection within the hospital.

Since 2014 when the CDC developed the seven Core Elements of Antibiotic Stewardship for Hospitals, North Dakota has continued to improve on meeting the core elements. In 2023, 94% of the 47 hospitals in North Dakota reported on NHSN's annual survey that they were meeting all of the core elements (Figure 5)[13]. North Dakota is closing the gap on the national average of 96% of hospitals meeting all core elements.

To further strengthen antimicrobial stewardship program efforts, the CDC established hospital-specific Priority Elements in 2022, derived from six of the seven core elements. In North Dakota, in 2023 four more hospitals were meeting all six priority elements which increased the percentage to12.8% of hospitals reporting implementation of all priority elements (Figure 7). In comparison, 13.5% of hospitals nationwide have met all six elements[14]. More importantly, is the fact that North Dakota increased the percentage in all six priority elements in 2023. This highlights the commitment hospitals are making to antimicrobial stewardship and actions to improve our antibiotic use and outcomes for North Dakotans.

Figure 6. Summarizes the number of hospitals meeting the seven Core Elements of Antibiotic Stewardship

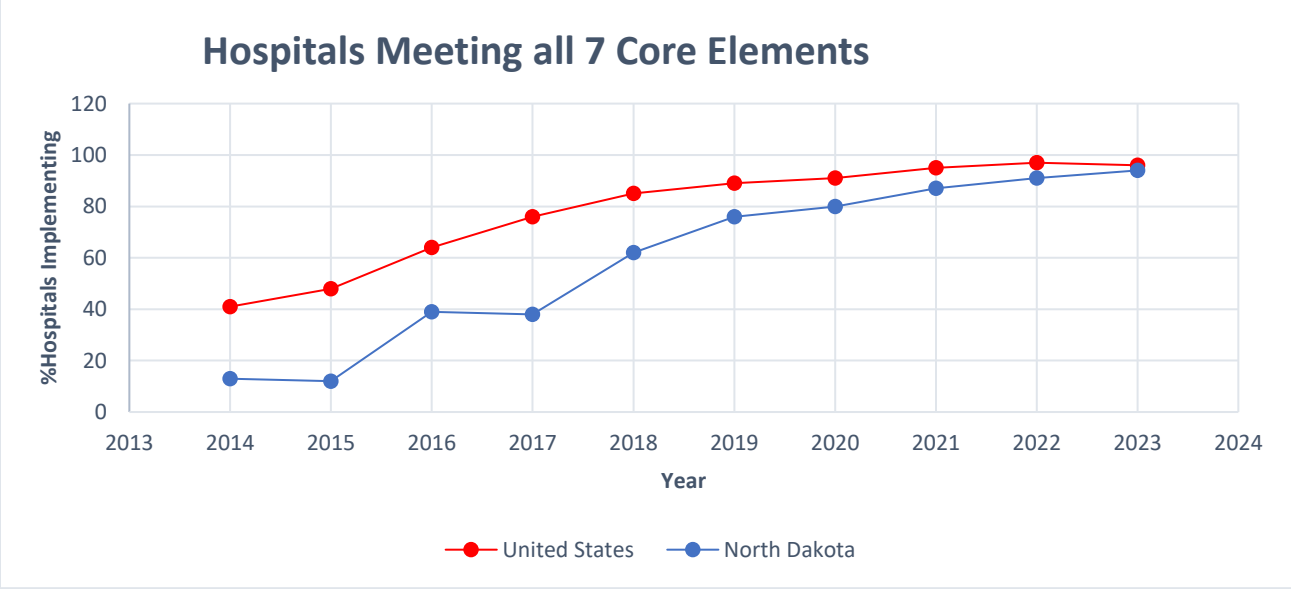
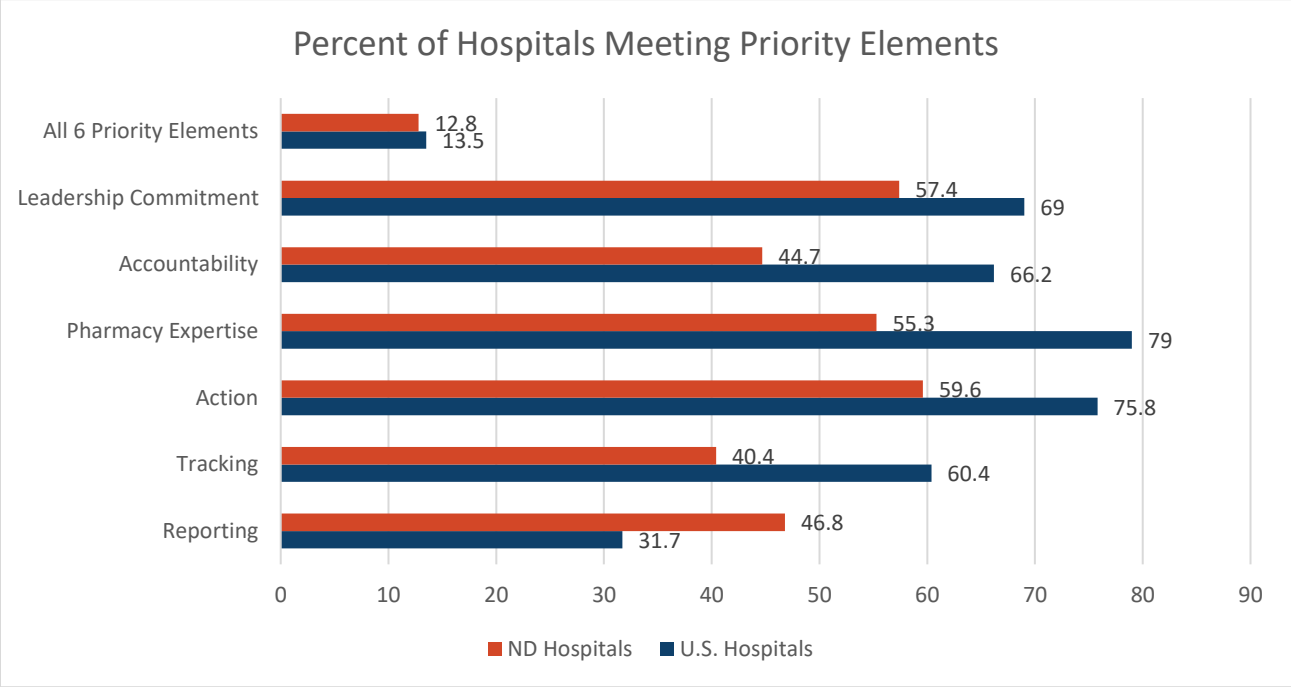


Figure 7. Summarizes the percentage of hospitals in North Dakota meeting the Priority Elements of Antibiotic Stewardship in 2023



HEALTH DEPARTMENT CORE ELEMENTS OF ANTIBIOTIC STEWARDSHIP

Since the creation of the Core Elements of Antibiotic Stewardship for Health Departments, ND HHS has been committed to implementing each of the elements. Leadership has committed funds to support antimicrobial stewardship initiatives in North Dakota, which includes continuing with an antimicrobial stewardship lead who is accountable for the program as well as the pharmacy expertise. This program has taken action to create the North Dakota Antimicrobial Stewardship Collaboration, which includes pharmacists and infectious disease physicians from acute care hospitals in the state who are now partnering on stewardship initiatives and share resources to collaboratively improve antimicrobial use within the state.

As for tracking and reporting, HHS stewardship group is now providing SAAR reports biannually to all facilities that report at least one month of antimicrobial use data in NHSN. This has been an excellent source of data that facilities can use to share with their facility's antimicrobial stewardship teams and leadership groups.

More facilities are reporting data to NHSN each year, which allows for more accurate analysis of antibiotic use in North Dakota. Tracking and sharing data for acute care hospitals via the North Dakota Antimicrobial Stewardship Collaboration has allowed acute care hospitals to compare usage, develop strategies to decrease antibiotic use, and trend usage. This has shown decreased antibiotic use in several outlier hospitals.

The ND HHS stewardship group provided a variety of virtual and in-person educational activities again this year at facilities throughout North Dakota. Activities included the following:

- Educational sessions at North Dakota State University (NDSU) to instill the importance of stewardship on pharmacy and master of public health students
- Guideline handouts for numerous infectious diseases created and added to NDSU CAP Center website
- Additional "Antibiotic Answers" videos created and posted to CAP Center website
- A three-part webinar series "Implementing Outpatient Antimicrobial Stewardship" with numerous participants from a variety of health care professions
- Partnership with the Center of Rural Health on presentations on CMS annual survey and sharing of antibiotic use data to critical access hospitals across the state
- Creation of an Infectious Disease Jeopardy game played at North Dakota's Pharmacy Convention

Many of these resources can be found at NDSU's CAP Center's webpage https://www.ndsu.edu/centers/cap/resources/infectious_disease. HHS is continuing to highlight the strong antimicrobial stewardship work by facilities through the North Dakota Honor Roll. In 2024, 10 hospitals and 12 long-term care facilities were awarded honor roll status, with more awards given out this year than last. The most notable event for HHS's antimicrobial stewardship group was being recognized and awarded the national "Antibiotic Stewardship Education & Community Engagement award" from the CDC at the national grantee meeting in Atlanta.

OPPORTUNITIES FOR STEWARDSHIP GROWTH

Even with the great work being done within North Dakota on stewardship, we strive to continue to make antimicrobial use even better. Areas both the state and facilities can improve upon are:

State level:

- Increasing technical assistance to facilities with data entry into NHSN
- Providing educational opportunities to high volume prescribers and encourage facilities to provide feedback to antimicrobial prescribers
- Obtaining quantitative and qualitative data on all outpatient antimicrobial prescriptions to explore prescribing in relation to diagnosis and health equity
- Disseminating educational materials to increase the public's and health care professionals' awareness of responsible antimicrobial use

Facility level:

- Identifying a target to reduce antimicrobial use (i.e., reducing prescriptions for asymptomatic bacteriuria, reducing fluoroquinolone use, appropriate duration of antibiotics for community acquired pneumonia)
- Promote collaboration and communication with antibiotic stewardship teams and participate in collaboratives to share information and best practices with other facilities
- Provide feedback to providers on antimicrobial prescribing highlighting priority conditions

Summary

Based on the data presented in this report, North Dakota continues to demonstrate strong performance in antibiotic stewardship across outpatient, hospital, and long-term care settings. Outpatient prescribing rates remain consistently below the national average, with a notable shift toward narrower-spectrum, first-line agents. Despite a gradual increase in total prescriptions since the pandemic-related dip in 2020, the decline in fluoroquinolone and macrolide use suggests a positive trend toward more judicious prescribing. However, the absence of indication-level data limits the ability to fully assess appropriateness, underscoring the need for more granular data collection.

In the Medicare population, prescribing patterns reveal that a small subset of high-volume prescribers account for a disproportionate share of antibiotic prescriptions. Specialties such as urology and infectious disease show particularly high concentrations of these prescribers, suggesting targeted stewardship interventions could yield meaningful reductions in unnecessary use. Hospital data collected through NHSN's AU module shows that North Dakota's median SAAR value is slightly below the national average, indicating relatively lower-than-expected antibiotic administration. The increase

in hospital reporting has enabled more accurate benchmarking and identification of stewardship opportunities.

Long-term care facilities and hospitals have made significant strides in implementing CDC's Core Elements of Antibiotic Stewardship. LTCFs in North Dakota now exceed the national average in meeting all seven core elements, thanks to renewed educational efforts and support from ND HHS. Similarly, 94% of hospitals report full implementation of the core elements, and the percentage meeting all six priority elements continues to rise. These improvements reflect a statewide commitment to stewardship and a collaborative approach to reducing antimicrobial resistance.

ND HHS has played a pivotal role in advancing stewardship through education, data sharing, and recognition programs. The establishment of the North Dakota Antimicrobial Stewardship Collaboration and the receipt of a national CDC award highlight the state's leadership in this area. Continued efforts to expand data access, support high-volume prescribers, and engage the public will be essential to sustaining progress and further optimizing antibiotic use across all care settings.

References:

1. CDC. Outpatient Antibiotic Prescribing in the United States. Antibiotic Prescribing and Use. December 5, 2024. Accessed June 26, 2025. https://www.cdc.gov/antibiotic-use/hcp/data-research/antibiotic-prescribing.html

2. Gerber JS, Prasad PA, Localio AR, et al. Racial differences in antibiotic prescribing by primary care pediatricians. *Pediatrics*. 2013;131(4):677-684. doi:10.1542/peds.2012-2500

3. Okunseri C, Zheng C, Steinmetz CN, Okunseri E, Szabo A. Trends and racial/ethnic disparities in antibiotic prescribing practices of dentists in the United States. *J Public Health Dent*. 2018;78(2):109-117. doi:10.1111/jphd.12245

4. Fleming-Dutra KE, Shapiro DJ, Hicks LA, Gerber JS, Hersh AL. Race, otitis media, and antibiotic selection. *Pediatrics*. 2014;134(6):1059-1066. doi:10.1542/peds.2014-1781

5. Kissler SM, Klevens RM, Barnett ML, Grad YH. Childhood Respiratory Outpatient Visits Correlate With Socioeconomic Status and Drive Geographic Patterns in Antibiotic Prescribing. *J Infect Dis*. 2021;223(12):2029-2037. doi:10.1093/infdis/jiab218

6. Outpatient Antibiotic Use: Retail Pharmacy Prescription Data | A.R. & Patient Safety Portal. Accessed June 27, 2025. https://arpsp.cdc.gov/profile/antibiotic-use/penicillins?antibiotic-class-selector-geomap=class214

7. Medicare Part D Prescribers - by Provider. Centers for Medicare & Medicaid Data. Accessed July 1, 2025. https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider/data?query

8. Promoting Interoperability Program | NHSN | CDC. March 8, 2023. Accessed October 1, 2024. https://www.cdc.gov/nhsn/cdaportal/datainteroperability.html

9. CDC. Core Elements of Antibiotic Stewardship for Nursing Homes. Antibiotic Prescribing and Use. May 20, 2024. Accessed August 7,2025. https://www.cdc.gov/antibiotic-use/hcp/core-elements/nursing-homes-antibiotic-stewardship.html

10. Dellit TH, Owens RC, McGowan JE, et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. *Clin Infect Dis*. 2007;44(2):159-177. doi:10.1086/510393

11. Fridkin S, Baggs J, Fagan R, et al. Vital signs: improving antibiotic use among hospitalized patients. *MMWR Morb Mortal Wkly Rep*. 2014;63(9):194-200.

12. Tamma PD, Avdic E, Li DX, Dzintars K, Cosgrove SE. Association of Adverse Events with Antibiotic Use in Hospitalized Patients. *JAMA Intern Med*. 2017;177(9):1308-1315. doi:10.1001/jamainternmed.2017.1938

13. North Dakota | A.R. & Patient Safety Portal. Accessed August 7,2025. https://arpsp.cdc.gov/profile/geography/north-dakota

14. Hospital Antibiotic Stewardship | A.R. & Patient Safety Portal. Accessed August 7, 2025. https://arpsp.cdc.gov/profile/stewardship?tabsection-44=0&state-select-priority-element-reporting=state38