Outpatient Antibiotic Prescribing in Minnesota and the U. S. — 2011–2018

SUMMARY REPORT

Background

Antibiotic use is a modifiable driver of antibiotic resistance, or the ability of bacteria to withstand the effects of antibiotic drugs used to treat infections. Measurement of antibiotic use helps us to understand the impact of efforts to improve prescribing behaviors and identify opportunities for improvement. Assuming infection rates remain steady over time, a decline in unnecessary use will be reflected in a decline in overall antibiotic use.

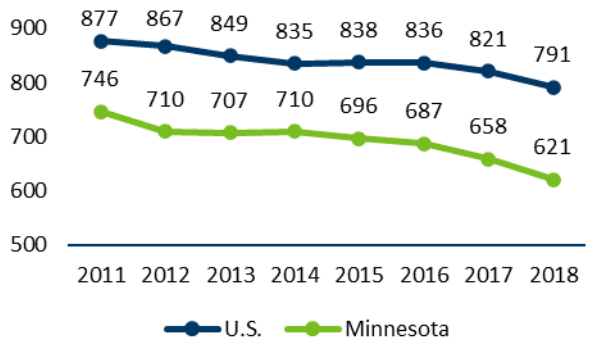
In the U.S., the contract research organization IQVIA™ tracks outpatient oral antibiotic prescriptions filled in community pharmacies. Estimates in this report are generated from IQVIA™ data, made available to MDH by the Centers for Disease Control and Prevention (CDC).

Results

The total number of outpatient antibiotic prescriptions continues to decline.

Prescribing rates displayed in Figure 1 show continued decline in total outpatient antibiotic prescriptions during 2011–2018. Declines occurred in Minnesota and in the U.S. during this time. Compared to the U.S. population, Minnesotans received fewer outpatient antibiotic prescriptions.

Figure 1. Outpatient Antibiotic Prescriptions per 1,000 Persons, 2011-2018



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Annual average prescription rates in Minnesota and the U.S. are shown in Table 1, with results compared for two years, 2017 and 2018. There was a six percent decrease in the annual prescriptions per 1,000 persons in Minnesota, as compared to a four percent decrease in the U.S. population.

Table 1. Mean Annual Outpatient Antibiotic Prescriptions per 1,000 Persons and Percent Change by Year, Minnesota and U.S.

	2017	2018	% Change
Minnesota	658	621	-6%
U.S.	821	806	-4%

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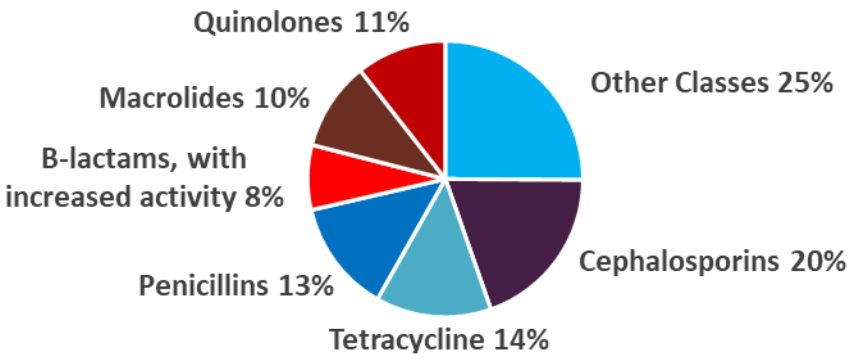
All antibiotics are not the same.

Compared to other antibiotics, the use of certain broad-spectrum antibiotics might pose a greater risk of complications. Such adverse effects include subsequent infections with drug-resistant pathogens, like methicillin-resistant *Staphylococcus aureus* (MRSA), and gastrointestinal infection with *Clostridioides difficile*, a toxin-producing bacterium. Broad-spectrum antibiotics kill or limit growth of a greater variety of bacteria than narrow-spectrum antibiotics. Because of their broader action, they often disrupt the usual balance of bacterial species in the digestive system, which can lead to the complications noted above. For these reasons, it is important to track usage of different types or classes of antibiotics.

Most or all the antibiotics in the following drug classes are broad-spectrum antibiotics: beta-lactams with increased activity, quinolones, and macrolides. Some cephalosporins and drugs included in other classes are also broad-spectrum antibiotics. Penicillins are considered narrow-spectrum antibiotics. The proportions of antibiotic prescriptions of each drug class, out of total prescriptions filled in Minnesota during 2018, are shown in Figure 2.

Figure 2. Outpatient Antibiotic Prescriptions by Drug Class, Minnesota, 2018



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Annual average prescription rates by drug class in Minnesota and in the U.S. are displayed in Tables 2 and 3 for two years, 2017 and 2018.

Rates of macrolide prescriptions decreased over this period, a thirteen percent reduction in Minnesota and ten percent nationally (Table 2). Over 90 percent of macrolide prescriptions in Minnesota are for one of the broad-spectrum drugs azithromycin or clarithromycin (based on 2016 and 2018 data, not shown). The decline in overall macrolide rates thus reflects a decrease in broad-spectrum antibiotic prescribing. The rate of quinolone prescriptions decreased by 13 percent reduction in Minnesota and 10 percent nationally from 2017 to 2018 (Table 3).

Table 2. Mean Annual Outpatient Macrolide Prescriptions per 1,000 Persons by Year, Minnesota and U.S.

	2017	2018	% Change
Minnesota	104	91	-13%
U.S.	142	128	-10%

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Table 3. Mean Annual Outpatient Quinolone Prescriptions per 1,000 Persons by Year, Minnesota and U.S.

	2017	2018	% Change
Minnesota	52	45	-13%
U.S.	78	70	-10%

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Results for prescription rates in the cephalosporin and penicillin drug classes are shown in Tables 4 and 5, respectively. There were modest changes in prescription rates for these drug classes between the two years.

Table 4. Mean Annual Outpatient Cephalosporin Prescriptions per 1,000 Persons by Year, Minnesota and U.S.

	2017	2018	% Change
Minnesota	97	97	0%
U.S.	115	114	-1%

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Table 5. Mean Annual Outpatient Penicillin Prescriptions per 1,000 Persons by Year, Minnesota and U.S.

	2017	2018	% Change
Minnesota	168	159	-5%
U.S.	194	185	-5%

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Methods

Antibiotic prescriptions filled in community pharmacies are collected by a contract research organization, IQVIA™, accounting for >92 percent of total outpatient antibiotic prescriptions filled at community and nongovernmental mail service pharmacies. The remainder of the prescriptions are estimated from wholesale data by using a patented projection method. IQVIA™ updated projection methodology in 2017. Where comparisons to previous years' estimates are presented in this report, rate data generated by pre-2017 methodology are used. Where 2018 data are shown alone, rate data generated by the updated methodology were used. Antibiotic prescriptions are attributed to the location of the prescriber's main office or, if not available, the location of the pharmacy. To calculate prescriptions per 1,000 persons, U.S. Census population estimates were used for denominators.

Minnesota-specific rate data for 2018 were obtained from detailed IQVIA™ Xponent® datasets shared with MDH by CDC. National IQVIA™ Xponent® rate data and Minnesota data from earlier years were obtained directly from CDC or from CDC Antibiotic Resistance & Patient Safety Portal (https://arpsp.cdc.gov/profile/antibiotic-use?tab=outpatient-antibiotic-use).[1]

Comments

These antibiotic rate data do not provide information on the appropriateness of antibiotic prescribing. However, research has shown that unnecessary antibiotic prescribing is common–30 percent of total outpatient antibiotic prescriptions in one study.[2] Antibiotic stewardship programs are intended to address inappropriate prescribing by educating to change behaviors and tracking progress. Monitoring trends in overall antibiotic prescribing is an indirect way to evaluate the effectiveness of these efforts.

References

1. Centers for Disease Control and Prevention. Antibiotic Resistance & Patient Safety Portal. Retrieved from https://arpsp.cdc.gov/profile/antibiotic-use?tab=outpatient-antibiotic-use
2. Fleming-Dutra KE, Hersh AL, Shapiro DJ et al. Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011. JAMA. 2016; 315:1864-73. 7/2019

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