

Fewer Antibiotics Prescribed for Patients with Viral Diagnoses Post-Pandemic

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Key Findings:

- The share of outpatient encounters with a systemic antibiotic prescription fell from 10.4% pre-pandemic to 8.0% during the pandemic and partially returned to pre-pandemic levels at 9.1% post-pandemic.
- Return to pre-pandemic levels varied substantially by diagnosis. Antibiotic prescribing rates for bacterial conditions such as sinusitis (89.9% pre-pandemic, 88.6% post-pandemic), otitis media (83.0% pre-pandemic, 83.1% post-pandemic), and UTI/acute cystitis (78.7% pre-pandemic, 78.3% post-pandemic) remained largely stable, while most viral respiratory diagnoses showed more pronounced and sustained declines.
- Among viral diagnoses, antibiotic prescribing rates for upper respiratory infections (URIs) fell from 19.0% pre-pandemic to 16.9% post-pandemic, and rates for the common cold declined from 14.4% to 11.7%. For influenza, rates were similar across eras (5.9% pre-pandemic, 5.8% post-pandemic). RSV showed a modest increase from 6.6% pre-pandemic to 8.4% post-pandemic.

Antibiotics are among the most commonly prescribed medications in outpatient settings, yet a substantial share of prescriptions are for conditions where antibiotics offer no benefit.¹ Overuse contributes to antimicrobial resistance, a major and growing public health threat.² The COVID-19 pandemic created an unprecedented disruption to outpatient care patterns: visit volumes dropped sharply in spring 2020, telehealth expanded rapidly, and patients deferred care for months. Prior research has documented a decline in antibiotic prescribing during the pandemic, with some return afterward, but the magnitude and persistence of that return, and whether it varied by diagnosis, has been less clear.^{3,4,5} Understanding whether prescribing has returned to pre-pandemic baselines, and whether any pandemic-era changes have been durable, informs stewardship priorities and helps clinicians and health systems benchmark their prescribing practices.

We examined more than 1.9 billion qualifying outpatient encounters occurring between January 2017 and December 2025 among adults and children seen in emergency, urgent care, office, walk-in, or telemedicine settings at U.S. organizations. Antibiotic prescribing rates are reported as era-level averages across three periods: pre-pandemic (January 2017 through February 2020), pandemic (March 2020 through April 2023), and post-pandemic (May 2023 through December 2025). Of note, the months contained in each period are not consistent between the periods, which might cause some bias for conditions that have high seasonality.

Antibiotic prescribing rates fell markedly during the pandemic and have not fully returned to pre-pandemic levels. Overall, 10.4% of outpatient encounters included a systemic antibiotic prescription in the pre-pandemic period, as seen in Figure 1. That share dropped to 8.0% during the pandemic and partially returned to pre-pandemic levels at 9.1% in the post-pandemic period. These shifts in overall prescribing likely reflect a combination of true changes in prescriber behavior and changes in healthcare seeking behavior among patients as encounter mix shifted substantially during 2020–2022.

The degree to which prescribing changed varied substantially by diagnosis, with conditions that are often viral showing larger and more durable declines than conditions that are often bacterial. For diagnoses where antibiotics are routinely indicated (sinusitis, otitis media, urinary tract infection, cellulitis, and pyelonephritis), rates were largely stable across all three eras, suggesting that pandemic disruptions did not meaningfully alter prescribing for clear-cut bacterial infections. Viral respiratory diagnoses tell a different story. Upper respiratory infection (URI) and common cold antibiotic prescribing rates dropped notably during the pandemic and returned only partially afterward, remaining below pre-pandemic levels. Acute bronchitis followed a similar trajectory, consistent with this condition being either bacterial or viral. Influenza prescribing remained low and stable throughout. RSV showed a modest upward rate increase post-pandemic. Encounters in which multiple conditions of interest were diagnosed were categorized separately and are included in the PDF download.

Systemic Antibiotic Prescribing Rates

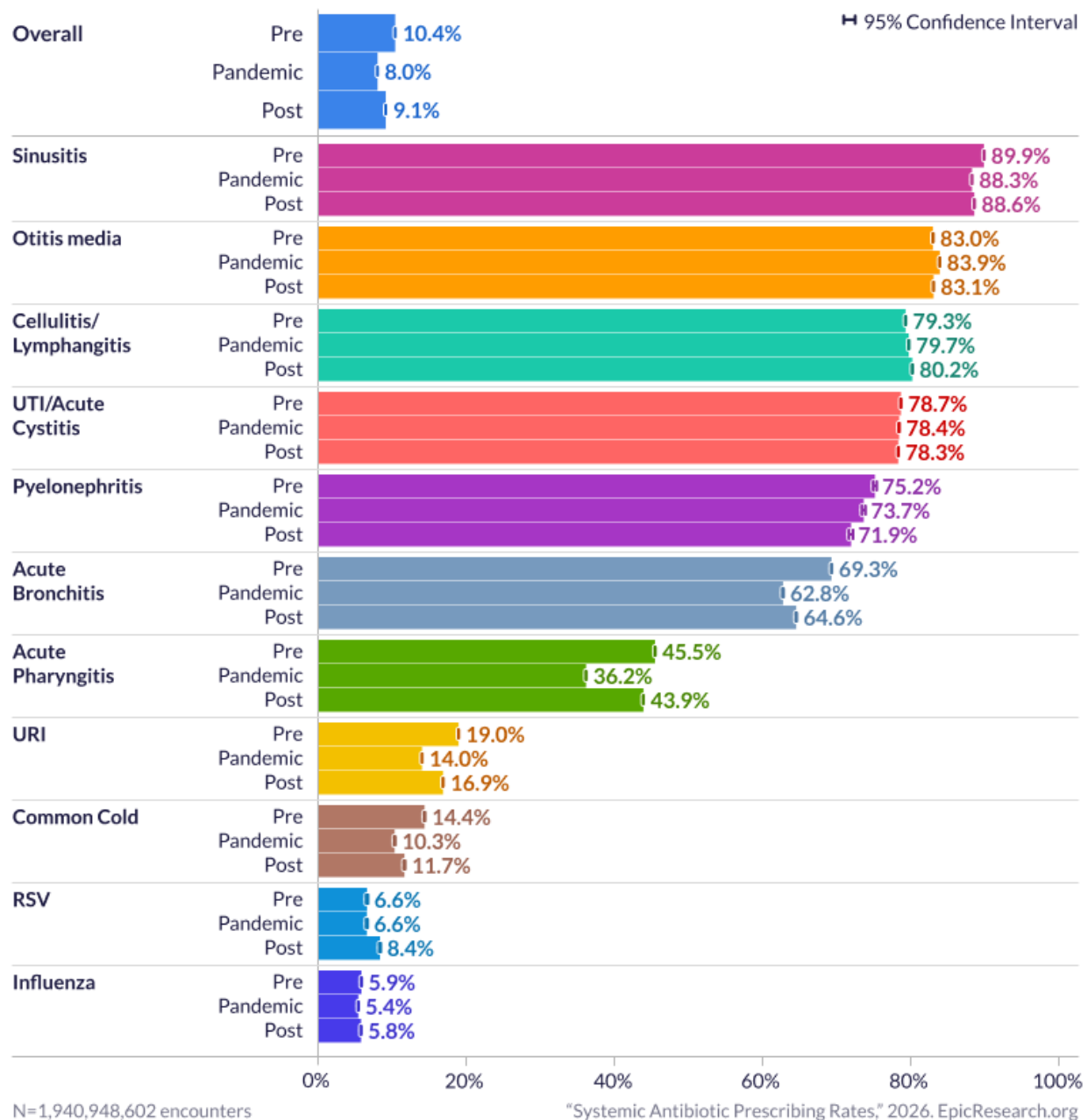


Figure 1. Antibiotic prescribing rates by diagnosis and era.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 304 million patient records from 2,000 hospitals and more than 47,000 clinics from all 50 U.S. states, Canada, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

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Data Definitions

Term	Definition
Study period	Pre-pandemic: 1/1/2017 to 2/29/2020 Pandemic: 3/1/2020 to 5/4/2023 Post-pandemic: 5/5/2023 to 12/31/2025
Study population: inclusion	Overall analysis: Encounters with a type of Emergency, Urgent Care, Office Visit, Walk-In, or Telemedicine during the study period, occurring in a department with a U.S. location, at an organization contributing to Cosmos throughout the full period. If multiple qualifying encounters occurred on the same day, patients are included in the denominator once and the numerator once if they had antibiotics on any encounter that day. Diagnosis-stratified analysis: Qualifying encounters (as above) with exactly one of the 11 named non-problem-list diagnoses on the encounter. Encounters with more than one qualifying diagnosis are classified as multiple diagnoses and excluded from single-diagnosis strata.
Study population: exclusion	Encounters in the following department/provider specialty categories: Surgical (peri-operative prophylaxis), Transplant (peri-transplant prophylaxis), Non-clinical therapy, Non-clinical rehabilitation, Alternative/integrative medicine, Counseling and support services, Other non-prescribing roles, and Dental. Encounters on any day the patient was admitted to the hospital. Diagnosis-stratified analysis only: Patients with the same qualifying diagnosis in the prior 30 days.
Outcomes	Percentage of qualifying encounters with at least one systemic antibiotic prescription.
Systemic antibiotics	An outpatient medication order with a pharmaceutical class of: Penicillin antibiotics; Cephalosporin antibiotics (1st–5th generation); Macrolide antibiotics; Tetracycline antibiotics; Quinolone antibiotics; Aminoglycoside antibiotics; Absorbable sulfonamide antibacterial agents; Chloramphenicol antibiotics and derivatives; Vancomycin antibiotics and derivatives; Lincosamide antibiotics; Polymyxin antibiotics and derivatives; Betalactams; Carbapenem/Penem antibiotics; Cyclic lipopeptides; Streptogramin antibiotics; Oxazolidinone antibiotics; Rifamycins and related derivative antibiotics; Ketolide antibiotics; Glycylcyclines; Lipoglycopeptide antibiotics; Nitrofurantoin derivatives; Antitubercular antibiotics; Antibiotics, miscellaneous. Route: oral or unspecified. Excluded: Amebicicides; Antiprotozoal drugs; Antiparasitics; Periodontal collagenase inhibitors (sub-antibiotic dose doxycycline).
Diagnosis categories	Acute pharyngitis: ICD-10-CM J02*

	Sinusitis: ICD-10-CM J01* Otitis media: ICD-10-CM H66* UTI/acute cystitis: ICD-10-CM N39.0 or N30.0* Acute bronchitis: ICD-10-CM J20* (excluding J20.5) Cellulitis/lymphangitis: ICD-10-CM L03* Pyelonephritis: ICD-10-CM N10 Influenza: ICD-10-CM J09*–J11* Upper respiratory infection (URI): ICD-10-CM J06* RSV: ICD-10-CM J20.5, J21.0 Common cold: ICD-10-CM J00 Multiple diagnoses: Encounter with two or more qualifying diagnoses above
Model specifications	Descriptive analysis only. Antibiotic prescribing rates reported as percentages of encounters with at least one systemic antibiotic prescription. No regression modeling or counterfactual comparison. Wilson confidence intervals reported for each rate.
Limitations	Denominator composition changed substantially during the pandemic (fewer office visits, more telehealth, ED avoidance). Rate changes over time can reflect composition changes in the denominator as much as prescribing behavior change. Cosmos reflects healthcare-seeking populations, not true population incidence. Denominators reflect who came in for care, not the underlying U.S. population. Medication orders do not confirm adherence or dispensing. ICD-10 coding behavior is not stationary; code-assignment patterns change over time and may affect year-over-year comparisons. Seasonal composition differs across eras. Winter months (Dec–Mar) represent 37% of the pre-pandemic span, 33% of pandemic, and 28% of post-pandemic. Because respiratory antibiotic prescribing peaks in winter, the pre-pandemic era-average is biased upward and post-pandemic is biased downward relative to a season-adjusted comparison. Route filter includes “Unspecified” routes, which may capture a small fraction of non-oral orders.

Table 1. Systemic Antibiotic Prescribing Rates

Diagnosis Category	Era	Encounter Count	Antibiotic Encounter Count	Rate	Lower CI	Upper CI
Overall	Pre-pandemic	569,939,515	59,391,874	10.42	10.42	10.42
	Pandemic	671,049,671	53,811,621	8.02	8.02	8.02
	Post-pandemic	699,959,416	63,947,792	9.14	9.13	9.14
Acute pharyngitis	Pre-pandemic	10,557,156	4,802,621	45.49	45.46	45.52
	Pandemic	10,741,191	3,885,319	36.17	36.14	36.2
	Post-pandemic	12,193,968	5,353,805	43.91	43.88	43.93
Sinusitis	Pre-pandemic	7,233,620	6,502,655	89.89	89.87	89.92
	Pandemic	5,240,035	4,625,481	88.27	88.24	88.3

	Post-pandemic	6,051,517	5,361,028	88.59	88.56	88.62
Otitis media	Pre-pandemic	5,027,616	4,173,566	83.01	82.98	83.05
	Pandemic	4,567,304	3,832,719	83.92	83.88	83.95
	Post-pandemic	5,588,296	4,642,929	83.08	83.05	83.11
UTI/acute cystitis	Pre-pandemic	6,419,054	5,050,428	78.68	78.65	78.71
	Pandemic	7,083,096	5,554,939	78.43	78.39	78.46
	Post-pandemic	7,960,268	6,234,834	78.32	78.3	78.35
Acute bronchitis	Pre-pandemic	2,968,473	2,057,434	69.31	69.26	69.36
	Pandemic	1,394,694	875,326	62.76	62.68	62.84
	Post-pandemic	1,843,574	1,189,952	64.55	64.48	64.61
Cellulitis/lymphangitis	Pre-pandemic	3,447,919	2,734,167	79.3	79.26	79.34
	Pandemic	3,808,110	3,036,438	79.74	79.7	79.78
	Post-pandemic	4,153,301	3,331,834	80.22	80.18	80.26
Pyelonephritis	Pre-pandemic	130,386	98,022	75.18	74.94	75.41
	Pandemic	124,108	91,411	73.65	73.41	73.9
	Post-pandemic	109,750	78,955	71.94	71.67	72.21
Influenza	Pre-pandemic	3,070,128	179,631	5.85	5.82	5.88
	Pandemic	1,447,366	78,619	5.43	5.4	5.47
	Post-pandemic	3,009,137	174,551	5.8	5.77	5.83
URI	Pre-pandemic	11,910,692	2,257,999	18.96	18.94	18.98
	Pandemic	10,256,445	1,438,926	14.03	14.01	14.05
	Post-pandemic	11,545,523	1,947,955	16.87	16.85	16.89
RSV	Pre-pandemic	166,408	10,995	6.61	6.49	6.73
	Pandemic	232,391	15,286	6.58	6.48	6.68
	Post-pandemic	275,777	23,057	8.36	8.26	8.46
Common cold	Pre-pandemic	825,826	118,709	14.37	14.3	14.45
	Pandemic	477,834	49,427	10.34	10.26	10.43
	Post-pandemic	501,262	58,432	11.66	11.57	11.75
Multi-dx	Pre-pandemic	6,825,937	4,125,249	60.43	60.4	60.47
	Pandemic	5,226,714	2,943,817	56.32	56.28	56.37

	Post-pandemic	7,251,465	3,906,930	53.88	53.84	53.91
Other	Pre-pandemic	507,229,882	25,514,904	5.03	5.03	5.03
	Pandemic	616,893,402	25,820,424	4.19	4.18	4.19
	Post-pandemic	635,222,443	29,685,435	4.67	4.67	4.67