

Antibiotic Prescribing in Oregon: Outpatient Settings 2018-2022

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Executive Summary

Unnecessary or inappropriate use of antibiotics contributes to antibiotic resistance among bacterial pathogens.^{1,2} Emerging pathogens resistant to antibiotic treatment remain a significant public health concern. Antibiotics are frequently prescribed for acute respiratory tract infections (ARTIs) even when they may not be appropriate.³ Because antibiotics are not indicated for many ARTIs, surveillance to describe antibiotic prescribing practices related to ARTIs remains a key aspect of antibiotic stewardship. Recent prescribing trends for bronchitis, pharyngitis, and upper respiratory tract infections are promising – but are confounded by the onset of the COVID-19 public health emergency. Claims data indicate that antibiotic prescribing during the public health emergency slowed but is trending towards pre-public health emergency levels as of 2022. Prescribing trends for patients seen in telehealth (virtual) settings are also promising. In all ARTI diagnosis categories, those who were seen via telehealth reported lower percentages of visits resulting in antibiotic prescriptions.

Background

Oregon's All Payer All Claims (APAC) database is an abundant source of data for monitoring antibiotic prescribing practices in Oregon.⁴ Providers submit claims to insurance companies to be paid for services rendered to the patient during the encounter.⁵ Insurance companies submit claim information to the APAC database along with demographic information for the patient.⁵ APAC data are estimated to be representative of over 95% of the population in Oregon.⁶ Overuse of antibiotics leads to antibiotic-resistant pathogens that are difficult to treat and often lead to adverse patient outcomes.¹ Centers for Disease Control and Prevention (CDC) estimates that there are approximately 2.8 million antibiotic-resistant infections in the United States every year, with an associated 35,000 deaths.² CDC identifies improving antibiotic use as a core strategy to slow the emergence of antibiotic-resistant pathogens.² Additionally, CDC defines several acute respiratory tract infections (ARTI) as high-priority conditions for antibiotic stewardship interventions, especially in outpatient settings.¹ The objective of this report is to describe antibiotic prescribing trends for outpatient ARTI visits in Oregon to determine where, and in what populations an increased focus on antibiotic stewardship efforts may be needed.

Methods

We queried medical and pharmacy claims data from Oregon’s APAC database from 2018 to 2022. Unique person identifiers of pharmacy claims for anti-infective agents were identified. All pharmacy and medical claims corresponding to those unique person identifiers were extracted from the APAC database. Medical claims were deduplicated by unique person identifier, service date, and primary diagnosis code. Using ICD-9 and ICD-10 codes, medical claims were restricted to ARTIs only, and claims that indicated alternate diagnoses of chronic pulmonary conditions (e.g., asthma, emphysema) or conditions warranting antibiotics (e.g., URI, STD) were excluded. Index ARTI visits were defined by sorting medical claims by unique person identifier and service start dates, and identifying visits that were more than 30 days from previous visits. All non-index ARTI visits were excluded. Medical claims were restricted to outpatient settings. Pharmacy claims were deduplicated by unique person identifier, prescription fill date, and text descriptor of the pharmaceutical, then restricted to antibiotic claims only. Medical claims were joined to pharmacy claims and a variable was created to indicate if an antibiotic prescription was filled within three days of the ARTI visit (antibiotic use). Deduplication of the merged medical and pharmacy claims was completed by sorting claims using unique person identifier, medical service start date, and if there was an antibiotic claim within three days of the medical visit – keeping only the last service start date in this grouping. Visits were defined as telehealth or non-telehealth using place of service codes and modifiers as defined by the Centers for Medicare & Medicaid Services (CMS). Risk factors considered in this report were payer type (Medicare, Medicaid, private), urban-rural classification of member, and age group. All data cleaning and analyses were completed in SAS, and all visuals and tables were created in RStudio.

Results

Antibiotic Use for ARTI Visits

From 2018 to 2022 in Oregon, antibiotic use was observed for approximately 41% of index ARTI visits. Overall antibiotic use for ARTIs by year (Table 1) indicated fewer antibiotic prescriptions were filled for ARTIs during the COVID-19 public health emergency, and that antibiotic use for these conditions was trending towards pre-public health emergency levels in 2022. Acute otitis media accounted for the highest percentage of visits resulting in antibiotic use, followed by sinusitis and bronchitis respectively (Table 2). Trends of antibiotic use by individual ARTI diagnoses early in the COVID-19 public health emergency (2020-2021) show small declines in antibiotic use (Figure 1), with subsequent rise towards pre-public health emergency levels in 2022.

Table 1. Antibiotic Use for ARTI Visits Within Three Days –
by Year

Characteristic	Yes, N = 759,619¹	No, N = 1,110,945¹
Year		
2018	211,253 (45%)	259,947 (55%)
2019	209,414 (44%)	263,754 (56%)
2020	110,513 (37%)	185,593 (63%)
2021	77,027 (30%)	180,897 (70%)
2022	151,412 (41%)	220,754 (59%)

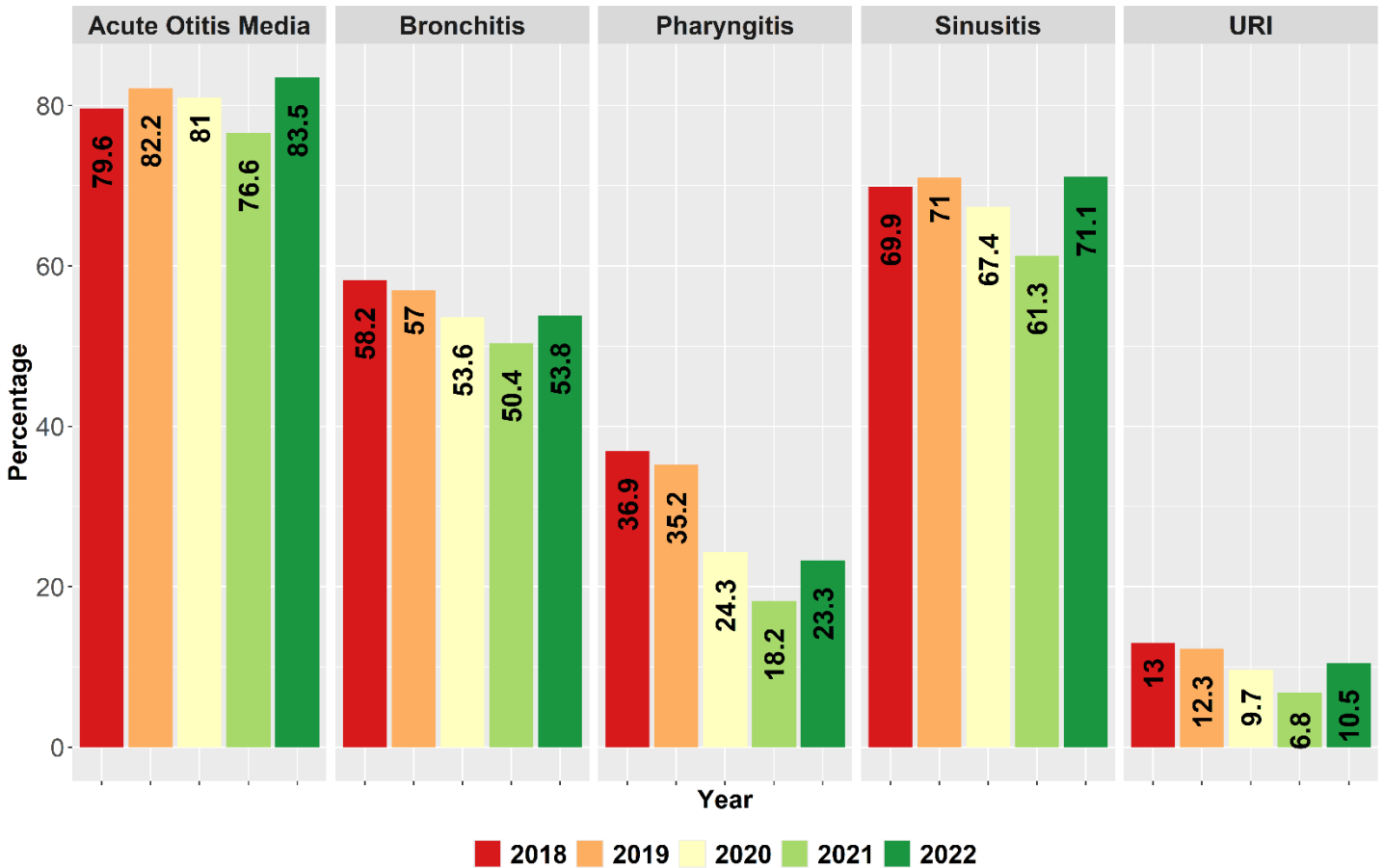
¹n (%)

Table 2. Antibiotic Use for ARTI Visits Within Three Days –
by Diagnosis

Characteristic	Yes, N = 759,619 ¹	No, N = 1,110,945 ¹
Diagnosis		
Acute Otitis Media	222,974 (81%)	51,935 (19%)
Bronchitis	93,051 (56%)	73,534 (44%)
Pharyngitis	145,155 (28%)	365,641 (72%)
Sinusitis	235,658 (69%)	106,212 (31%)
URI	62,781 (11%)	513,623 (89%)

¹n (%)

Figure 1. Antibiotic Use for ARTI Visits Within Three Days - by Diagnosis

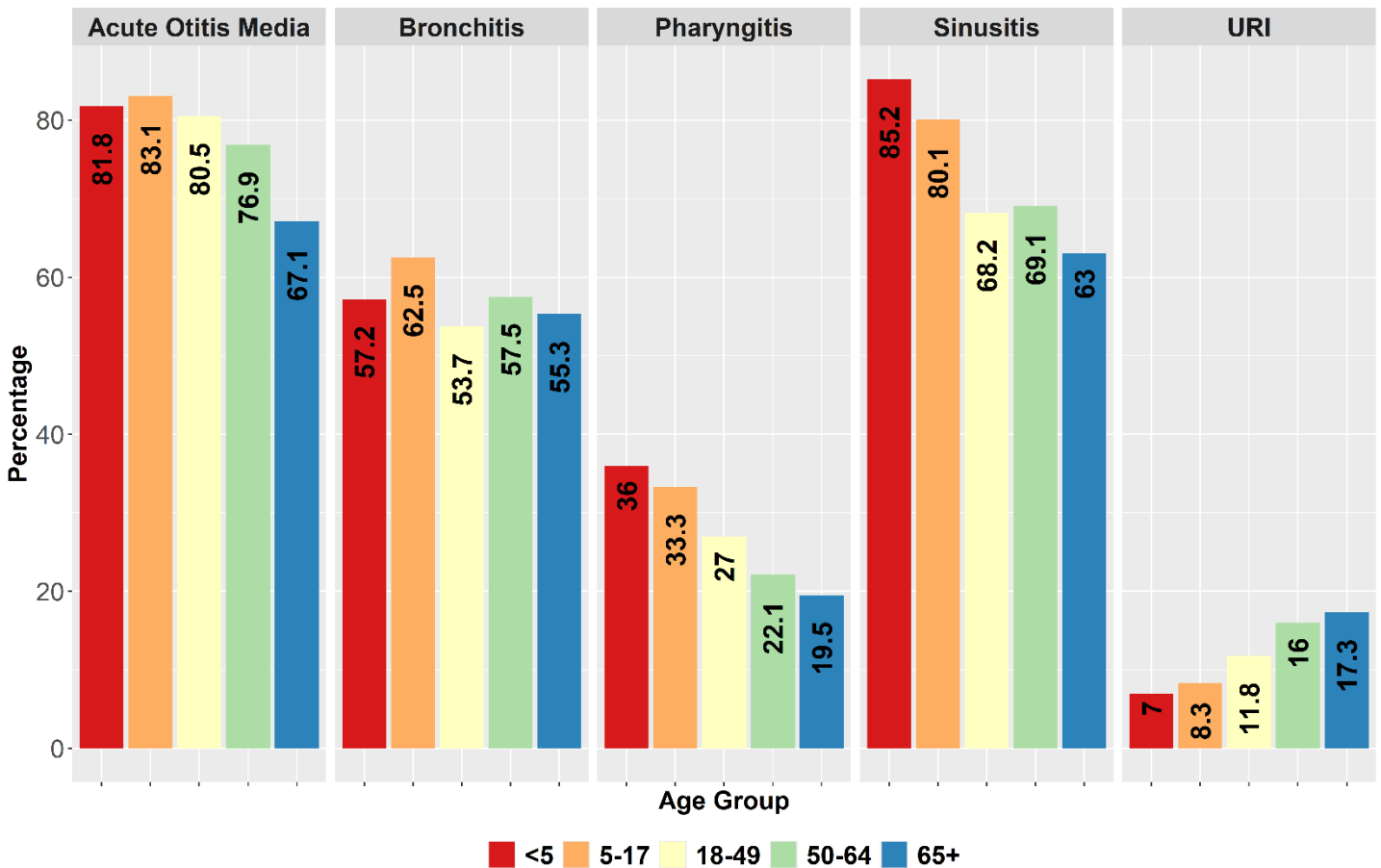


Demographic and Other Risk Factors

As patient age group increased, antibiotic use decreased for acute otitis media, pharyngitis, and sinusitis (Figure 2). Antibiotic use remained relatively stable by age group for bronchitis and increased with age for upper respiratory infections (Figure 2). Aside from acute otitis media, all conditions reported higher percentages of ARTI visits resulting in antibiotic use for members living in rural areas as compared to urban areas (Figure 3). By payer type, Medicaid reported the highest proportions of ARTI visits resulting in antibiotic use for all conditions except upper respiratory infections (Figure 4). In upper respiratory infections, Medicare members reported the highest percentage of antibiotic use following medical visits.

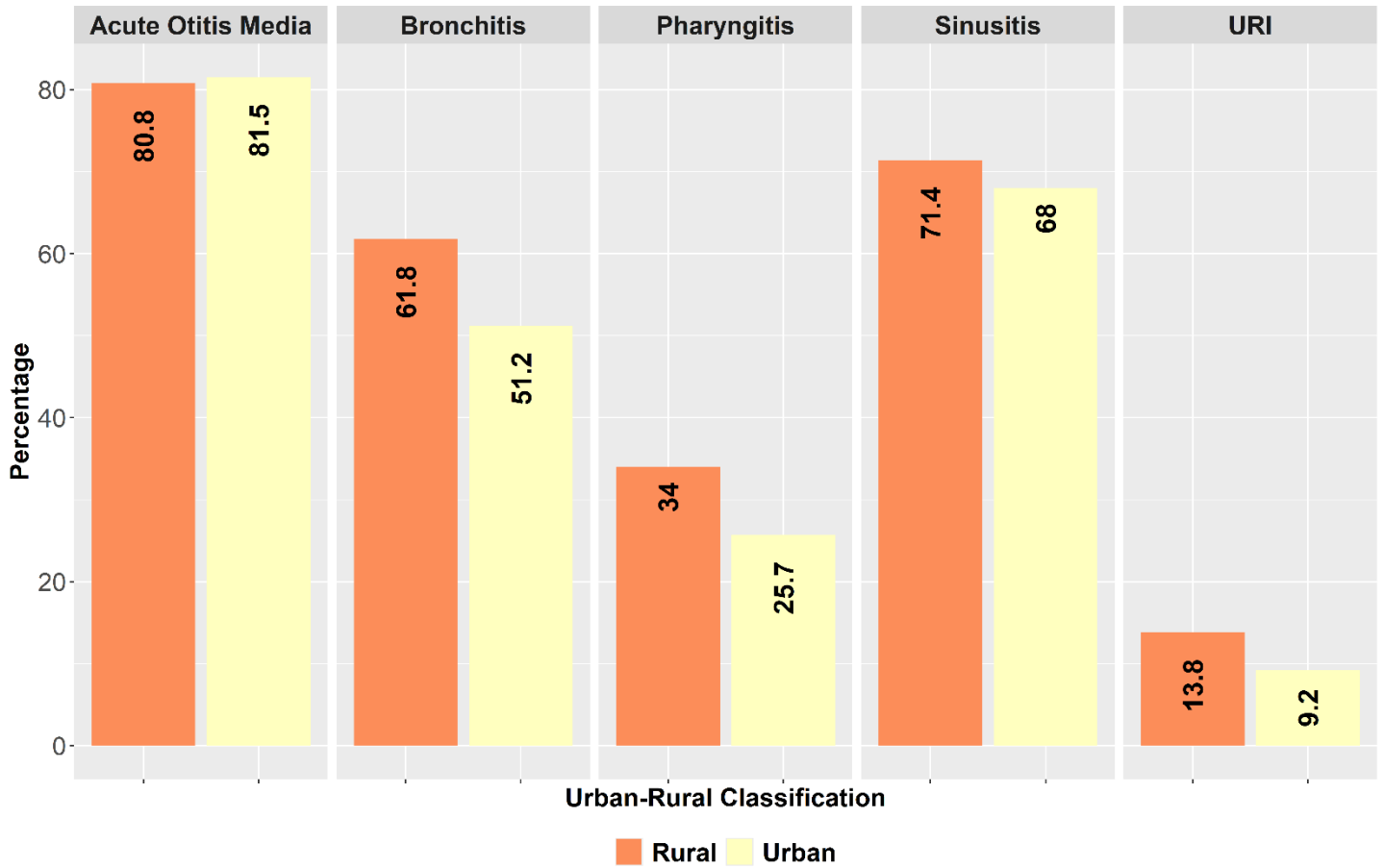
Age

Figure 2. Antibiotic Use for ARTI Visits Within Three Days - by Age Group



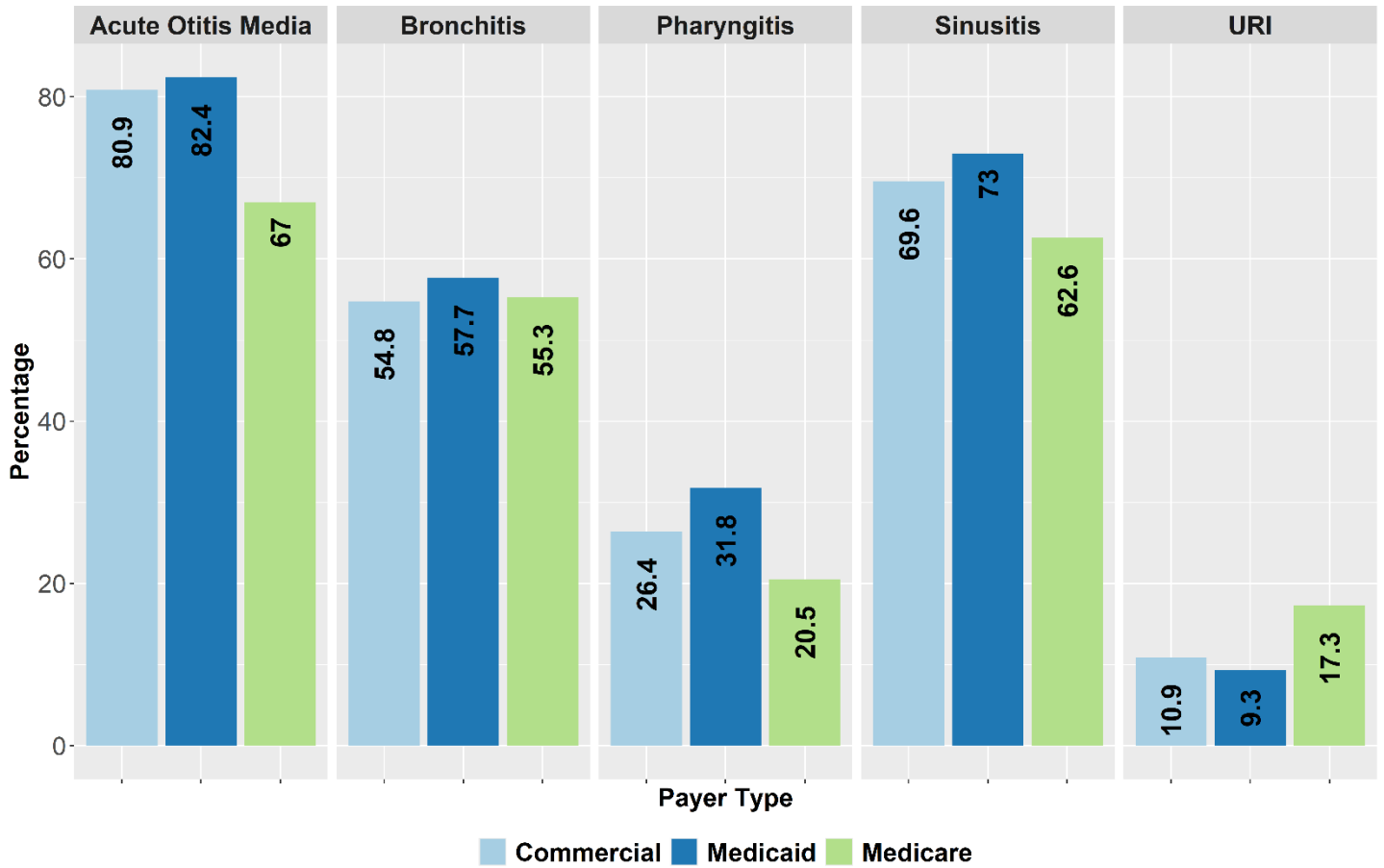
Urban-Rural Classification

Figure 3. Antibiotic Use for ARTI Visits Within Three Days - by Urban-Rural Classification



Payer Type

Figure 4. Antibiotic Use for ARTI Visits Within Three Days - by Payer Type



Telehealth vs Non-Telehealth Settings

The number of ARTI patients who were seen in telehealth settings increased dramatically during the COVID-19 public health emergency (Table 3). Antibiotic use for ARTI visits in telehealth settings was lower than for patients seen in non-telehealth settings. A total of 27% of telehealth ARTI visits resulted in use of antibiotics compared to 41% of non-telehealth visits (Table 4). By diagnosis, antibiotic use for ARTI visits were lower for all diagnosis categories in telehealth visits as compared to non-telehealth visits (Figure 5). Specifically, antibiotic use in telehealth visits related to a diagnosis of pharyngitis was approximately half that of non-telehealth visits related to a diagnosis of pharyngitis.

Table 3. Number of ARTI Visits via Telehealth - by Year

Characteristic	Telehealth, N = 32,832 ¹	Non-Telehealth, N = 1,837,732 ¹
Year		
2018	2 (<0.1%)	471,198 (100%)
2019	3 (<0.1%)	473,165 (100%)
2020	12,907 (4.4%)	283,199 (96%)
2021	13,206 (5.1%)	244,718 (95%)
2022	6,714 (1.8%)	365,452 (98%)

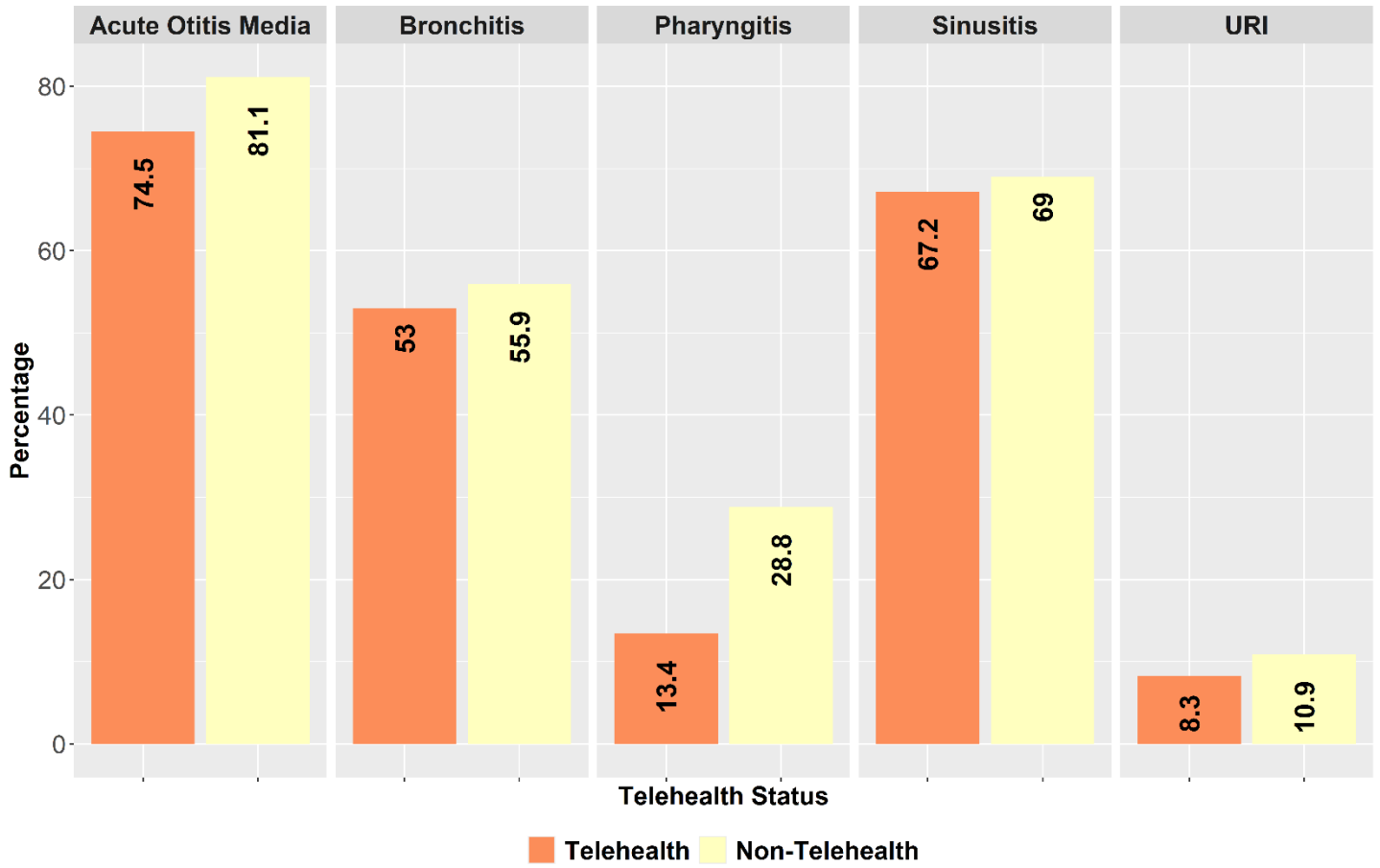
¹n (%)

Table 4. Antibiotic Use for ARTI Visits Within Three Days – by Telehealth Status

Characteristic	Yes, N = 759,619 ¹	No, N = 1,110,945 ¹
Telehealth		
Telehealth	8,923 (27%)	23,909 (73%)
Non-Telehealth	750,696 (41%)	1,087,036 (59%)

¹n (%)

Figure 5. Antibiotic Use for ARTI Visits Within Three Days - by Telehealth Status



Conclusions

Antibiotic prescribing patterns in ARTIs in Oregon from 2018 to 2022 are relatively consistent with findings from previous APAC analyses completed by OHA.⁷ However, several factors complicate comparisons of these data to those from previous years. Since the last analysis of APAC data for antibiotic prescribing practices, APAC data has transitioned to a new vendor. New variables for person identifiers, identifying outpatient settings, and classifying pharmaceuticals were used in this analysis. Additionally, the onset of the COVID-19 public health emergency likely impacted data in several ways. The public health emergency affected the ability of patients to access care and receive antibiotics, which likely confounded results. Furthermore, non-pharmaceutical interventions deployed during the COVID-19 public health emergency (masks, hand hygiene, and social distancing) likely lowered the relative number of ARTIs observed for years 2020 to 2022. However, monitoring trends of antibiotic prescribing despite these challenges informs where the greatest need for stewardship activities may be and deepens our understanding of how our healthcare system adapted to the public health emergency. One important consideration from the COVID-19 public health emergency is the expansion of telehealth as a method to increase access to care. Telehealth will likely be an important consideration in antibiotic stewardship analyses moving forward as it may improve equitable access to care. Finally, one inherent limitation of this analysis is that there are not metrics to determine relative appropriateness of antibiotic prescriptions. The APAC data is limited to ICD-10 and ICD-9 codes only, and therefore offers little clinical context for appropriateness of the prescription.

Much like previous analyses completed by OHA, APAC data presented several limitations. APAC data were not representative of the entire Oregon population. Specifically, those that were uninsured were not represented in these data. While the data was estimated to be representative of 95% of the Oregon population, not all populations of the state were captured. Additionally, the medical claims lack contextual data on the severity of the illness or means to identify if the prescription was appropriate given other clinical or diagnostic data. Similarly, there was no data on the number of prescriptions written by physicians for antibiotics. Only filled antibiotic prescriptions were captured in these data. It is likely that this analysis underestimates the true number of antibiotics that were prescribed due to the reliance on pharmacy encounters for the antibiotic prescription to be captured. Finally, numbers of telehealth visits (and their resulting proportions) are likely underestimated given variations in documentation of place of service variables. Variations in provider reporting of telehealth visits likely lead to underestimating the true number of telehealth visits.

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