Prevalence and characteristics of urinary tract infections in office-based physician practices in the United States, 2016–2019

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Introduction

- UTIs are one of the most common bacterial infections.¹ with \geq 50% of women experiencing ≥ 1 in their lifetime²
- There is a lack of contemporary data that describe the burden of uUTIs and cUTIs in the US, especially in the outpatient setting

Aim

• This study aimed to describe the national prevalence of overall UTIs, uUTIs, and cUTIs in the US ambulatory setting using nationally representative data of office-based physician practice visits

Methods

- This study was a retrospective, cross-sectional study using National Ambulatory Medical Care Surveys (NAMCS) data from 2016, 2018, and 2019
- Data from 2017 had not been released from the National Center for Health Statistics at the time of this study due to delays in data processing
- Data from 2020 onwards were not available at the time the study was conducted
- NAMCS sample geographic areas, physicians within these areas, and patient visits within practices to produce nationally representative samples and corresponding weights at the visit (i.e., encounter) level
- The multiplicity estimator method³ was used to extrapolate patient-level counts, and US Census Bureau data⁴ were used to determine the annualized prevalence
- Inclusion criteria: encounters in patients aged 15 years or older (Figure 1), with an ICD-10-CM diagnosis code for any of the following UTI-related diagnoses:
- Acute cystitis (N30.0); other chronic cystitis (N30.2); other cystitis (N30.8); cystitis unspecified (N30.9); UTI, site not specified (N39.0); acute pyelonephritis (N10); non-obstructive reflux-associated chronic pyelonephritis (N11.0); chronic obstructive pyelonephritis (N11.1); tubulo-interstitial nephritis, not specified as acute or chronic (N12); pyonephrosis (N13.6)
- UTIs were stratified by uUTI and cUTI, as defined by regulatory and professional society guidelines⁵ at the time the study was conducted and in alignment with existing algorithms^{6–8}

Figure 1: Encounter selection flowchart

All encounters captured in NAMCS in 2016, 2018, and 2019			
Unweighted*	31,368	100%	
Weighted and annualized ^{†,‡}	926,865,040	100%	
Encounters with diagnosis of UTI in any diagnosis field [§]			
Unweighted*	386	12%	
Weighted and annualized ^{†,‡}	10,301,347	1.1%	
Encounters by patient over the age of 15 years			
Unweighted*	372	1.2%	
Weighted and annualized ^{†,‡}	9,799,054	1.1%	
Final study population			
Unweighted*	372	1.2%	
Weighted and annualized ^{†,‡}	9,799,054	1.1%	

*Total number of encounters recorded in the NAMCS data (unweighted). †Total number of encounters was calculated using sample weights, with each patient encounter weight accounting for selection probabilities, physician non-response, and other adjustments to reflect office-based patient visits in the US. [‡]Calculated as an average annualized estimate by dividing sampling weights by three (the total number of years of data). [§]UTI diagnoses were identified using the ICD-10-CM codes for codes related to UTI (N30.0, N30.2, N30.8, N30.9, N39.0, N10, N11.0, N11.1, N12, or N13.6) in all available diagnosis fields.

Abbreviations

Cl, confidence interval; cUTl, complicated urinary tract infection; ICD, International Classification of Diseases; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification; IDSA, Infectious Diseases Society of America; NAMCS, National Ambulatory Medical Care Surveys; US, United States; uUTI, uncomplicated urinary tract infection; UTI, urinary tract infection

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Results

- Across the three years, 9,799,054 annualized overall UTI encounters were identified (Figure 1), with an annualized prevalence of 1511/100,000 persons (95% CI: 1234–1787; Figure 2)
- Overall, cUTIs accounted for 42.2% of UTI encounters (**Table 1**)
- Annualized prevalence of uUTIs and cUTIs was 851 (95% CI: 685–1017) and 659/100,000 persons (95% CI: 495–824), respectively
- In males, all UTIs were defined as cUTIs with an annualized prevalence of 966/100,000 persons (95% CI: 637–1296; Table 2)
- Among females, the annualized prevalence of uUTIs and cUTIs was 1473 (95% CI: 1185–1761) and 330/100,000 persons (95% CI: 231–428), respectively (Table 2)

Table 1: Annual UTI, uUTI, and cUTI encounters

	Total number of encounters (unweighted)*	Total number of encounters (weighted) [†]	95% CI	Number of patients [‡]	95% CI
2016					
UTI	187	9,727,889	7,397,930–12,057,849	3,734,433	2,935,975-4,532,891
uUTI	71	4,358,719	3,733,875-4,983,563	1,954,855	1,452,858-2,456,853
cUTI	116	5,369,170	3,387,709–7,350,631	1,779,578	1,184,142–2,375,015
2018					
UTI	102	7,461,052	6,457,715–8,464,389	3,327,903	1,719,157–4,936,649
uUTI	47	4,984,511	4,101,549–5,867,473	1,829,176	1,119,966–2,538,386
cUTI	55	2,476,541	1,812,905–3,140,178	1,498,728	918,171–2,079,284
2019					
UTI	83	12,208,220	9,866,810–14,549,631	4,775,429	3,440,464–6,110,393
uUTI	44	7,654,224	7,096,515–8,211,934	2,886,054	1,811,947–3,960,162
cUTI	39	4,553,996	2,275,595–6,832,397	1,889,375	730,693–3,048,057
2016, 20	018 and 2019§				
UTI	372	9,799,054	8,683,188–10,914,919	3,945,922	3,233,695-4,668,148
uUTI	162	5,665,818	5,279,694–6,051,942	2,223,362	1,788,841–2,657,882
cUTI	210	4,133,236	3,186,737–5,079,735	1,722,560	1,292,706–2,152,414

*Total number of UTI, uUTI, and cUTI encounters recorded in the NAMCS data (unweighted). [†]Total number of UTI, uUTI, and cUTI encounters was calculated using sample weights, with each patient encounter weight accounting for selection probabilities, physician non-response, and other adjustments to reflect office-based patient visits in the US. [‡]To reduce the contributions of patients who made multiple visits to a physician in a 12-month period, the multiplicity estimator method described by Burt and Hing 2007³ was applied. To apply the multiplicity estimator method, visit weights for NAMCS data were multiplied by the inverse of the multiplicity factor (i.e., the number of visits to the provider within the last 12 months, per visit record) to derive patient weights. [§]Calculated as an average annualized estimate by dividing sampling weights by three (the total number of years of data).

Table 2: Stratified annualized prevalence of UTI, uUTI, and cUTI* encounters

Prevalence/ 100,000 persons (95% CI)*†‡§	UTI	uUTI	cUTI
Sex			
Female	1803 (1486–2120)	1473 (1185–1761)	330 (231–428)
Male	966 (637–1296)	_	966 (637–1296)
Age, years			
15–44	3599 (3107–4091)	2157 (1971–2342)	_
15–24	-	_	_
25–44	4978 (4640–5316)	_	_
45–64	1200 (931–1469)	489 (476–503)	711 (388–1034)
65–74	1042 (899–1185)	722 (653–791)	320 (242–398)
75+	1870 (1281–2460)	1146 (685–1608)	724 (346–1102)
Race			
White	1740 (1435–2045)	992 (787–1196)	748 (514–982)
Black/African American	-	_	-
Other [¶]	_	_	-
Ethnicity			
Hispanic/Latino	1085 (796–1374)	_	548 (220–877)
Not Hispanic/Latino	1363 (1124–1603)	731 (616–846)	632 (450–814)

*To reduce the contributions of patients who made multiple visits to a physician in a 12-month period, the multiplicity estimator method described by Burt and Hing 2007³ was applied. To apply the multiplicity estimator method, visit weights for NAMCS data were multiplied by the inverse of the multiplicity factor (i.e., the number of visits to the provider within the last 12 months, per visit record) to derive patient weights. [†]The estimated numbers of prevalent UTI, uUTI, and cUTI cases/100,000 persons were calculated by dividing the number of patients with UTI, uUTI, and cUTI for each year by the average US population \geq 15 years of age in the applicable stratum between 2016, 2018, and 2019, and multiplying by 100,000. [‡]Stratifications that resulted in fewer than 30 unweighted encounters (denoted by "-") did not meet the National Center for Health Statistics statistical reliability criteria (i.e., estimates were not reliable) and, therefore, are not presented. §Calculated as an average annualized estimate by dividing sampling weights by three (the total number of years of data). [¶]Other race categories included Asian, Native Hawaiian/Other Pacific Islander, and American Indian/Alaska Native.

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UTI is highly prevalent and is the most common infection-related diagnosis in US office-based physician practices

Figure 2: Annualized prevalence of UTI, uUTI, and cUTI encounters from 2016, 2018, and 2019*



*To reduce the contributions of patients who made multiple visits to a physician in a 12-month period, the multiplicity estimator method described by Burt and Hing 2007³ was applied. To apply the multiplicity estimator method, visit weights for NAMCS data were multiplied by the inverse of the multiplicity factor (i.e., the number of visits to the provider within the last 12 months, per visit record) to derive patient weights. [†]The estimated numbers of prevalent UTI, uUTI, and cUTI cases/100,000 persons were calculated by dividing the number of patients with UTI, uUTI, and cUTI for each year by the average US population ≥15 years of age in the applicable stratum between 2016, 2018, and 2019, and multiplying by 100,000. [‡]Calculated as an average annualized estimate by dividing sampling weights by three (the total number of years of data).

Table 3: The most common diagnoses overall, including the rank of UTI diagnosis

ank	Diagnosis	Weighted frequency*
1	Essential (primary) hypertension	130,184,014
2	Hyperlipidemia, unspecified	51,210,962
3	Type 2 diabetes mellitus without complications	46,480,804
4	Encounter for general adult medical examination	34,261,456
5	Pain in joint	25,970,837
6	Atherosclerotic heart disease of native coronary artery	25,126,934
7	Gastro-esophageal reflux disease without esophagitis	24,202,515
8	Anxiety disorder, unspecified	23,579,646
9	Major depressive disorder, single episode, unspecified	23,040,110
10	Hypothyroidism, unspecified	19,204,071
48	UTI, site not specified	6,994,818

Table 4: The most common diagnoses in females, including the rank of UTI diagnosis

ank	Diagnosis	Weighted frequency*
1	Essential (primary) hypertension	70,409,733
2	Hyperlipidemia, unspecified	26,094,084
3	Type 2 diabetes mellitus without complications	23,571,298
4	Encounter for general adult medical examination	19,537,284
5	Anxiety disorder, unspecified	15,790,577
6	Major depressive disorder, single episode, unspecified	15,461,534
7	Gastro-esophageal reflux disease without esophagitis	15,346,609
8	Hypothyroidism, unspecified	15,327,861
9	Encounter for gynecological examination	15,232,513
10	Pain in joint	14,986,837
36	UTI, site not specified	5,016,618

Tables 3 and 4: *Ranked diagnoses at physician office visits for patients aged ≥15 years were calculated using sample weights and pooled across 2016, 2018, and 2019.

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Conclusions

Table 5: Reasons for cUTI categorization across 2016, 2018, and 2019

Reasons for cUTI catego Acute pyelonephritis Chronic obstructive p Complicated/uncontr Fever Immunosuppressed of Infection and inflam to indwelling urinary Intravenous antibiotic Male sex Non-obstructive reflu chronic pyelonephriti Pregnancy Pyonephrosis Tubulo-interstitial nep as acute or chronic Urologic abnormalitie Urological or nephrolo Urosepsis Number of factors indic

*Total number of cUTI encounters recorded in the NAMCS data (unweighted), across 2016, 2018, and 2019. †Diagnosis can only be identified precisely through a four-digit ICD-10-CM code. Several urologic abnormalities were excluded as cUTI indicators due to the imprecision of the corresponding three-digit ICD code.

Limitations

- of uUTI and cUTI
- of diagnoses

• This study used a nationally representative data source and highlights UTI as a highly prevalent diagnosis in US office-based physician practices

• UTI was the most common infection-related diagnosis reported at the physician office visits overall and among females

• Further research is needed to better understand the burden of UTIs and associated healthcare utilization in inpatient, emergency department, and hospital-based ambulatory settings

 Across 2016, 2018, and 2019. UTI was the most common infection-related diagnosis overall and for females only

- UTI was the 48th most common diagnosis overall (**Table 3**), and 36th most common diagnosis for females only (**Table 4**)

• In females, classification of cUTIs was predominantly due to urologic abnormalities (92.5%; **Table 5**)

	Number of cUTI encounters (unweighted)* n=210	Number of female cUTI encounters (unweighted)* n=80	Number of male cUTI encounters (unweighted)* n=130
orization, n (%)			
	0	0	0
elonephritis	0	0	0
olled diabetes	3 (1.4)	2 (2.5)	1 (0.8)
	3 (1.4)	2 (2.5)	1 (0.8)
onditions	1 (0.5)	0	1 (0.8)
atory reaction due atheter	2 (1.0)	1 (1.3)	1 (0.8)
S	0	0	0
	130 (61.9)	0	130 (100.0)
-associated	0	0	0
	3 (1.4)	3 (3.8)	0
	0	0	0
hritis, not specified	0	0	0
s†	111 (52.9)	74 (92.5)	37 (28.5)
ogical procedures	1 (0.5)	0	1 (0.8)
	0	0	0
ative of cUTI, n (%)			
	168 (80.0)	78 (97.5)	90 (69.2)
	40 (19.0)	2 (2.5)	38 (29.2)
	2 (1.0)	0	2 (1.5)
	0	0	0

 Estimates are limited to outpatients among office-based physician and community health center encounters

• IDSA guidelines are currently evolving and may affect the classification

• NAMCS are restricted to the documentation of up to five diagnosis codes, which consist of only three digits, thus limiting the capture and specificity

• Longitudinal patient-level data are not available as the data are cross-sectional in nature and on the encounter level





