



Annual Surveillance Summary: *Escherichia coli* (*E. coli*) Infections in the Military Health System (MHS), 2017

NMCPHC-EDC-TR-380-2018

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Abstract

The EpiData Center (EDC) conducts routine surveillance of *Escherichia coli* (*E. coli*) incidence and prevalence among all beneficiaries seeking care within the Military Health System (MHS). This report describes demographics, clinical characteristics, prescription practices, and antibiotic resistance patterns observed for *Escherichia coli* in the calendar year (CY) 2017.

Multiple data sources were linked to assess descriptive and clinical factors related to *E. coli*. Health Level 7 (HL7)-formatted Composite Health Care System (CHCS) microbiology data identified *E. coli* infections. These infections were matched to HL7-formatted CHCS pharmacy data to assess prescription practices, the Standard Inpatient Data Record (SIDR) to determine healthcare-associated exposures, and the Defense Manpower Data Center (DMDC) rosters to determine burden among Department of Defense (DOD) active duty (AD) service members.

The *E. coli* incidence rate among MHS beneficiaries decreased by 7.0% during 2017 in relation to the weighted historic incidence rate (634.9 vs. 682.6 per 100,000 persons per year). Characteristics of MHS *E. coli* infections concur with existing literature, and occurred at higher rates among females, manifested most commonly as urinary tract infections (UTIs), and primarily identified as community-associated (CA) cases. Approximately 20% of all prevalent *E. coli* infections during 2017 were multidrug-resistant, underscoring the need for continued surveillance. While antibiotic susceptibilities indicate that viable treatment options are available for *E. coli* infections in the MHS, some commonly prescribed antibiotics no longer display sufficient efficacy or are no longer recommended for treating select conditions. Further surveillance and analysis are warranted.



Contents

Abstract	ii
Background, Methods, and Limitations	1
Results	2
Section A – Descriptive Epidemiology	2
Incidence of <i>Escherichia coli</i>	2
Demographic Distribution of <i>Escherichia coli</i>	3
Seasonality	4
<i>Escherichia coli</i> Clinical Characteristics	5
Exposure Burden Metrics	6
Regional Epidemiologic Infection Classifications	8
Section B – Antimicrobial Resistance and Use	10
Regional Multidrug Resistance	10
Antibiogram	12
Antimicrobial Consumption/Prescription Practices	13
Discussion	14
References	16
Appendix A: Antibiotics Used to Identify Resistance among <i>Escherichia coli</i> Infections in the MHS, CY 2017	18
Appendix B: Acronym and Abbreviation List	19



Background, Methods, and Limitations

The EpiData Center (EDC) at the Navy and Marine Corps Public Health Center (NMCPHC) prepares a retrospective report each calendar year (CY) that summarizes the demographics, clinical characteristics, prescription practices, and antibiotic susceptibility patterns for *Escherichia coli* (*E. coli*) infections among Military Health System (MHS) beneficiaries. This report presents analytical results and discussion of CY 2017 data for *E. coli* infections in the MHS.

The background, methods, and limitations relevant to this analysis have been discussed in previous reports (CY 2015 and 2016 annual reports for *E. coli*^{1,2}). The CY 2017 report does not include an analysis of burden associated with deployment-related infections using Contingency Tracking System (CTS) data; all other methods and limitations are the same as in recent years. Recent literature reviews did not present any relevant developments in *E. coli* research since CY 2016 analyses.

The EDC also monitors other multidrug-resistant organisms (MDROs) of interest in the MHS.^{3,4}



Results

Section A – Descriptive Epidemiology

Incidence of *Escherichia coli*

In 2017, the annual incidence rate (IR) for *E. coli* infection among MHS beneficiaries treated at a military treatment facility (MTF) was 634.9 per 100,000 persons per year. This reflects a 7.0% change below the weighted historic IR. The observed decrease in the MHS IR was outside of the normal variation of two standard deviations from the weighted historic IR. The same pattern of decreasing trend and unexpected variation was observed in the Air Force and Army. Additionally, the Air Force and Army rates comprised 68.0% of the total MHS beneficiaries with an *E. coli* infection, suggesting that these service-specific rates were the main drivers of the overall MHS IR deviation from historical observations. The Navy and Marine Corps service-specific rates decreased from the weighted historic IR but remained within two standard deviations of the weighted historic IR.

Table 1. Incidence Rate (IR) for *Escherichia coli* Infections in the MHS, CY 2017

Population	2017 IR	Weighted Historic ^a IR 2014 - 2016	Two Standard Deviations: Weighted Historic ^a IR	2017	
				Direction	Percent Change ^b
MHS Beneficiaries	634.9	682.6	29.9	↓	7.0%
Air Force	582.3	628.1	37.6	↓	7.3%
Army	671.2	715.7	29.4	↓	6.2%
Marine Corps	671.6	718.5	51.4	↓	6.5%
Navy	593.0	645.5	14.3	↓	8.1%
DOD Active Duty	832.5	918.5	78.2	↓	9.4%

Rates are presented as the rate per 100,000 persons per year.

A green arrow indicates an increasing percent change and a blue arrow indicates a decreasing percent change.

^a Historic IR reflects the weighted average of the three years prior to the analysis year.

^b This reflects the percent change from the weighted historic IR to the IR of the current analysis year.

Data Source: NMCPHC HL7-formatted CHCS microbiology and MHS M2 databases.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, on 01 May 2018.



Demographic Distribution of *Escherichia coli*

In 2017, there were 59,646 incident *E. coli* species infections identified among all MHS beneficiaries treated at an MTF. Incidence among females was nearly 11 times higher than among males. Beneficiaries aged 18-24 years experienced the highest incidence rate among all age groups, followed closely by beneficiaries 25-34 years of age. Among beneficiary types, active duty (AD) service members had the highest incidence rate followed closely by family members (Table 2).

Table 2. Demographic Characteristics of *Escherichia coli* Infections in the MHS, CY 2017

	N = 59,646	
	Count	Rate
Gender		
Female	54,483	1,181.5
Male	5,163	107.9
Age Group (in Years)^a		
0-17	5,826	298.6
18-24	12,251	1083.1
25-34	12,310	1039.4
35-44	7,811	922.7
45-64	13,439	657.6
65+	8,008	357.8
Beneficiary Type		
Active Duty	11,448	842.3
Family Members	41,249	754.9
Retired	3,950	179.8
Other ^b	2,999	--

^a Age was unable to be classified in one record.

^b Rate is not reported due to variation in population denominator.

Rates are presented as the rate per 100,000 persons per year.

Data Source: NMCPHC HL7-formatted CHCS microbiology and MHS M2 databases.

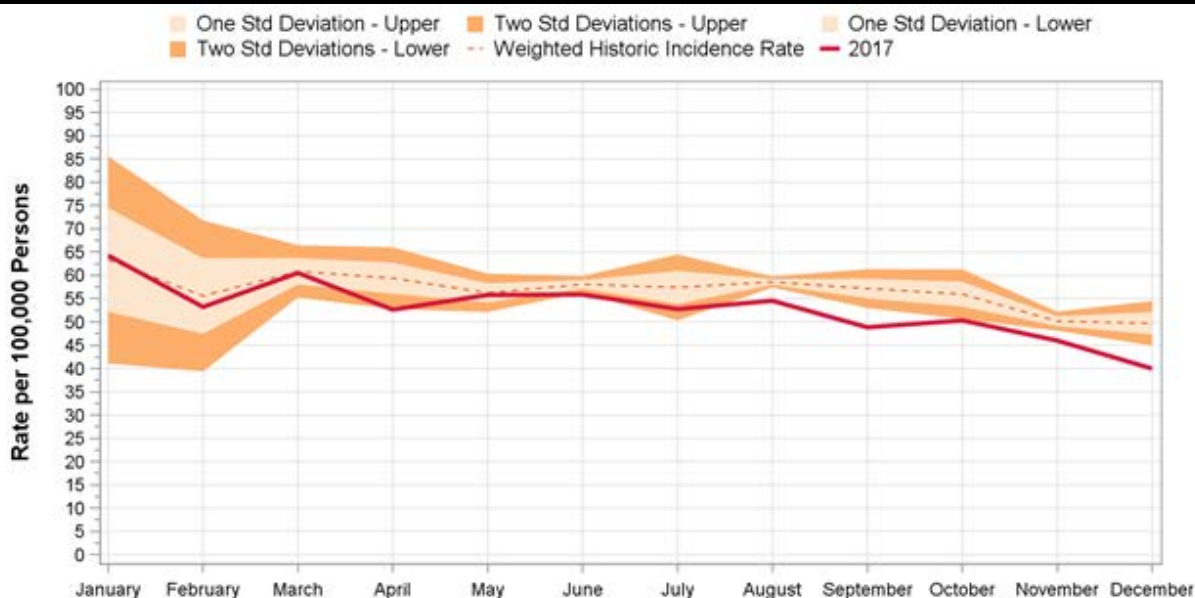
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Seasonality

Monthly IRs of *E. coli* infections in 2017 were below the weighted historic IR for all months of the year except January. The 2017 incidence rate was highest in January but did not exceed two standard deviations for the month. A downward trend in monthly IRs was observed from February to December, with seven months of the year lower than expected and more than two standard deviations below the weighted historic IR. February, March, May, and July IRs were consistent with prior historical observations (Figure 1).

Figure 1. Monthly Incidence of *Escherichia coli* Infections and Weighted Historic Incidence Rate (IR) Comparisons in the MHS, CY 2017



Rates are presented as the rate per 100,000 persons per year.
 Bands indicate one and two standard deviations above and below the weighted historic monthly IRs.
 The weighted historic monthly IR is a weighted average of the three years prior to the analysis year.
 Data Source: NMCPHC HL7-formatted CHCS microbiology and MHS M2 databases.
 Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, on 01 May 2018.



Escherichia coli Clinical Characteristics

There were 67,775 prevalent *E. coli* infections identified among all MHS beneficiaries treated at an MTF in 2017. The majority of *E. coli* specimens were collected in the outpatient setting (97.6%) as non-invasive infections (99.3%) from urine samples (96.6%) (Table 3).

Table 3. Clinical Characteristics of *Escherichia coli* Prevalent Infections in the MHS, CY 2017

	N = 67,775	
	Count	Percent
Specimen Collection Location		
Inpatient	1,599	20.3
Outpatient	66,176	97.6
Infection Type		
Invasive	491	0.7
Non-Invasive	67,284	99.3
Body Collection Site		
Blood	362	0.5
Respiratory	159	0.2
SSTI/Wound	987	1.5
Urine	65,476	96.6
Other	791	1.2

Data Source: NMCPHC HL7-formatted CHCS microbiology database.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, on 01 May 2018.



Exposure Burden Metrics

In 2017, there were 226,808 direct care inpatient admissions across all MHS MTFs. Table 4 details two multidrug-resistant (MDR) *E. coli* infection metrics related to community and healthcare exposures.

The admission MDRO prevalence rate measures the rate of MDR *E. coli* importation into the MHS and includes 1) hospitalized patients in 2017 that tested positive for the infection within the first three days of admission and 2) all other hospitalized patients in 2017 that tested positive for the infection or colonization in 2016. The 2016 samples are included in the calculation of the admission prevalence rate to estimate the reservoir of *E. coli* impacting the MHS. In 2017, the admission MDRO prevalence rate for *E. coli* infection was 10.7 per 1,000 inpatient admissions. Within the MHS, the US South region had the highest admission MDR *E. coli* prevalence rate (13.0 per 1,000 inpatient admissions), and the US South Atlantic region had the lowest rate (8.4 per 1,000 inpatient admissions).

The overall MDR *E. coli* prevalence rate measures the cumulative community reservoir and healthcare-associated exposure burden for *E. coli* and includes 1) hospitalized patients in 2017 that tested positive for the infection at any time during admission and 2) all other hospitalized patients in 2017 that tested positive for the infection or colonization in 2016. The 2016 samples are included in the calculation of the overall prevalence rate to estimate the reservoir of *E. coli* impacting the MHS. In 2017, the overall MDRO prevalence rate for *E. coli* infection was 11.4 per 1,000 inpatient admissions. The overall MDRO prevalence rate varied by region (ranging from 8.9 per 1000 inpatient admissions to 14.2 per 1,000 inpatient admissions).

By definition, admission MDRO prevalence infections are included in the calculation of the overall MDRO prevalence rate. In 2017, the admission prevalence rate comprised 94.1% of the overall prevalence rate of MRSA in the MHS (10.7 of the 11.4 per 1,000 inpatient admissions). This suggests that the majority of *E. coli* infections were imported into the MHS from the community reservoir.



Table 4. MDRO Community- and Healthcare-Associated Exposure Burden Metrics among *Escherichia coli* in the MHS, CY 2017

Region	Admission MDRO Prevalence ^a		Overall MDRO Prevalence ^b		Percentage ^d of Admission (Imported) Prevalent Infections among Overall Prevalent Infections
	Count	Rate ^c	Count	Rate ^c	
OCONUS	179	11.1	186	11.5	96.2
US Midwest	106	12.4	150	12.8	96.4
US Northeast	2	--	2	--	--
US South	686	13.0	750	14.2	91.5
US South Atlantic	651	8.4	690	8.9	94.3
US West	802	11.5	847	12.0	95.6
Total	2,426	10.7	2,577	11.4	94.1

^a Admission MDRO prevalence included hospitalized patients in 2017 that tested positive for the infection within the first three days of admission and all other hospitalized patients in 2017 that tested positive for the infection or colonization in 2016.

^b Overall MDRO prevalence included hospitalized patients in 2017 that tested positive for the infection at any time during admission and all other hospitalized patients in 2017 that tested positive for the infection or colonization in 2016.

^c Rates are presented as the rate per 1,000 inpatient admissions per year. Rates are not provided when the prevalence count is less than or equal to 5.

^d Percentage reflects the proportion of MDRO infections that were imported into the healthcare system in the calendar year.

Data Source: NMCPHC HL7-formatted CHCS microbiology and SIDR databases.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, on 01 May 2018.



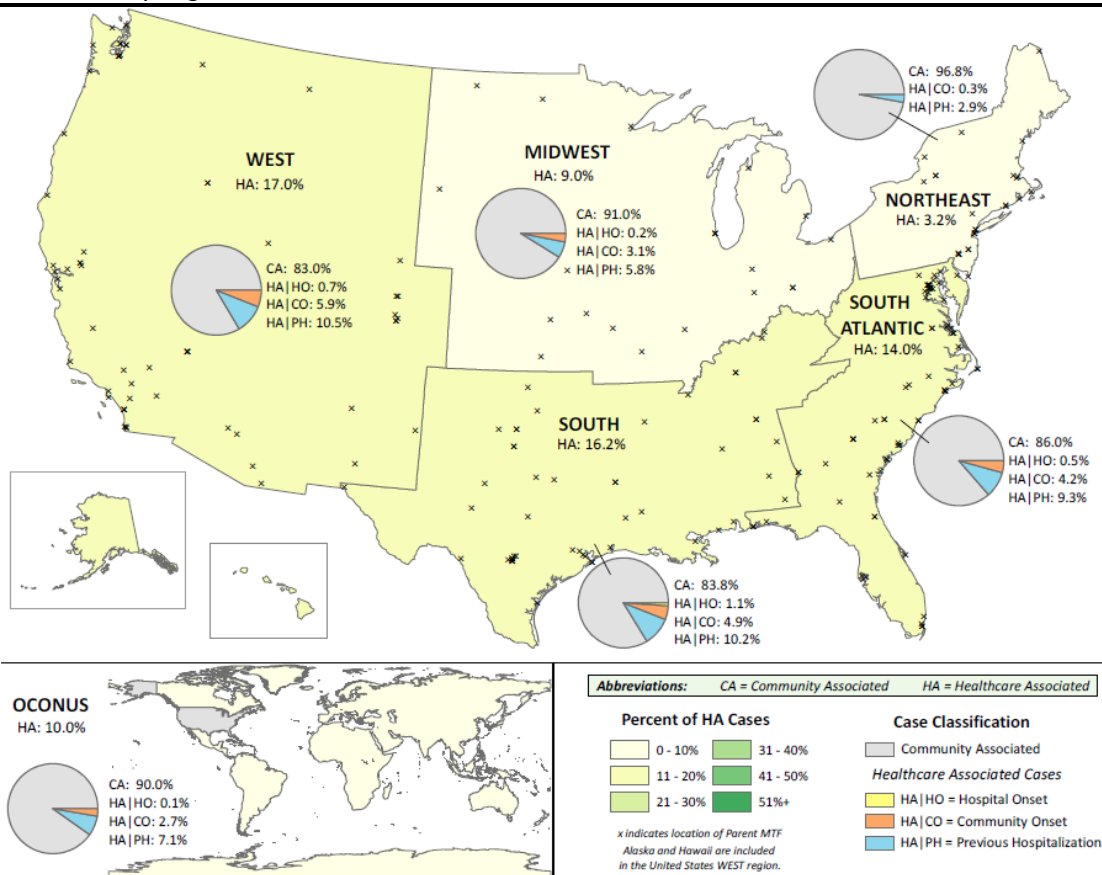
Regional Epidemiologic Infection Classifications

Among all prevalent *E. coli* infections identified in the MHS during 2017, 85.5% were community-associated (CA) cases and 14.5% were healthcare-associated (HA) cases. Regionally, the proportion of HA cases ranged from 3.2% in the US Northeast to 17.0% in the US West (Figure 2).

HA cases were further categorized into hospital-onset (HO), community-onset (CO), or previous hospitalization (PH) groupings. Among all prevalent *E. coli* infections (regardless of HA or CA classification or region), the greatest proportion was classified as PH cases (9.3%), indicating that the *E. coli* infections were not associated with a current admission but the patient had a prior hospitalization in the previous 12 months. The second largest proportion of prevalent infections was CO cases (4.5%), indicating that the specimens were collected within the first three days of hospital admission and the infection most likely originated from the community. Only 0.6% of prevalent *E. coli* infections were HO cases, indicating the infection was identified after the third day of admission and likely contracted during the current hospitalization (data not shown). A similar distribution of HA case classifications was observed by region, where PH cases accounted for the largest percentage, followed by CO cases and HO cases (Figure 2).



Figure 2. Proportion of Healthcare- and Community-Associated Cases among *Escherichia coli* Infection in the MHS by Region, CY 2017



Data Source: NMCPHC HL7-formatted CHCS microbiology, SIDR, and MHS M2 databases.
 Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, on 01 May 2018.



Section B – Antimicrobial Resistance and Use

Regional Multidrug Resistance

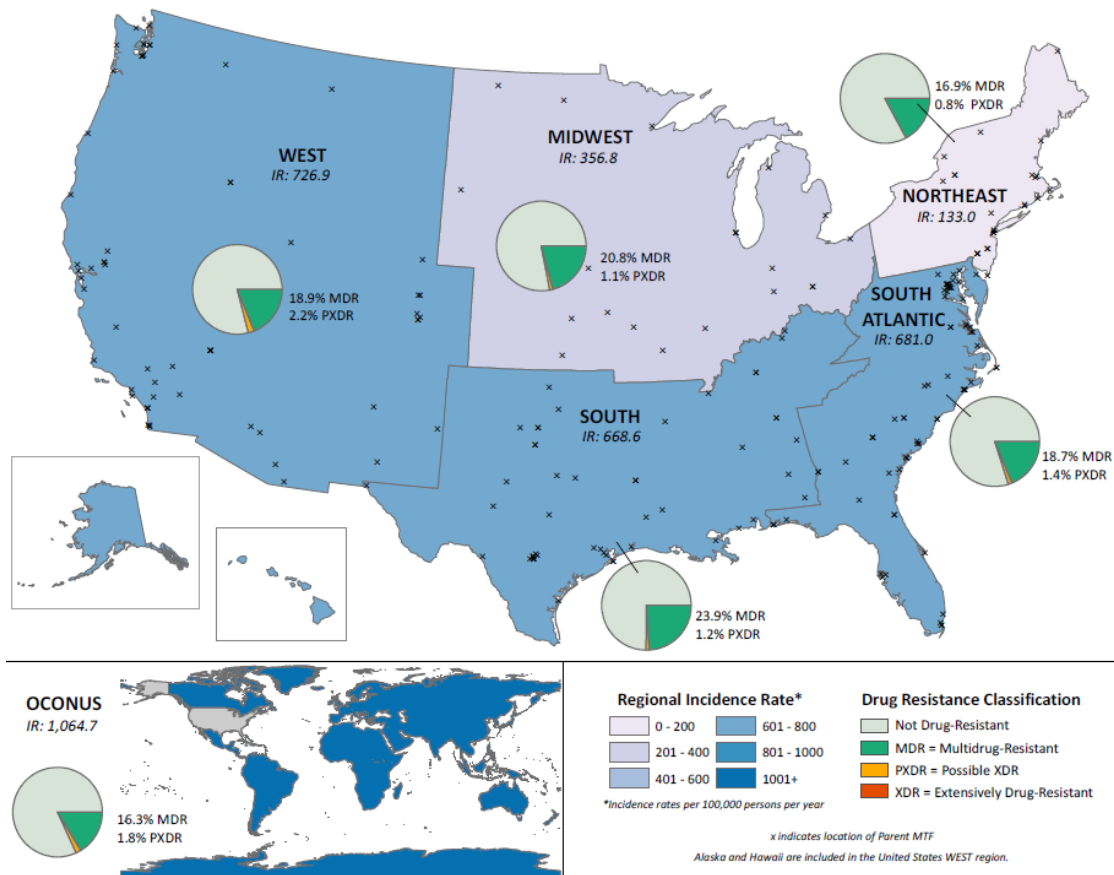
In 2017, the IR of *E. coli* was 634.9 infections per 100,000 persons per year; the IR of drug-resistant *E. coli* (i.e., resistant to antibiotics in at least three classes) was 120.6 infections per 100,000 persons per year. Regionally, locations outside the continental United States (OCONUS), as a group, had the highest total incidence rate of *E. coli* infections (1,064.7 per 100,000 persons per year). In the US, the total incidence rate of *E. coli* infections ranged from 133.0 per 100,000 persons per year in the Northeast to 726.9 per 100,000 persons per year in the West (Figure 3).

Approximately 21.5% of all prevalent *E. coli* infections were MDR, extensively drug-resistant (XDR), or possibly extensively drug-resistant (PXDR). Of these prevalent infections, the majority were MDR (20.0%) and 1.6% were PXDR. No XDR infections were identified among MHS beneficiaries in 2017. By region, the US West demonstrated the largest percentage of *E. coli* infections classified as PXDR at 2.2% (Figure 3).

Prevalent *E. coli* infections were also assessed for carbapenem resistance (CR). CR *E. coli* infections accounted for 0.01% (n=43) of prevalent infections, which were distributed across the US Northeast (n=1), US South (n=8), US Midwest (n=6), US West (n=2), and US South Atlantic (n=21) regions (data not shown).



Figure 3. Annual Incidence Rate (IR) and Percentage of Multidrug Resistance among *Escherichia coli* Infections in the MHS by Region, CY 2017



Rates are presented as the rate per 100,000 persons per year.

Data Source: NMCPHC HL7-formatted CHCS microbiology, SIDR, and MHS M2 databases.

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Antibiogram

Table 5 displays an antibiogram of *E. coli* incident infections for all MHS beneficiaries from 2012 to 2017. In 2017, *E. coli* was most susceptible to carbapenems, including ertapenem (99.9%), imipenem (99.8%), and meropenem (99.9%). *E. coli* was least susceptible to ampicillin (60.7%) and ampicillin/sulbactam (62.0%). Statistically significant decreases in susceptibility from 2012 to 2017 were observed among 12 of the 21 drugs commonly used to treat *E. coli* infections. Three antibiotics demonstrated significant increases in efficacy during the same period, though the increasing trends were minimal; these antibiotics included amoxicillin/clavulanate, nitrofurantoin, and trimethoprim/sulfamethoxazole.

Table 5. Antibiogram of *Escherichia coli* Infections Identified in the MHS, CY 2012-2017

Antibiotics	2012	2013	2014	2015	2016	2017	Susceptibility	Comment ^b
							Trend ^a	
Amoxicillin/Clavulanate	86.9	87.3	87.5	88.0	88.2	87.7		↑
Ampicillin	60.5	61.1	61.4	61.6	61.2	60.7		
Ampicillin/Sulbactam	67.6	65.3	64.2	63.9	63.0	62.0		↓
Cefazolin	92.6	91.7	91.4	91.0	90.0	90.5		↓
Cefepime	98.2	98.0	98.1	97.6	97.6	97.4		↓
Cefotaxime	98.6	98.5	98.3	98.3	97.6	97.1		↓
Ceftazidime	97.9	97.7	97.8	97.5	97.5	96.9		↓
Ceftriaxone	97.7	97.3	97.2	96.8	96.7	96.3		↓
Cefuroxime	95.7	95.2	95.2	94.6	94.5	93.3		↓
Ciprofloxacin	90.6	90.3	90.2	89.9	89.3	89.3		↓
Ertapenem	99.9	99.9	99.9	99.9	99.9	99.9		
Gentamicin	94.6	94.5	94.4	94.3	94.2	94.2		↓
Imipenem	99.9	99.9	99.9	99.9	99.9	99.8		
Levofloxacin	91.3	90.8	90.3	90.1	89.5	89.4		↓
Meropenem	99.9	100.0	100.0	100.0	99.9	99.9		
Moxifloxacin	91.5	92.3	90.9	90.7	88.8	89.2		
Nitrofurantoin	96.4	96.4	96.1	97.0	97.9	98.0		↑
Piperacillin/Tazobactam	98.3	97.7	97.8	97.8	97.9	97.4		↓
Ticarcillin/Clavulanate	92.5	91.5	92.4	92.4	93.3	94.3		
Tobramycin	95.2	94.8	94.5	94.6	94.4	93.9		↓
Trimethoprim/Sulfamethoxazole	81.3	81.6	82.0	81.8	81.9	81.3		↑

^a Susceptibility trends are displayed only for antibiotics with susceptibility data for at least five consecutive years.

^b Arrow indicates the antibiotics with a significant change in direction of trend for significant two-tailed Cochrane-Armitage tests for trend established for a single antibiotic over time. A significant increase in susceptibility is denoted by a green upward arrow and a significant decrease in susceptibility is denoted by a blue downward arrow.

Data Source: NMCPHC HL7-formatted CHCS microbiology database.

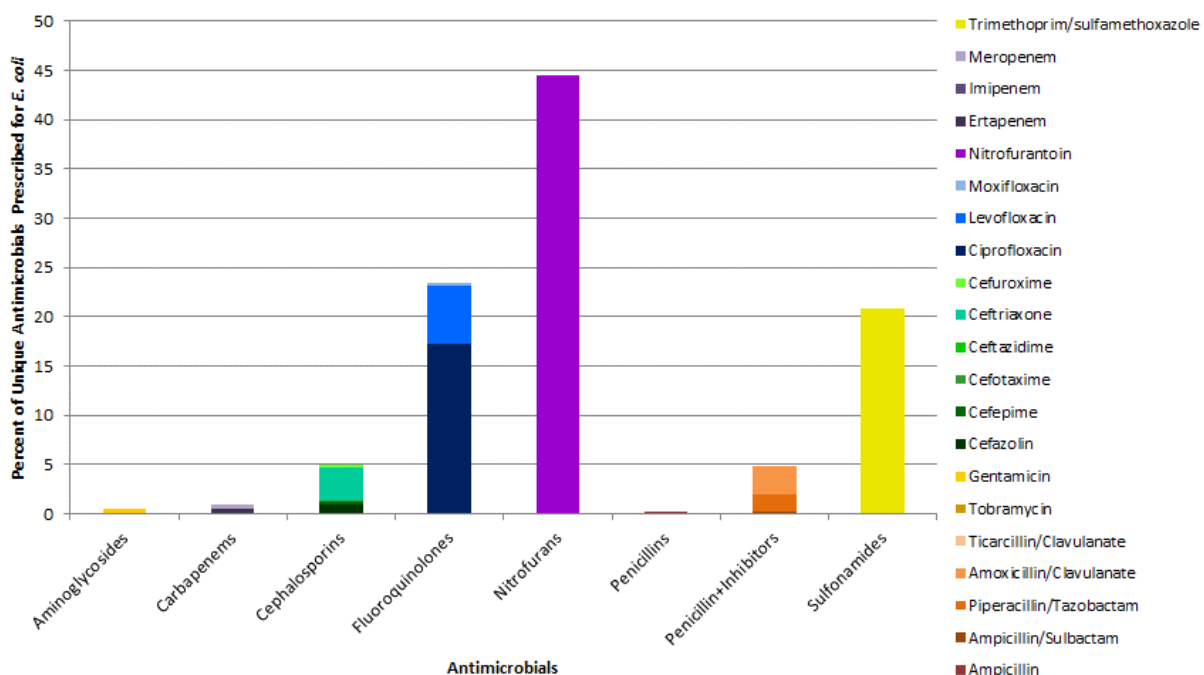
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Antimicrobial Consumption/Prescription Practices

Among all MHS beneficiaries, the most commonly prescribed antibiotic classes associated with *E. coli* infections in 2017 were nitrofurans (44.4%), followed by fluoroquinolones (23.4%) and sulfonamides (20.8%) (Figure 4). The most commonly administered antibiotic was nitrofurantoin (44.4%), followed by trimethoprim/sulfamethoxazole (20.8%).

Figure 4 *Escherichia coli* Infection and Prescription Practices in the MHS, CY 2017



Only the first occurrence of a unique antibiotic was counted per person per infection, regardless of administration route.

Data Source: NMCPHC HL7-formatted CHCS microbiology and HL7-formatted pharmacy databases.

Prepared by the EpiData Center, Navy and Marine Corps Public Health Center, on 01 May 2018.



Discussion

In 2017, the MHS *E. coli* IR demonstrated a 7.0% decrease from the weighted historic IR. The observed decrease was outside of the normal variation based on the weighted historical IR. Monthly IRs were also below their weighted historic IRs for seven months of the year. The January IR was the only monthly IR above the weighted historic IR which may be due in part to the *E. coli* incident infection definition. Only the first occurrence of an *E. coli* infection was counted per person per year; if a person had multiple episodes of an *E. coli* infection throughout the year (e.g., a recurrent *E. coli* UTI), the first would be counted once at the beginning of the year, resulting in seemingly inflated IRs early in the calendar year. Seasonal rates and variability cannot be corroborated by the literature, which has yet to determine a direct seasonal correlation due to the variety of illnesses and mechanisms through which *E. coli* causes disease.⁵

Evaluation of clinical and demographic characteristics found the *E. coli* IR in females was 11 times higher than males, and the majority of prevalent infections clinically manifested as urinary tract infections (UTIs) at 96.6%. These results are consistent with literature describing UTIs caused by *E. coli* as one of the most common extraintestinal infections among young, otherwise healthy, sexually active women.⁶ Screening practices may also contribute to higher rates of *E. coli* infections among females of reproductive age, as the Infectious Diseases Society of America (IDSA) and US Preventive Services Task Force recommend screening for asymptomatic bacteriuria among pregnant women and those undergoing urological procedures.^{7,8} Existing literature describing *E. coli* as the primary etiological agent for CA UTIs in the general US population also aligns with results demonstrated from this assessment, describing the majority of prevalent *E. coli* infections among MHS beneficiaries as CA (85.5%).^{7,9}

Resistant *E. coli* infections pose serious challenges to clinical treatment and can reduce mission readiness.¹⁰⁻¹³ CR *E. coli* infections comprised less than 1.0% of prevalent *E. coli* infections over the last three years. Even so, CR infections are difficult to treat and can contribute to a high rate of mortality.^{1,2,14} Almost 20% of all prevalent *E. coli* infections in MHS beneficiaries were classified as MDR in 2017, indicating resistance to at least one antibiotic from at least three different antibiotic classes. This finding is similar to estimates reported for the general US population; one study assessing over 30,000 outpatient urinary *E. coli* isolates from The Surveillance Network (TSN) Database USA during 2010 found 17% met the MDR definition, demonstrating resistance to three or more tested antimicrobial agents.¹⁵ In all MHS regions, MDRO healthcare-associated exposure burden metrics indicated high levels of importation of drug-resistant *E. coli* from the community to the healthcare setting. The admissions MDRO prevalence rate during 2017 accounted for approximately 94% of the overall MDRO prevalence metric, demonstrating the majority of MDRO burden for *E. coli* was identified within the first three days of an inpatient admission and thus more likely community-associated rather than a result of the hospital setting. These results underscore the need for drug-resistance surveillance outside of hospital settings.

E. coli infections in the MHS retained high susceptibilities to several antibiotics, indicating a range of viable treatment options. Nitrofurantoin, a first-line antibiotic recommended for uncomplicated UTIs in non-seriously ill patients,^{16,17} was the most commonly prescribed treatment identified



among MHS beneficiaries with *E. coli* infections in 2017. Antibiogram results support these treatment practices, as nitrofurantoin susceptibility was 98.0% in 2017. Trimethoprim/sulfamethoxazole and ciprofloxacin were the second and third most commonly prescribed antibiotics for *E. coli* infections during 2017, but, as of the most recently published Johns Hopkins Antibiotic Guide, neither are preferred treatments for UTIs caused by *E. coli*.¹⁷ The Johns Hopkins Antibiotic Guide indicates the use of trimethoprim/sulfamethoxazole for UTIs only when expected resistance rates are less than 20%; however, antibiogram results for this particular antibiotic during 2017 indicate resistance patterns among MHS beneficiaries nearly exceed this threshold (18.7%).¹⁷ Additionally, the recent increase in *E. coli* fluoroquinolone resistance has been demonstrated as related to increased prescribing practices, both in civilian and military cohorts.^{16,18} An assessment among DOD beneficiaries noted a moderate positive correlation between ciprofloxacin prescriptions and ciprofloxacin resistance for *E. coli* isolates from inpatient settings between 2010 and 2014.¹⁸ The current analysis identified a statistically significant decrease for ciprofloxacin susceptibility among *E. coli* infections, from 90.6% in 2012 to 89.3% in 2017.

In summary, this report documents a decrease in *E. coli* infection rates among MHS beneficiaries in 2017. The characteristics of *E. coli* infections in 2017 are consistent with existing literature reporting elevated rates among females, clinical presentation as UTIs, and a preponderance of CA cases. The large proportion of drug-resistant *E. coli* infections identified during 2017, along with elevated MDRO admission prevalence rates, underscore the need for surveillance outside of hospital settings. Finally, analysis of antibiotic susceptibility patterns indicate that viable treatment options are present for *E. coli* infections; however, the declining susceptibility of ciprofloxacin, in combination with resistance patterns from the general US population, merit further attention. Continued surveillance for *E. coli* is warranted to monitor any changes in burden, susceptibility, and treatment options and to guide targeted prevention efforts.

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Appendix A: Antibiotics Used to Identify Resistance among *Escherichia coli* Infections in the MHS, CY 2017

Table A1. Antibiotics Included in the Resistance Definitions for *Escherichia coli* in the DOD, CY 2017

Antibiotic Class	Antibiotics Included in Class
Aminoglycosides	Amikacin
	Gentamicin
	Tobramycin
Antipseudomonals penicillins & β -lactamase inhibitors	Piperacillin/Tazobactam
	Ticarcillin/Clavulanic Acid
Carbapenems	Ertapenem
	Imipenem
	Meropenem
1st and 2nd Generation Cephalosporins (non-extended spectrum cephalosporins)	Cefazolin
	Cefuroxime
3rd and 4th Generation Cephalosporins (extended spectrum cephalosporins)	Cefotaxime
	Ceftriaxone
	Ceftazidime
	Cefepime
Fluoroquinolones	Moxifloxacin
	Ciprofloxacin
	Levofloxacin
Nitrofurans	Nitrofurantoin
Sulfonamides	Trimethoprim/Sulfamethoxazole
Penicillins	Ampicillin
Penicillins & β -lactamase inhibitors	Amoxicillin/Clavulanic Acid
	Ampicillin/Sulbactam

Source: Magiorakos et al., 2012.¹⁹

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Appendix B: Acronym and Abbreviation List

Acronym/Abbreviation	Definition
AD	active duty
CA	community-associated
CHCS	Composite Health Care System
CO	community-onset
CONUS	continental United States
CR	carbapenem-resistant
CTS	Contingency Tracking System
CY	calendar year
DMDC	Defense Manpower Data Center
DOD	Department of Defense
DON	Department of the Navy
EDC	EpiData Center Department
HA	healthcare-associated
HL7	Health Level 7 format
HO	hospital-onset
IDSA	Infectious Diseases Society of America
IR	incidence rate
M2	MHS Data Mart
MDR	multidrug-resistant
MDRO	multidrug-resistant organism
MHS	Military Health System
MTF	military treatment facility
NMCPHC	Navy and Marine Corps Public Health Center
OCONUS	outside the continental United States
PXDR	possible extensively drug-resistant
PH	previous hospitalization
SIDR	Standard Inpatient Data Record
TSN	The Surveillance Network (TSN) Database USA
US	United States
UTI	urinary tract infection
XDR	extensively drug-resistant

