NHSN Antibiotic Use and Resistance Module Data Trends

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Objectives

- Establish access to CDC National Healthcare Safety Network Antibiotic Use and Resistance Module
- Interpret reports generated from the CDC NHSN AUR Module

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About the NHSN AUR Module

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Core Elements of Antibiotic Stewardship

Action
- Broad interventions
- Staff-pharmacy interventions
- Infection- and syndrome-specific interventions

Tracking
- NHSN AU and AR Options
- Stratification by unit and therapy

Reporting
- Optimize prescribing

Pollack and Srinivasan. CID, 2014.

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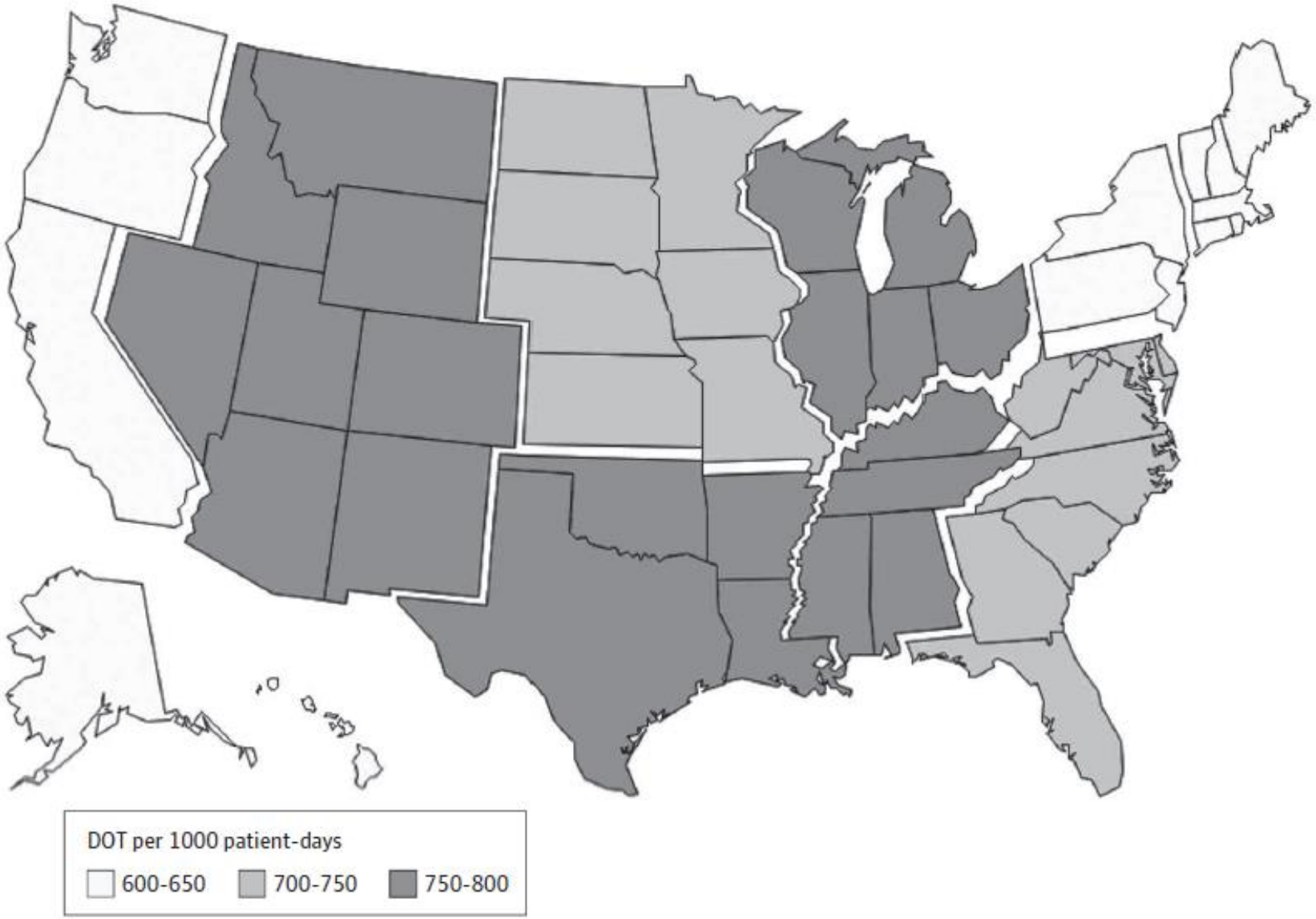
Figure 2. Mean DOT per 1000 Patient-days by US Census Division Between January 1, 2006, and December 31, 2012



Baggs, et. al. JAMA, 2016.

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Purpose of the NHSN AUR Module

- Mechanism for facilities to report
- Informs for local and regional efforts to reduce antimicrobial resistant infections through antimicrobial stewardship
- Antimicrobial Use
  - Facilitate risk-adjusted inter- and intra-facility benchmarking
  - Evaluate trends of antimicrobial usage over time
- Antimicrobial Resistance
  - Facilitates evaluation of antimicrobial resistance data using a standardized approach
  - Regional and national assessment of organisms of public health importance

Meaningful Use 3

Address high-impact measure areas that safeguard public health

Are patient-centered and meaningful to patients, clinicians and providers

Are outcome-based where possible

Fulfill requirements in programs' statutes

Minimize level of burden for providers

Identify significant opportunity for improvement

Address measure needs for population based payment through alternative payment models

Align across programs and/or with other payers

https://www.cms.gov/Regulations-and-Guidance

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Louisiana AUR Reporters By Year

Year	Antibiotic Use Module	Antibiotic Resistance Module
2017	8	7
2018	22	22
2019-01	10	7

Participation is limited to general acute care hospitals, long-term acute care hospitals (LTAC), inpatient rehabilitation facilities (IRF), oncology hospitals, and critical access hospitals enrolled in NHSN.

Antimicrobial Use

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Antibiotic prescriptions per 1000 persons by state (sextiles) for all ages — United States, 2016.

State	Number of prescriptions per 1000 persons, Rate
Kentucky	1,270
West Virginia	1,257
Mississippi	1,235
Louisiana	1,193
Alabama	1,188
Tennessee	1,169
Arkansas	1,131
Nebraska	1,040
Iowa	997
Kansas	964

CDC. Outpatient Antibiotic Prescriptions, 2016.

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Antimicrobial Use (AU) Data Reporting Requirements

- Indicate surveillance locations in the Monthly Reporting Plan
- CDA file for each location of data submitted
- Upload CDA files for all locations indicated on Monthly Reporting Plan

Reports Available in the AU Option

- Standardize Antibiotic Administration Ratio (SAAR)
- Rate Table – Drugs predominantly used for extensively AR bacteria
- Line Listing of AU Data (FacWideIn, By Location)
  - Most recent month
  - All submitted AU data
- Rate Tables
  - Antimicrobial Utilization Rates
  - Selected Drugs
- Pie Charts
  - AU Data by Antibacterial Class and Location
  - Antifungal Class and Location
  - Anti-Influenza Class and Location
- Bar Charts
  - AU Data by Antibacterial Class and Location
  - Antifungal Class and Location
  - Anti-Influenza Class and Location

Standardized Antimicrobial Administration Ratio

- SAAR is an Observed-to-Predicted (O-to-E) ratio
  - Observed antibiotic use – Days of therapy reported by a healthcare facility for a specified category of antimicrobial agents in a specified patient care location or group of locations
  - Predicted antibiotic use – Days of therapy predicted for a healthcare facility's use of a specified category of antimicrobial agents in a specified category patient care location or group of locations on the basis negative binomial regression modeling applied to nationally aggregated AU data
- The SAAR metric is constructed by using an indirect standardization method for comparing observed to predicted days of therapy

Dutra. NHSN Training, 2018.

Graph 1. Rates and 95% CI – Drugs Predominantly Used for Extensively AR Bacteria, December 2018 (N = 21)

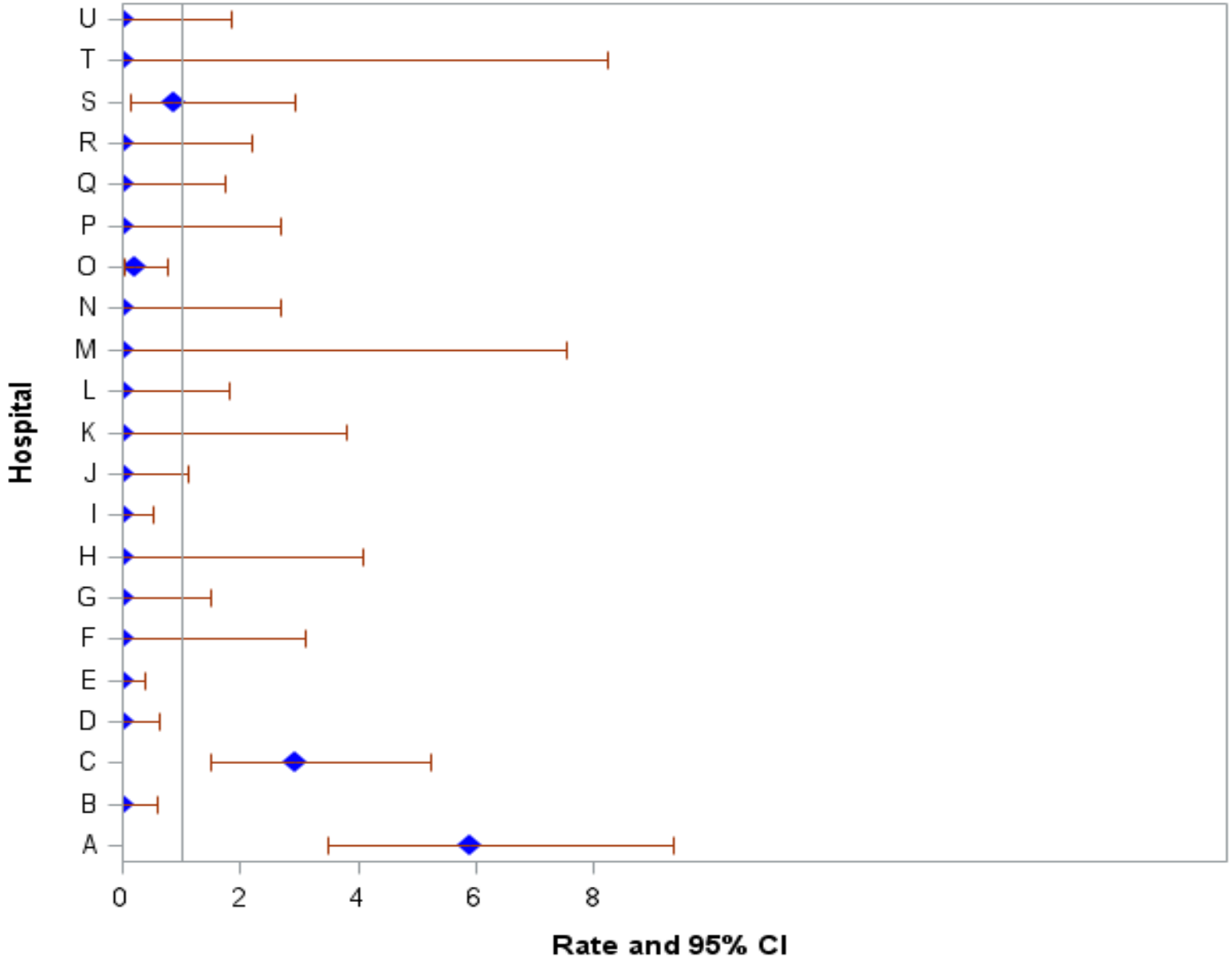


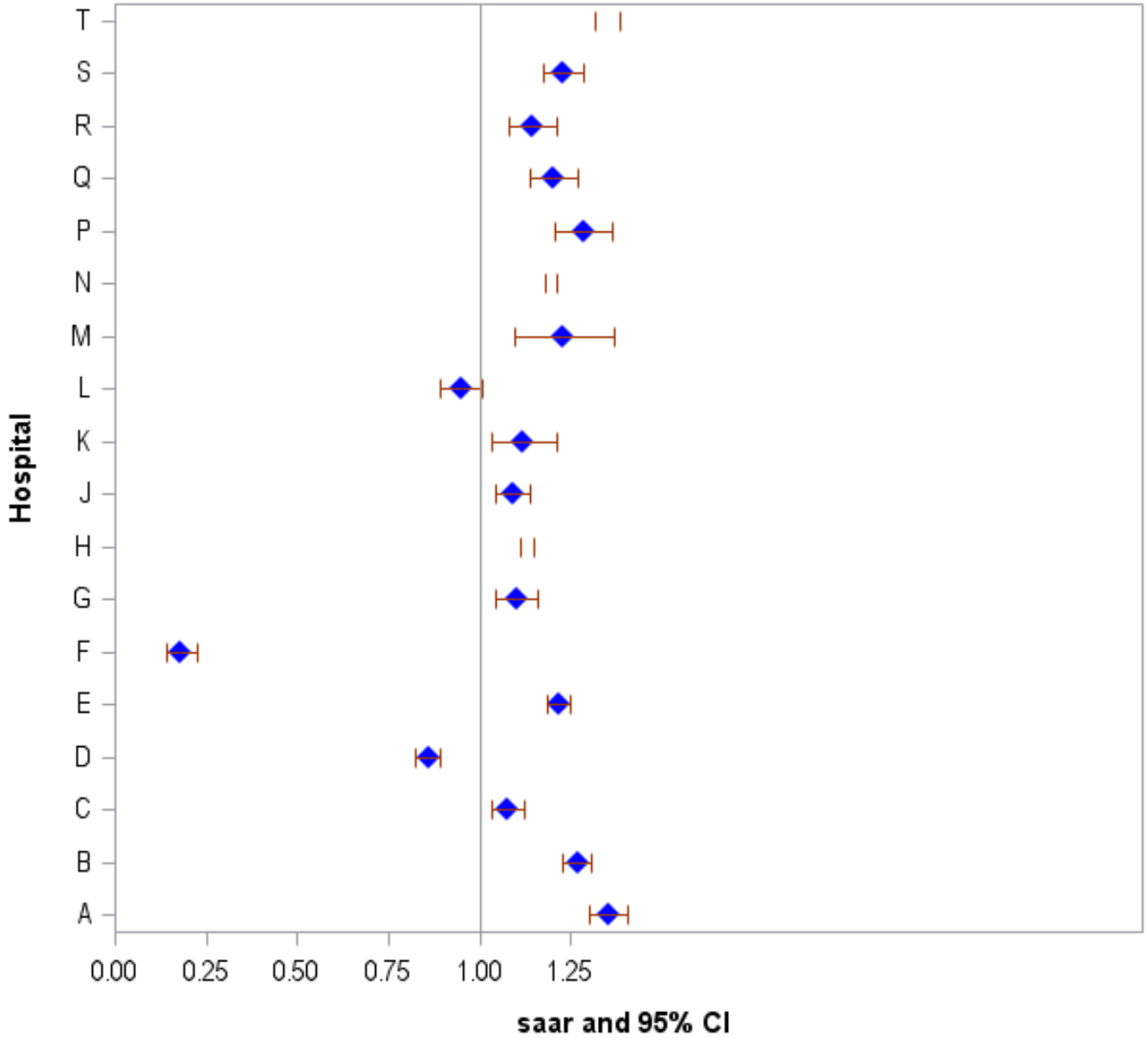
Table 1. Fluoroquinolone Rate Table – February 2019 (N = 13)

Facility	Antimicrobial Days	Rate Days Present	Rate Admissions	Beds	CDI Test Type
A	244	48.868	27.051	238	EIA
B	208	34.357	13.684	232	NAAT
C	685	79.466	46.253	328	NAAT
D	197	50.799	25.256	167	EIA
E	32	17.947	9.091	350	NAAT
F	532	72.145	37.518	330	NAAT
G	808	72.214	37.564	393	NAAT
H	223	68.679	30.054	152	EIA
I	175	115.435	53.517	52	NAAT
J	172	175.689	78.899	140	NAAT
K	25	47.619	56.818	27	
L	20	9.407	4.228	175	EIA
M	14	20.349	12.844	85	NAAT

Table 2. Carbapenem Rate Table – February 2019 (N = 13)

Facility	Rate Days Present	Rate Admissions	Num Beds
A	34.649	19.18	238
B	18.005	7.171	232
C	40.603	23.633	328
D	13.409	6.667	167
E	3.926	1.989	350
G	35.937	18.688	330
H	22.165	11.53	393
I	32.338	14.151	152
J	10.554	4.893	52
K	41.879	18.807	140
L	22.857	27.273	27
M	15.052	6.765	175
N	0	0	85

Graph 2. SAAR and 95% CI – All Antibacterial Agents in Adult Locations, December 2018 (N = 21)



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Example of AU Data By Antibacterial Class and Location Report

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Table 3. Proportion of 30-Day Antibiotic-Associated Adverse Drug Events in 1488 Hospitalized Patients Receiving Systemic Antibiotic Therapy[a]

Antibiotic Agent	No. of Patients Receiving Agent	No. (%)						
		Cardiac	Gastro-intestinal[b]	Hematologic	Hepato-biliary	Renal	Neurologic	Other Events[c]
β-Lactams[d]	1187	0	59 (5.0)	27 (2.3)	6 (0.5)	17 (1.4)	10 (0.8)	2 (0.2)
Ampicillin	63	0	2 (3.2)	1 (1.6)	1 (1.6)	1 (1.6)	0	0
Amoxicillin-clavulanate	102	0	3 (2.9)	0	0	0	0	0
Ampicillin-sulbactam	52	0	1 (1.9)	0	0	2 (3.8)	0	0
Oxacillin	33	0	4 (12.1)	1 (3.0)	2 (6.0)	0	0	0
Piperacillin-tazobactam	315	0	16 (5.1)	4 (1.3)	1 (0.3)	1 (0.3)	1 (0.3)	1 (0.3)
Cefazolin	79	0	0	1 (1.3)	0	2 (2.5)	0	0
Ceftriaxone	607	0	14 (2.3)	11 (1.8)	3 (0.5)	5 (0.8)	1 (0.2)	0
Cefpodoxime	89	0	2 (2.2)	0	0	0	0	0
Cefepime	414	0	10 (2.4)	6 (1.4)	0	6 (1.4)	7 (1.7)	1 (0.2)
Ertapenem	85	0	3 (3.5)	0	0	0	0	0
Meropenem	80	0	4 (5.0)	3 (3.8)	0	0	1 (1.3)	0
Non-β-lactams								
Aminoglycosides	32	0	0	0	0	2 (6.3)	0	0
Azithromycin	400	1 (0.3)	1 (0.3)	0	4 (1.0)	0	0	0
Clindamycin	193	0	3 (1.6)	0	0	0	0	0
Daptomycin	8	0	0	0	0	0	0	1 (12.5)
Doxycycline	57	0	2 (3.5)	0	0	0	0	0
Fluoroquinolones	394	1 (0.3)	5 (1.3)	1 (0.3)	3 (0.8)	1 (0.3)	1 (0.3)	1 (0.3)
Linezolid	23	0	0	0	0	0	1 (4.3)	0
Metronidazole	175	0	1 (0.6)	0	0	0	1 (0.6)	0
Trimethoprim-sulfamethoxazole	155	0	5 (3.2)	0	0	6 (3.9)	0	1 (0.6)
Intravenous vancomycin	544	0	2 (0.4)	0	0	19 (3.5)	0	2 (0.4)
Any antibiotics	1488[e]	2 (0.1)	78 (5.2)	28 (1.9)	13 (0.9)	45 (3.0)	13 (0.9)	7 (0.5)

Tamma, et al. JAMA Int Med, 2017.

Antimicrobial Resistance

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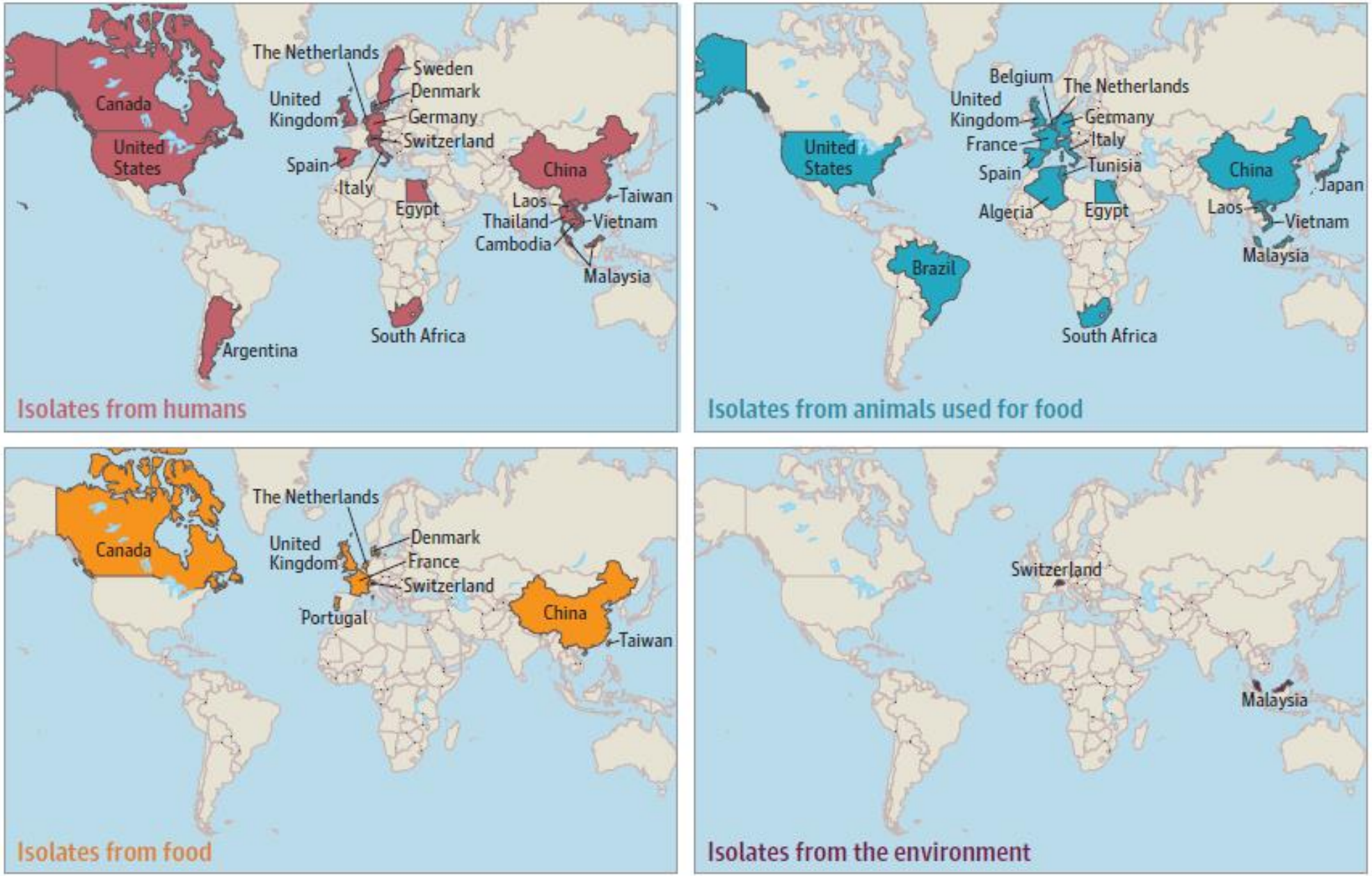
Examples of the Consequences of Antibiotic Resistance

Problem	Example	Consequences	Responses	Problems with Mitigation
Infections Cause by MDR Bacteria	E. coli bacteremia treated with ceftriaxone	Inadequate therapy/delay in effective therapy	Guideline alteration with carbapenems for empiric therapy	Over use of broad spectrums
Colonization with MDR Bacteria	Failure of FQ to prevent infection by resistant strains of E. coli	Additional infections	Guideline alteration, with fosfomycin, etc.	Likely ineffective therapy
Infections Cause by non-MDR Bacteria	Vancomycin for MSSA	Less efficacious treatment	Antimicrobial stewardship to limit use of Vanc	Cost; under-treatment of MRSA
Hospitalization	Spread of VRE clones in a unit	Additional infections	VRE targeted inf ctrl measures	Cost; negative effects of patients related to isolation

Friedman, et al. Clin Micro of Inf Dis, 2015.



Marston, et al. JAMA, 2016.

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Antimicrobial Resistance (AR) Data Reporting Requirements

- Indicate surveillance locations in the Monthly Reporting Plan
- Two record types must be reported for each month of surveillance:
  - One file for each isolate-based report
  - One file for the denominator data report (FacWideIN)

CDC. NHSN Patient Safety Manual, 2019.

Reports Available in the AR Option

- Line Listing – All Antimicrobial Resistance Events
- Bar Chart – All antimicrobial Resistance Events
- Line Listing – Antimicrobial Resistant Organisms
- Frequency Table – Antimicrobial Resistant Organisms
- Facility-wide Antibiogram (Percent Non-Susceptible)
- Rate Table – Antimicrobial Resistance Percentages
- Line Listing – All AR Summary Data

Eligible Organisms

- *Acinetobacter*
- *Candida albicans*
- *Candida glabrata*
- *Citrobacter freundii*
- *Enterobacter*
- *Enterococcus faecalis*
- *Enterococcus faecium*
- *Enterococcus spp. (when not specified to the species level)*
- *Escherichia coli*
- *Group B Streptococcus*
- *Klebsiella oxytoca*
- *Klebsiella pneumoniae*
- *Morganella morganii*
- *Proteus mirabilis*
- *Pseudomonas aeruginosa*
- *Serratia marcescens*
- *Staphylococcus aureus*
- *Stenotrophomonas maltophilia*
- *Streptococcus pneumoniae*

Table 2. Example of Aggregate Antibiogram Using MRSA – Louisiana, December 2018 (N = 12)

Facility	Number Isolated	Number Tested	Number Resistant
A	10	10	7
B	11	11	6
C	37	27	16
D	3	3	1
E	2	2	1
F	12	12	5
G	6	5	5
H	5	5	3
I	1	1	1
J	5	3	3
K	1	1	1
L	1	1	0

Table 3. Example of Aggregate Antibiogram Using CRE–Louisiana, December 2018 (N = 13)

Facility	No. Isolated	No. Tested	No. Resistant	%Resistant
A	109	109	0	0
B	29	29	0	
C	170	170	0	0
D	34	34	0	0
E	34	34	0	0
F	123	123	0	0
G	148	148	0	0
H	45	43	0	0
I	23	2	0	
J	53	52	2	3.8
K	37	5	0	
L	29	29	0	
M	30	30	0	0

Getting Started with the AUR Module

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Getting Started!

START AT YOUR CORE!

- Leadership Commitment
- Accountability
- Drug Expertise
- Action
- Tracking
- Reporting
- Education

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Informatics and I.T. Infrastructure Needed By Option

Antimicrobial Use

- Electronic Medication Administration Record (eMAR) or Bar Coding Medication Administration (BCMA) systems
- Clinical Document Architecture

Antimicrobial Resistance

- Electronic Laboratory Information System (LIS) and Admission Discharge Transfer (ADT) System
- Clinical Document Architecture

https://www.cdc.gov/nhsn/PDFs/training/AUR-training.pdf

www.ldh.la.go/HAI

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