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Antimicrobial Stewardship Data for Action and Education

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PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS

Objectives

1. Give examples of how analysis of antibiotic-use data has helped identify common opportunities for stewardship
2. Discuss approaches to using data to improve prescribing practices
3. Explain how antibiotic use is tracked in Minnesota care settings and how statewide outpatient prescribing rates can be used to educate patients and providers

Presentation Outline

- **Antimicrobial Stewardship Measurement Background**
- **Overview of Prescribing in the U.S.**
- **Evidence Base for Using Data to Drive Practice Change**
  - Benchmarking
  - Audit, Feedback, and Peer Comparison
  - Syndrome-Specific AU Tracking and Interventions
- **Tools to Harness Clinical AU Data**
  - NHSN AUR Module
  - Home-Grown Data Visualization
  - MDH Long-Term Care Infection Tracking Tool
  - Point Prevalence Surveys
- **Population Data to Drive Change**

Types of Antimicrobial Stewardship (AS) Measures

- Antimicrobial use (AU) data
  - Hospitals: days of therapy or defined daily dose
  - Outpatient facilities: prescriptions written
- AS process measures
  - Compliance with facility protocols, record-keeping
- Outcome measures
  - *Clostridioides difficile,* resistant infections
  - Adverse antibiotic events
- Antimicrobial stewardship program (ASP) implementation data
  - Implementation of CDC Core Elements of Antimicrobial Stewardship

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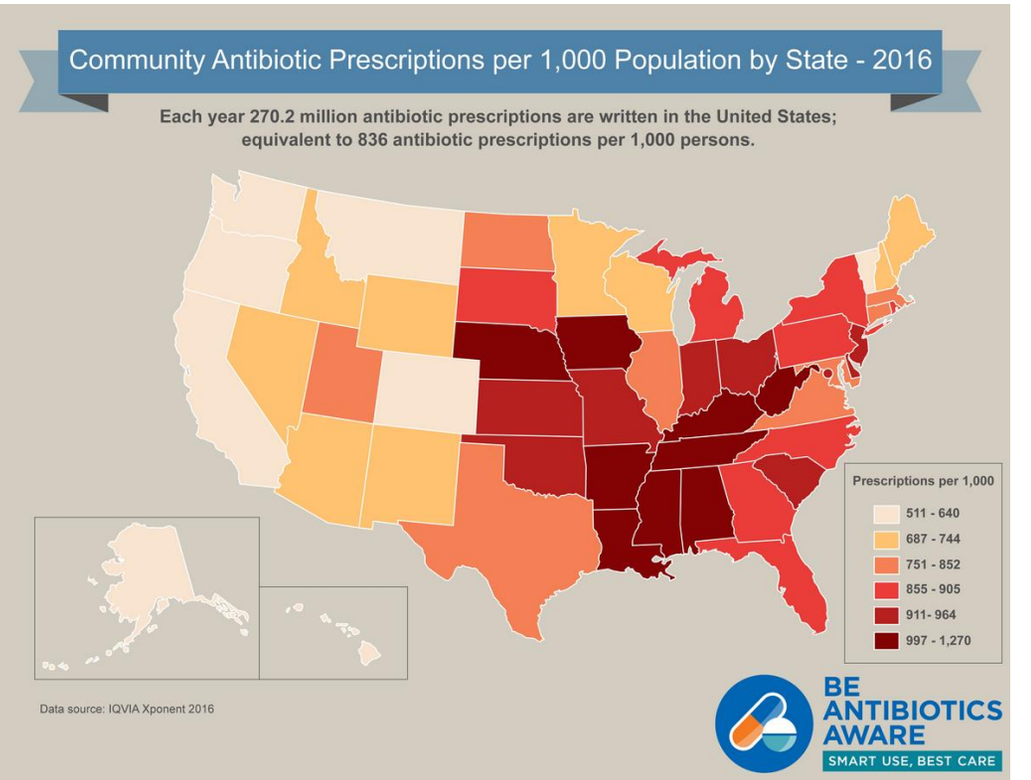
Why are data important to AS?

- Establish baseline
- Measure change over time
- Benchmark against others
- Identify intervention opportunities
- Define determinants of practice
- Allocate resources
- Understand overall state of practice
- Inform guideline development and policy-making



AU Data Sources

Facilities and health systems

- Electronic medical record system
- Pharmacy system
- Manual chart review
- NHSN Antimicrobial Use and Resistance Module
- Claims data

Academia and public health

- Claims data
  - e.g., Medicare, all payer claims databases
- National datasets
  - e.g., National Ambulatory Medical Care Survey
- Quality measures
  - e.g., Healthcare Effectiveness Data and Information Set (HEDIS)
- Proprietary datasets
  - e.g., IQVIA Xponent
- NHSN Antimicrobial Use and Resistance Module

AU Measurement Approaches

- **Antimicrobial use (AU) data**
  - Total use measure
  - Appropriateness of use
  - Cost
- **Stratification categories**
  - Drug class
  - Provider type
  - Syndrome/diagnosis
  - Hospital unit
- **Approaches to measurement**
  - Prospective tracking
  - Retrospective measurement
  - Point prevalence survey

AU data can differ by facility but should be:

Accessible

Manageable

Repeatable

Meaningful

Data Used to Establish Baseline Understanding of Inpatient AU

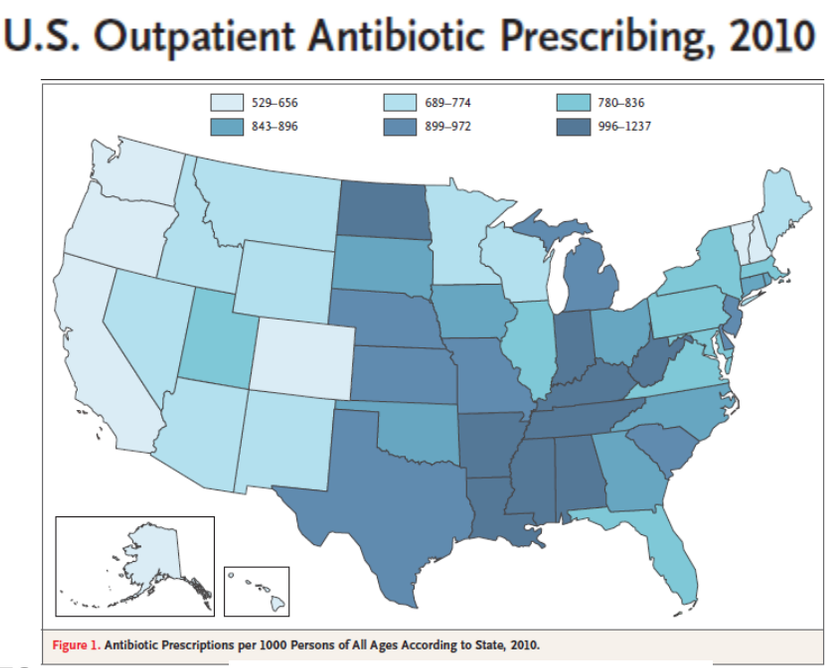
- Hospitals
  - Approximately 50% of hospitalized patients receive an antibiotic[1,8]
  - 20–50% of antibiotic use in hospitals is likely unnecessary or inappropriate[1-3]

- Long-Term Care
  - Prevalence of antimicrobial use among residents is ~11%[4, 5]
  - Up to 75% of antibiotics might be prescribed incorrectly[6,7]
  - Antibiotics particularly overprescribed for urinary tract infection, respiratory tract infection

1. Fridkin SK et al. MMWR. Morbidity and mortality weekly report. 2014;63.
2. Camins BC et al. nfect Control Hosp Epidemiol 2009 October ; 30(10): 931–938. doi:10.1086/605924
3. CDC. Core Elements of Hospital Antimicrobial Stewardship Programs. https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html
4. Eure T, et al. Inf Contr Hosp Epi. 2017 Aug;38(8):998-1001
5. Pakyz AL, et al. Inf Contr Hosp Epi. 2010 June;31(6):661-662
6. Lim CJ et al. Clin Interven Aging. 2014; 9: 165-177
7. Pickering T et al. J Am Geriatr Soc 1994;42:28-32,1994
8. Magill SS., et al. N Engl J Med 2014;370:1198-208.

Data Used to Establish Baseline Understanding of Outpatient AU

- Outpatient
  - In 2010, 5 prescriptions written yearly for every 6 people in the U.S.[1]
  - 13% of visits result in antibiotic prescription, and ≥ 30% of prescriptions are inappropriate or unnecessary[2]
  - ≥ 50% of outpatient prescriptions are unnecessary for upper respiratory infections[2]
  - 52% of patients with sinus infection, middle-ear infection, pharyngitis receive recommended first-line antibiotics[3]
  - Children <2 years receive the most antibiotics (1.3/child/year)[2]
- Dentistry
  - Dentists prescribe 10% of outpatient antibiotics[4]
  - Dentists prescribe some antibiotic classes not usually indicated in dentistry (e.g., quinolones, urinary anti-infective agents)



1. Hicks LA et al. N Engl J Med. 2013;368(15):1461–2
2. Fleming-Dutra K, et al. JAMA 2016;315(17)
3. Hersh AL et al. JAMA Intern Med. Published online October 24, 2016.doi:10.1001/jamainternmed.2016.6625
4. Hicks LA, et al. CID. 2015;60(9):1308–16
5. Roberts R., et al. JADA 2018;148(3):172-178.

Professions, Settings, Regions Have Different Needs

- Patient, practice, and provider characteristics are associated with inappropriate prescribing,[1,2]
  - National and local data stratified by provider these characteristics can be used to target education and AS interventions
  - Recognize that professions and settings have different prescribing norms and needs for AS support
  - Awareness of how different professions prescribe can help target continuing education and resources, and changes can be tracked over time
  - Profession-wide prescribing challenges might benefit from pre-professional AS education

- Performance for appropriate outpatient antibiotic prescribing varies by state, region, health plan[3,4]

1. Schmidt ML., et al. Inf Contr Hosp Epi 2018;39:307-315.
2. Palms D., et al. JAMA Int Med 2018;178(9):1267-1270.
3. Roberts R, et al. 2016. American Journal of Managed Care 22(8): 519-523
4. CDC. Outpatient antibiotic prescriptions — United States, 2014. Available at: https://www.cdc.gov/antibiotic-use/community/pdfs/annual-reportsummary_2014.pdf

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Evidence Base for Using Data to Drive Practice Change:

Benchmarking

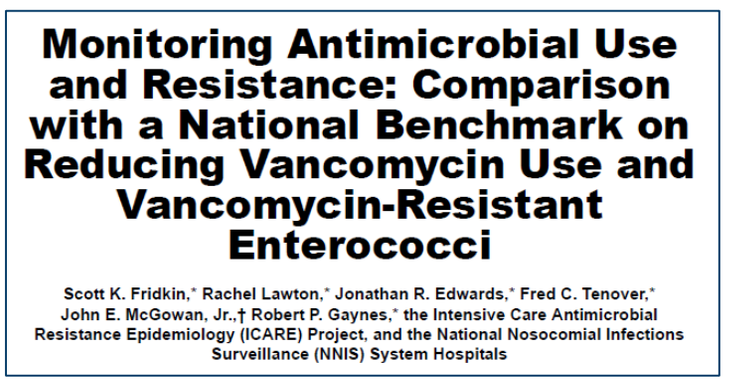
Benchmarking

- **What is benchmarking?**
  - Comparison of AU measures to internal or external standards
  - Benchmarking is recommended as a key part of hospital ASP
- **Goal**
  - Identify hospitals, units, individual prescribers whose AU deviates from expected
- **Impact**
  - Helps identify AU outliers, target interventions, track over time
- **Risk adjustment**
  - Makes comparison of hospitals more meaningful by controlling for inter-hospital differences
  - Patient population (patient mix), unit type will impact needs for antimicrobial use
- **Caveats**
  - Cannot identify inappropriate prescribing
  - Does not include any diagnostic component

1. CDC. Core Elements of Hospital Antimicrobial Stewardship Programs.
2. Dellit TH, et al. Clin Infect Dis 2007;44(2):159–77.
3. Fridkin SK, Srinivasan A.. Clin Infect Dis 2014;58(3):401–6.
4. Polk RE. CID 2011;53(11):1 100-10.

Benchmarking in Action

- **Vancomycin use targeted for reduction in hospitals, Fridkin et al. 2002**
  - Hospitals participating in ICU vancomycin-resistant enterococci surveillance invited to participate
- **Benchmarking intervention**
  - Each hospital received local hospital area data, benchmarked to national data
  - Stratified by hospital type (e.g., ICU, non-ICU) for risk adjustment
  - Benchmark data disseminated to hospital committees, personnel
- **Outcomes**
  - Some ICUs identified unit-specific practices for improvement
  - Significant decreases in vancomycin use
    (mean decrease=48 DDD/1,000 patient days)
  - Stratification provided meaningful comparisons to target unit-specific practice changes


Monitoring Antimicrobial Use and Resistance: Comparison with a National Benchmark on Reducing Vancomycin Use and Vancomycin-Resistant Enterococci

Scott K. Fridkin,* Rachel Lawton,* Jonathan R. Edwards,* Fred C. Tenover,* John E. McGowan, Jr.,† Robert P. Gaynes,* the Intensive Care Antimicrobial Resistance Epidemiology (ICARE) Project, and the National Nosocomial Infections Surveillance (NNIS) System Hospitals

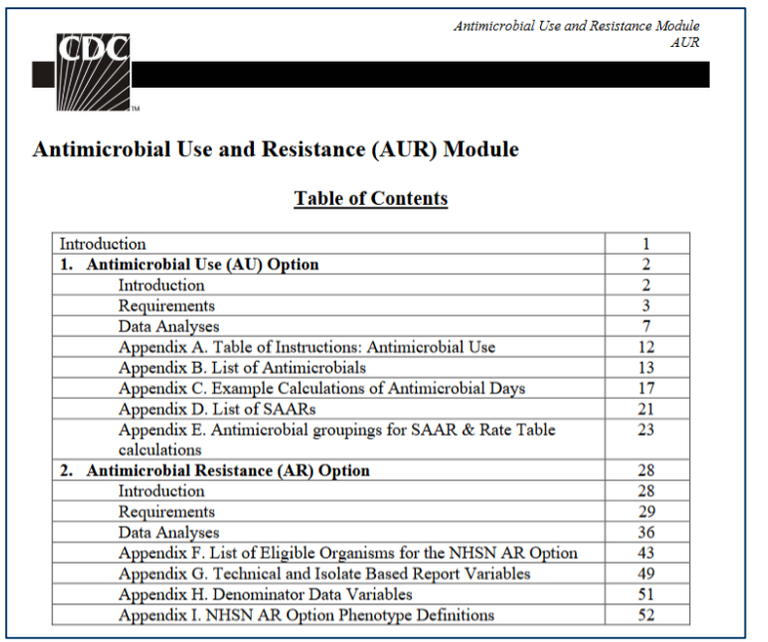
Fridkin SK. Et al. EID. Vol. 8, No. 7, July 2002

Benchmarking with the NHSN AUR Module

- National Healthcare Safety Network (NHSN) is CDC's system for tracking and reporting healthcare-associated infections
  - Mainly used by hospitals
- The Antibiotic Use and Resistance (AUR) Module is a NHSN component used to:
  - Track hospital AU and/or AR
  - Highlight patient care areas for possible intervention
  - Facilitate benchmarking with other hospitals
  - First data were uploaded in July 2012

NHSN AU Option

- Key features
  - Data usable by submitting hospitals, CDC, state public health agencies
  - Single set of technical specifications and standard definitions
- Electronic data
  - Medication administration data
  - Admission and transfer data
  - No personal identifiers
  - Data submission to NHSN
  - Unlike other NHSN data, electronic file submission only



Antimicrobial Use and Resistance Module
AUR

Antimicrobial Use and Resistance (AUR) Module

Table of Contents

Flow of Antibiotic Use Data AUR Module

Medication administration record data

Health IT Vendor Services/Software

Extracted along with admission and discharge data

Clinical Document Architecture CDA

Formatted and submitted electronically

NHSN National Healthcare Safety Network

Stored on NHSN Servers

Hospital staff can access and analyze using NHSN-platform tools, and/or download data for further analysis

Benchmark Measure: Standardized Antimicrobial Administration Ratio (SAAR)

- SAAR is a ratio measure =

$$\frac{\text{Observed (actual) antimicrobial days}}{\text{Expected (predicted) antimicrobial days}}$$

- SAAR is risk adjusted with the expected number calculated from a statistical model*
- Adjusted for:
  - Hospital characteristics (e.g., size, teaching status)
  - Ward type (general vs. ICU)
  - Patient group (adult/pediatric)

Statistically significant SAAR

- **>1 signals more antibiotic use than peers**
- **<1 signals less antibiotic use than peers**
- **Does not in itself assess whether prescribing is appropriate or not**

*Katharina L van Santen, Jonathan R Edwards, Amy K Webb, Lori A Pollack, Erin O'Leary, Melinda M Neuhauser, Arjun Srinivasan, Daniel A Pollock; The Standardized Antimicrobial Administration Ratio: A New Metric for Measuring and Comparing Antibiotic Use, *Clinical Infectious Diseases*, ciy075, https://doi.org/10.1093/cid/ciy075

SAARs Currently Available through NHSN AUR Module

- All antibacterial agents
- Broad-spectrum agents predominantly used for hospital-onset infections
- Broad-spectrum agents predominantly used for community-acquired infections
- Antibacterial agents predominantly used for resistant Gram-positive infections (e.g., MRSA)
- Narrow-spectrum beta-lactam agents
- Antibacterial agents posing the highest risk for *C. difficile* infection
- Antifungal agents predominantly used for invasive candidiasis
- Azithromycin (pediatric only)

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Evidence Base for Using Data to Drive Practice Change:

Audit and Feedback with Peer Comparison

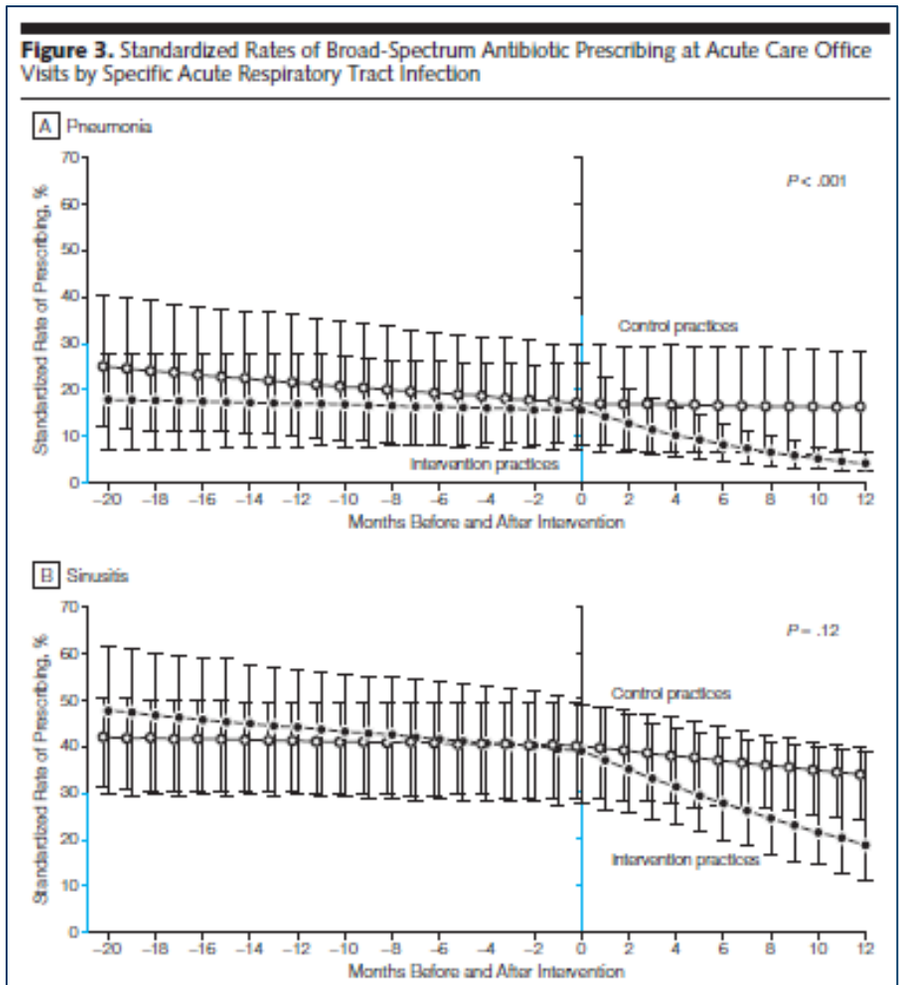
Audit and Feedback with Peer Comparison

- **What is audit and feedback? Peer comparison?**
  - Tracking prescribing practices and reporting back to prescribers, with comparison of individual performance to that of peers[1]
- **Goal**
  - Make individuals more aware of their prescribing practices, especially for conditions with defined guidelines, and highlight where they might diverge from peers
- **Impact**
  - Helps identify outlier prescribing and drive behavior change through peer comparison
- **Supplemental action:** Couple prescribing data reports with education, personalized letters
  - One-hour onsite clinician education session followed by quarterly personalized audit and feedback to primary care practitioners led to 13% decrease in prescribing[2]
  - Personalized letters to highest-level prescribers can lead to decreased prescribing rates[4]
- **Caveat**
  - When audit and feedback intervention is discontinued, prescribing might return to pre-intervention levels[3]

1. CDC. Core Elements of Outpatient Antimicrobial Stewardship Programs.
2. Gerber J.., et al. JAMA 2013;309(22):2345-2352.
3. Gerber JS, Prasad PA, Fiks AG, et al. JAMA 2014;312:2569-70.
4. Hallsworth M, Chadborn T, Sallis A, et al. Lancet 2016;387:1743-52.

Audit and Feedback in Action

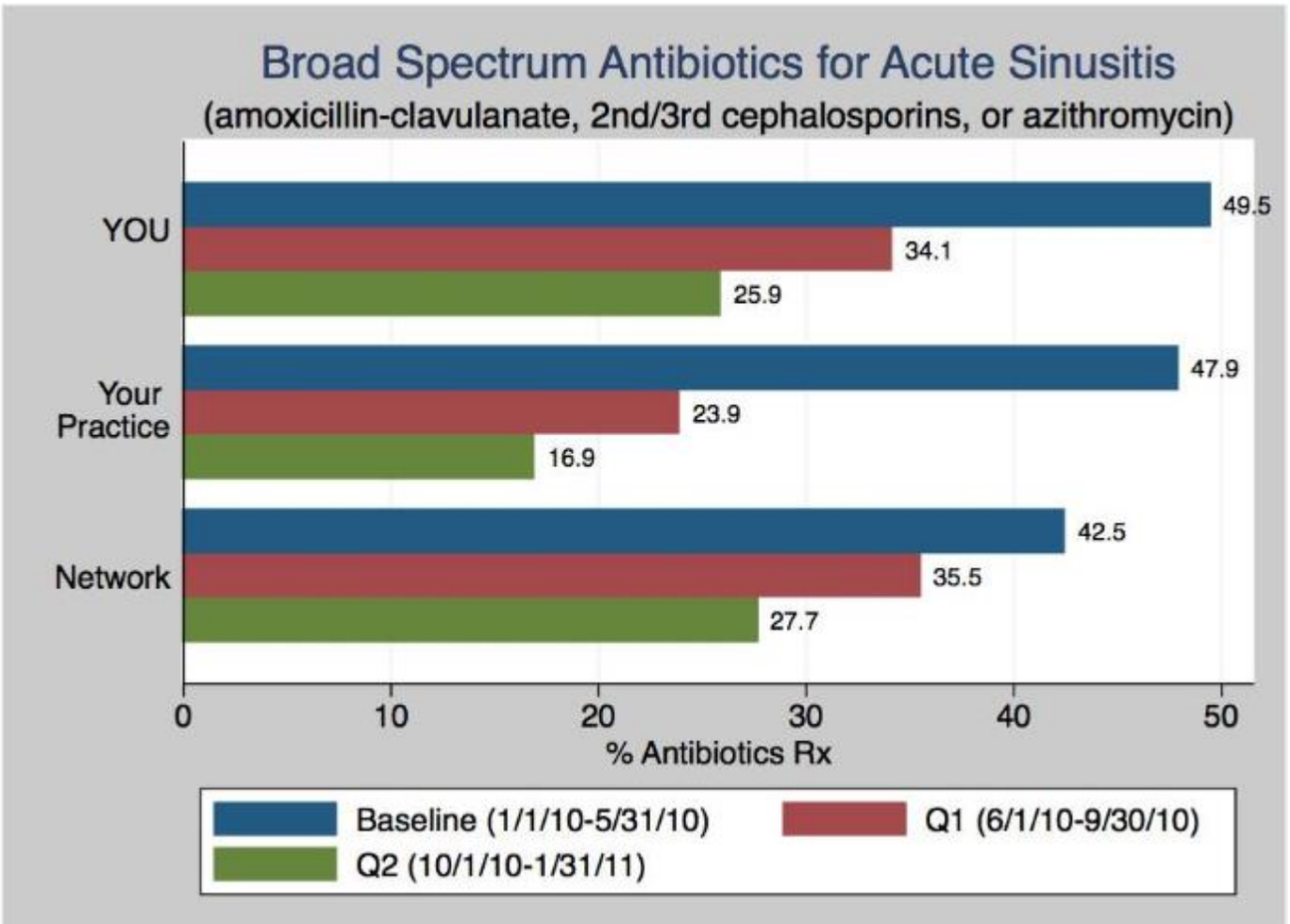
- **Cluster randomized trial in 18 pediatric primary care practices, Gerber 2013**
  - Pediatricians given education, feedback on prescribing of themselves, their practice, and their network
  - Focused on AU for bacterial infections with established guidelines
- 12.5% decrease in broad spectrum antibiotic prescriptions acute respiratory infections
- Off-guideline prescribing decreased for pneumonia (15.7% to 4.2%), acute sinusitis (38.9% to 18.8%)



Gerber JS, Prasad PA, Fiks AG, et al. JAMA 2013;309:2345-52.10.1001/jama.2013.6287.

Audit and Feedback Report Example

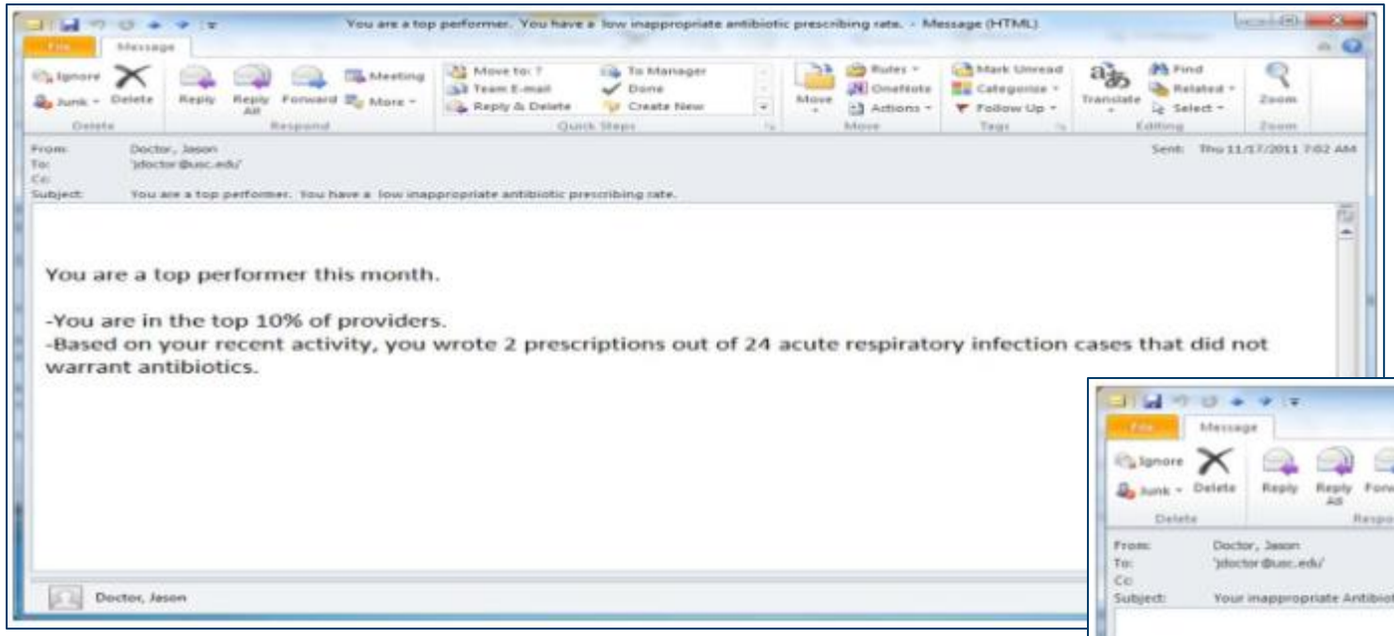
- **From Gerber 2013**

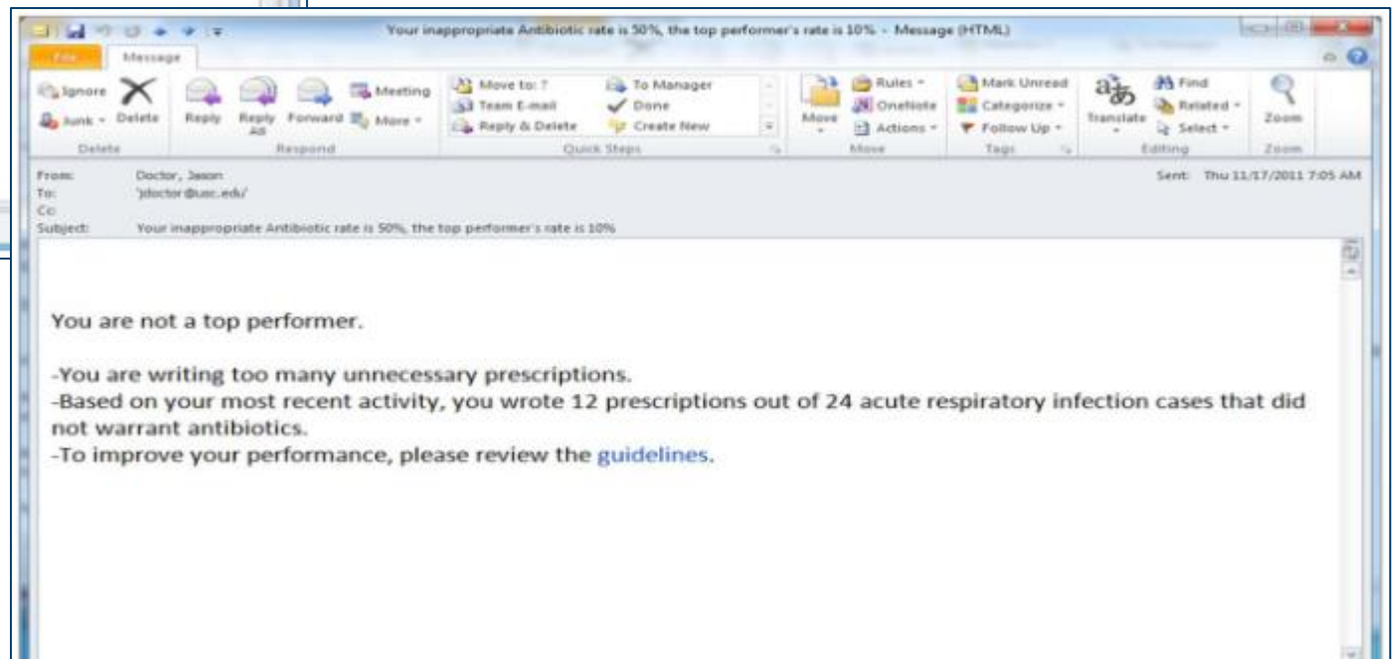


Gerber JS, Prasad PA, Fiks AG, et al. JAMA 2013;309:2345-52.10.1001/jama.2013.6287.

Provider Performance Email Example

- **From Meeker 2016**





Meeker D., et al. JAMA. 2016;315(6):562-570.

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Evidence Base for Using Data to Drive Practice Change:

Syndrome-Specific AU Tracking and Interventions

Syndrome-Specific AU Tracking and Interventions

- **What is syndrome-specific tracking?**
  - Focus on tracking AU for one or more syndromes (e.g., urinary tract infection (UTI), acute respiratory infection)
- **Goal**
  - Improve prescribing practices for conditions known to have high inappropriate prescribing, through targeted intervention, education, and measurement
- **Impact**
  - Provides way to implement and track AS interventions for when conditions of interest have clear prescribing guidelines

Targeted AS Improvement Project in MN LTC Facility

- AS to improve management of asymptomatic bacteriuria (AB) and UTI
- >250 LTC beds, residents managed by 15 providers
  - Medical director interest in quality
  - Identified need for improved knowledge, documentation of resident infections
- Interventions initiated
  - Education conducted for staff on AB and UTI management
  - Empiric recommendations provided to clinicians with facility-specific antibiogram for urinary *E. coli*
  - Modified Loeb criteria used to guide urine screening and UTI treatment
  - UTI SBAR* tool incorporated into workflow and electronic records
  - Daily UTI AU tracking by infection prevention nurse educator

Preliminary Outcomes

- First-line ciprofloxacin use 58% → 27%
- First-line cephalexin use 8% → 25%
- Consistent with ID guidance, antibiogram

*SBAR: Situation, Background, Assessment, Recommendation

Parker C. TOPICS in Geriatric Medicine and Medical Direction 2018;39(3).

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Tools to Harness Clinical AU Data

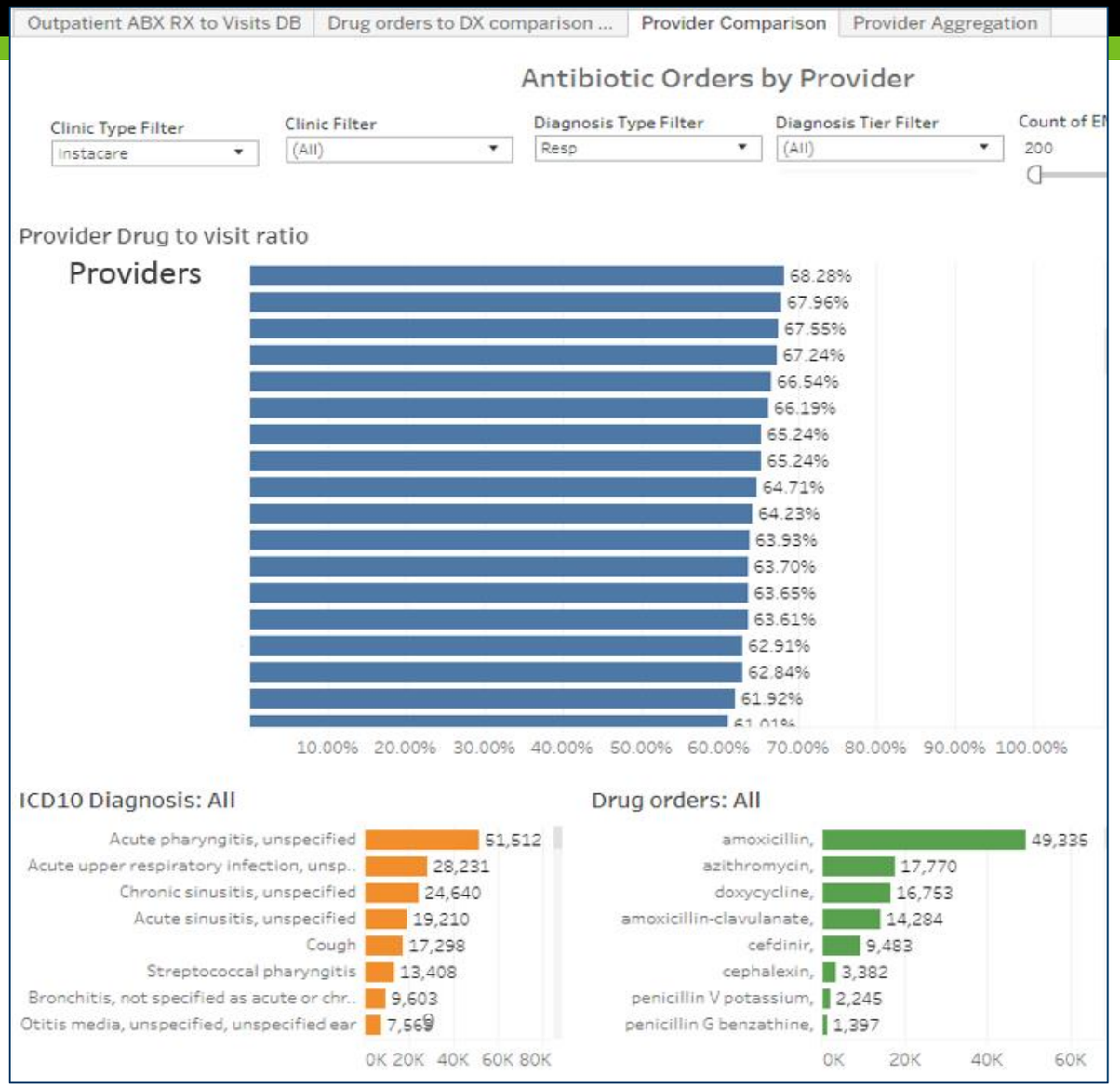
Hospital Tools Used to Harness AU Data

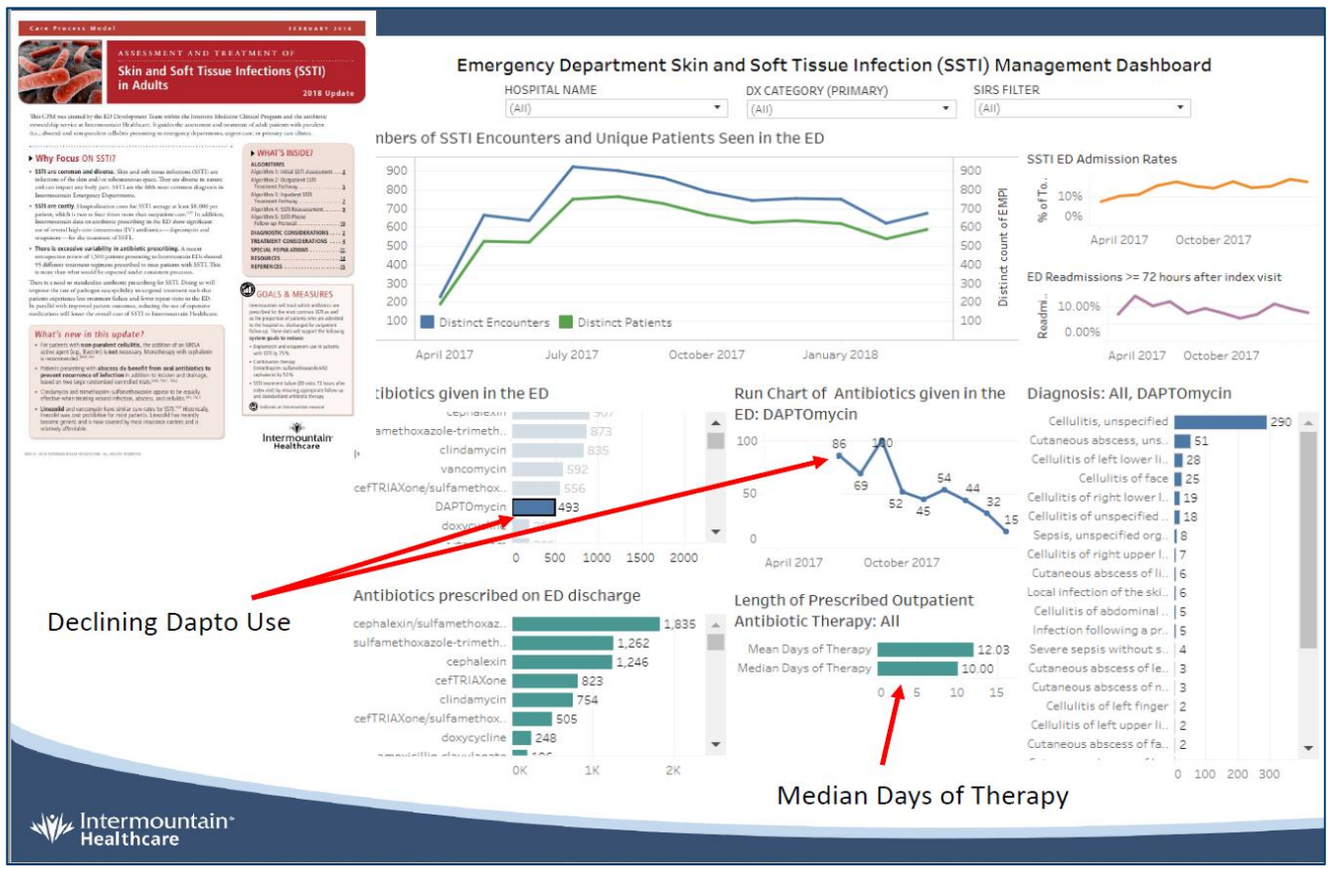
- **NHSN AUR Module** for hospitals[1]

- **Home-grown data visualization platform**[2]
  - Intermountain Healthcare, Utah
  - Track inpatient and outpatient use, compare peers, assess outcomes
  - Electronic medical record system → data warehouse → structured query language (SQL) to extract relevant data → visualization of data by using Tableau software
  - Can review AU data retrospectively and/or in real-time
  - Customizable data visualization platform
  - Challenges: lack of standard comparator metrics, syndrome classification

1. CDC. Surveillance for AU and AR Options. Available at: https://www.cdc.gov/nhsn/acute-care-hospital/aur/index.html
2. Dr. Eddie Stenehjem, Intermountain Healthcare. Personal Communication. April 2019

Data Visualization: Peer Comparison, Syndrome-Based Tracking



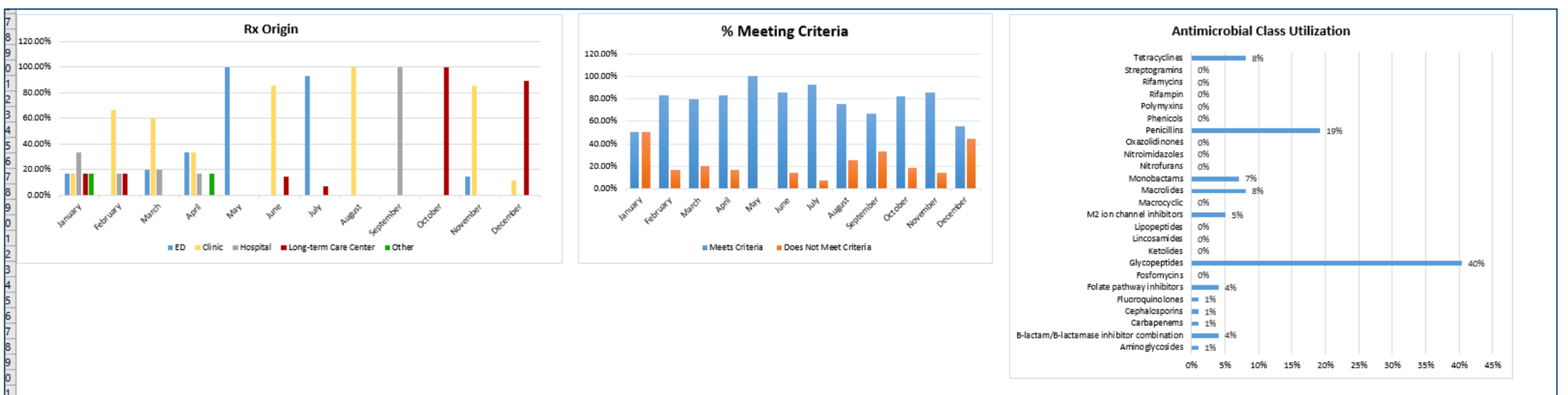


Dr. Eddie Stenehjem, Intermountain Healthcare. Personal Communication. April 2019

Images used with permission from Intermountain Healthcare.

Long-Term Care Tool Used to Harness AU Data

- **Minnesota Department of Health infection tracking tool for long-term care**[1,2]
  - Serves dual purpose of tracking infections and AU, in monthly format
  - Each line on Excel-based tool is used for a single infection
  - Resident days/month are entered manually
  - "Summary" sheet automatically populates with infection and AU metrics, as data are entered each month



1. MDH. Infection and Antibiotic Use Tracking Tool. Available at: https://www.health.state.mn.us/diseases/antibioticresistance/hcp/asp/ltc/index.html
2. Thanks for Cody Schardin and tammy Hale, who have developed and refined this tool over the last year

Long-Term Care Tool Summary Sheet

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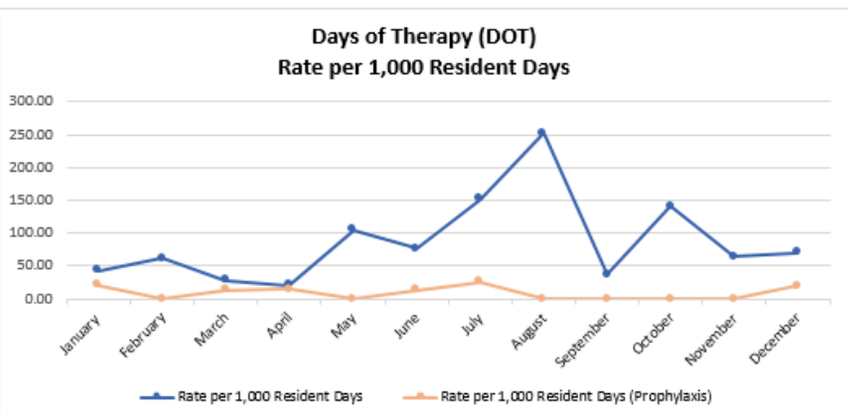
ICAR

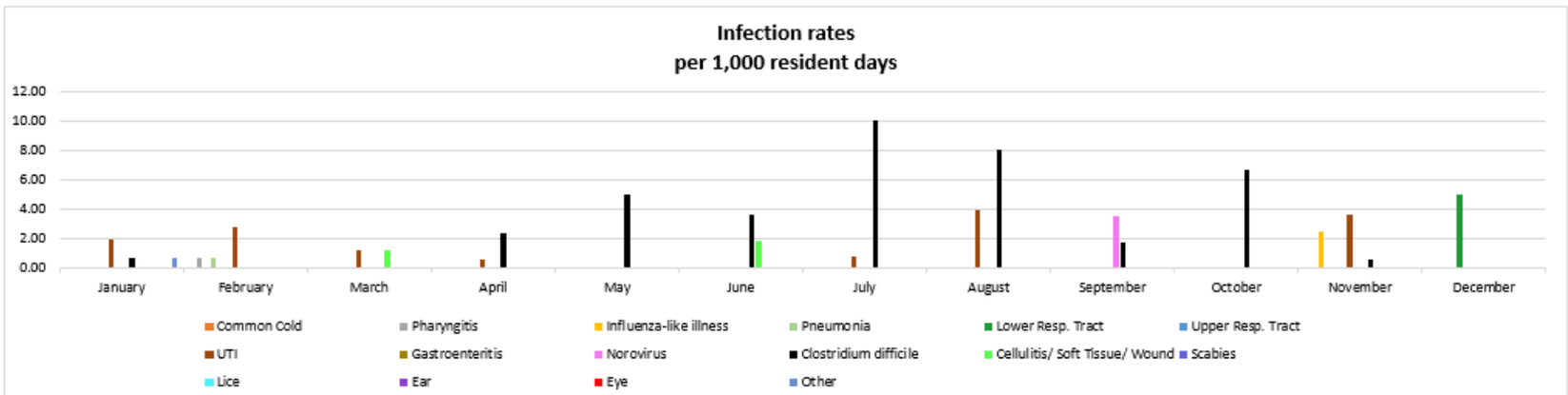
Total Days of Therapy

Month	Total Days of Therapy per Month	Rate per 1,000 Resident Days	Total Days of Therapy per Month (Prophylaxis)	Rate per 1,000 Resident Days (Prophylaxis)
January	64	42.67	30.00	20.00
February	89	61.13	0.00	0.00
March	44	27.73	21.00	13.23
April	35	20.59	25.00	14.71
May	126	105.00	0.00	0.00
June	84	76.36	14.00	12.73
July	182	151.67	31.00	25.83
August	252	252.00	0.00	0.00
September	63	37.06	0.00	0.00
October	231	140.00	0.00	0.00
November	105	64.02	0.00	0.00
December	112	70.00	31.00	19.38

Total Infection Rates per 1,000 Resident Days

Month	Total	Common Cold	Pharyngitis	Influenza-like illness	Pneumonia	Lower Resp. Tract	Upper Resp. Tract	UTI	Gastroenteritis	Norovirus	Clostridium difficile	Cellulitis/ Soft Tissue/ Wound	Scabies	Lice	Ear	Eye	Other
January	3.33	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.67
February	4.12	0.00	0.69	0.00	0.69	0.00	0.00	2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	2.52	0.00	0.00	0.00	0.00	0.00	0.00	1.26	0.00	0.00	0.00	1.26	0.00	0.00	0.00	0.00	0.00
April	2.94	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	2.35	0.00	0.00	0.00	0.00	0.00	0.00
May	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
June	5.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.64	1.82	0.00	0.00	0.00	0.00	0.00
July	10.83	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
August	12.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00
September	5.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.53	1.76	0.00	0.00	0.00	0.00	0.00	0.00
October	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00
November	6.71	0.00	0.00	2.44	0.00	0.00	0.00	3.66	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00	0.00
December	5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





MDH. Infection and Antibiotic Use Tracking Tool. Available at: https://www.health.state.mn.us/diseases/antibioticresistance/hcp/asp/ltc/index.html

Long-Term Care Infection Tracking Tool Data Elements

Resident	Classification	History	Diagnostics	AU	Other
Unit	Infection type	Symptoms	Test performed?	Drug name, class	IPC needs
Resident name	Body system	Onset date	Test date	Dose, route, frequency	Date resolved
Room #	Infection surveillance definition met? (e.g., McGeer)	Device type	Test type	Prescriber name, location	
Admit date		Device days	Specimen source	Start date, end date	
		Infection risk factors	Results	Total days of therapy	
			Antibiotic-resistant?	Meets antibiotic initiation criteria (e.g., Loeb)	
				Antibiotic time-out done?	

MDH. Infection and Antibiotic Use Tracking Tool. Available at: https://www.health.state.mn.us/diseases/antibioticresistance/hcp/asp/ltc/index.html

Point Prevalence Survey (PPS) to Track AU

- **PPS methodology** has been used to define national rates of healthcare-associated infections and AU hospital and long-term care settings
  - AU in nursing homes[1,2]
  - Health care-associated infections and AU in hospitals[3,4]
- Minimal data are collected on a single day or over a specified period ("period prevalence")
  - Prospective or retrospective data collection
  - Can be repeated over time for a non-time-intensive way of summarizing practices
  - Used to define both overall AU rates and appropriateness for specific syndromes
- Can be conducted by using an Excel-based tool with defined SOP for data collectors

PPS Snapshot of U.S. Nursing Homes

- One day PPS, 9 facilities in four states
- 11% of residents on antibiotics
- 32% of prescriptions for UTI
- 50% had wrong drug, dose, or duration.
- 38% lacked prescribing documentation

1. Eure T, et al. Inf Contr Hosp Epi. 2017 Aug;38(8):998-1001
2. Thompson ND. Et al. JAMA 2016;17(12):1151-1153.
3. Magill SS., et al. N Engl J Med 2014;370:1198-208.
4. Magill SS., et al. JAMA. 2014;312(14):1438-1446.

PPS in UMN Small Animal Veterinary Teaching Hospital

- Data collected on first Monday of every month
  - Inpatients: All patients present on selected wards at 4pm
  - Outpatients: All patients seen on selected services
- Data sources:
  - Electronic medical records
  - Laboratory reports
  - Treatment sheets
- Outcome measures:
  - % inpatients on antibiotic
  - % outpatients prescribed antibiotic
  - Summary of drugs/classes prescribed overall, by syndrome, by prescriber
  - Appropriateness of prescription and drug selection
  - % patients receiving diagnostic testing

General	Patient	History	Antibiotic
Survey date	Medical record no.	Complaint	Prescribed date
Data collector	Name	Visit Reason	Service
Service	Sex	Comorbidities	Prescriber
	DOB	Diagnostics conducted?	Drug name, class
	Species	Diagnostic results available?	Route, duration
	Breed	Antibiotic?	Indication
		Antibiotic no.	Treatment classification

Basic PPS for AU Tracking

- For prescribing rate, collect at minimum:
  - Total number of patients seen on date
  - Total number prescribed an antibiotic on date
  - Antibiotic drug name

- For basic measure of prescribing reason, also collect:
  - Diagnosis/indication for antibiotic prescription (e.g., otitis, sinusitis)
  - Use of ICD codes provides standardization for repeated survey dates and across data collectors

General	Patient	History	Antibiotic
Survey date	Medical record no.	Complaint	Prescribed date
Data collector	Name	Visit Reason	Service
Service	Sex	Comorbidities	Prescriber
	DOB	Diagnostics conducted?	Drug name, class
		Diagnostic results available?	Route, duration
		Antibiotic?	Indication
		Antibiotic no.	Treatment classification

First Discussion

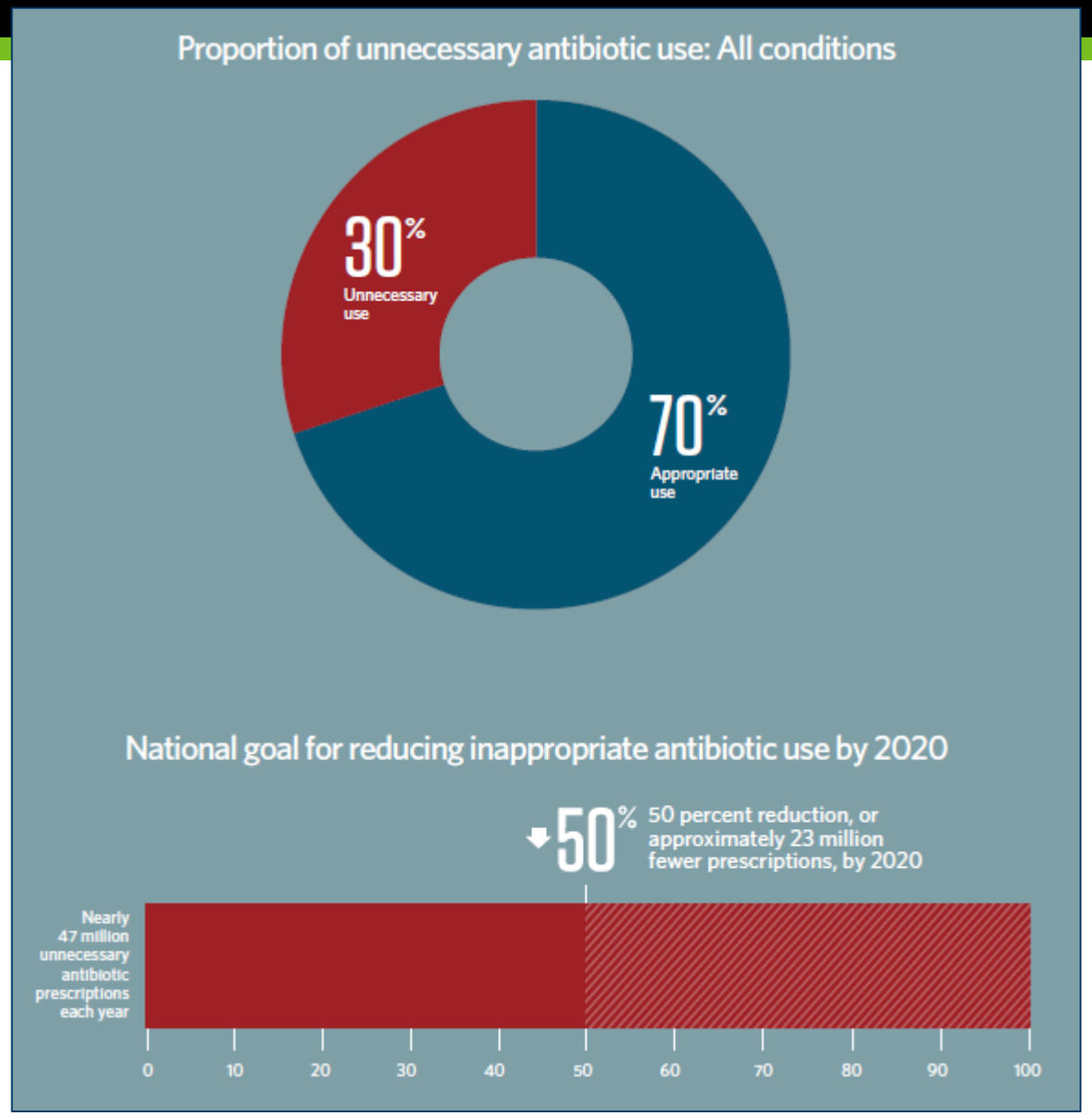
How have you used AU tracking methods in your setting?

What are the major challenges?
What makes things work better?

DEPARTMENT OF HEALTH

Population-Level Data to Drive Change

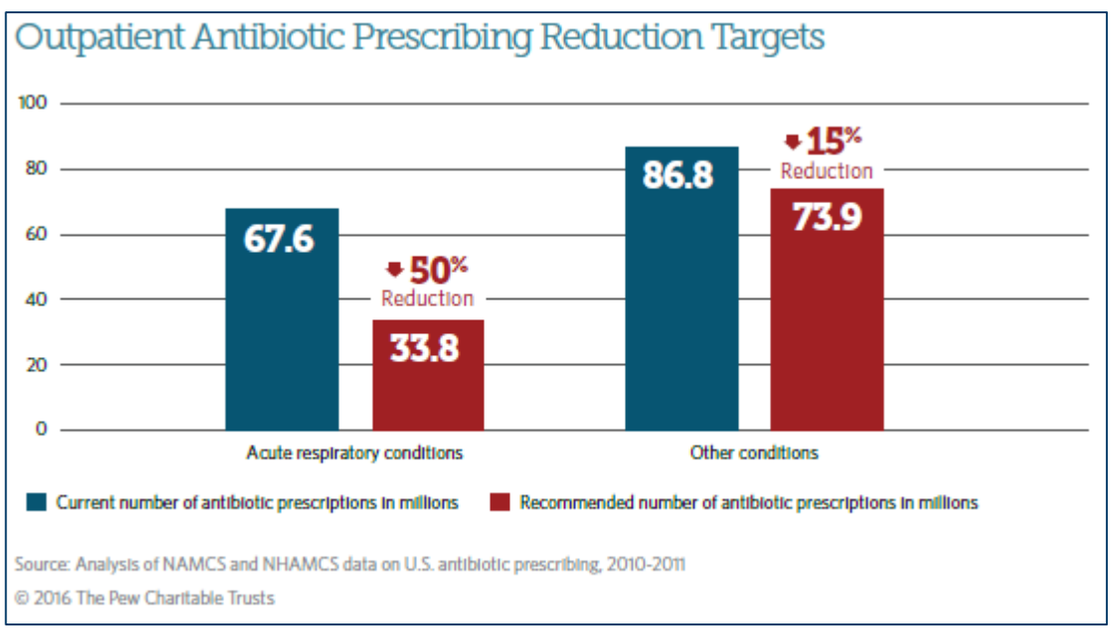
2014 National Targets for Outpatient Prescribing



Antibiotic Use in Outpatient Settings

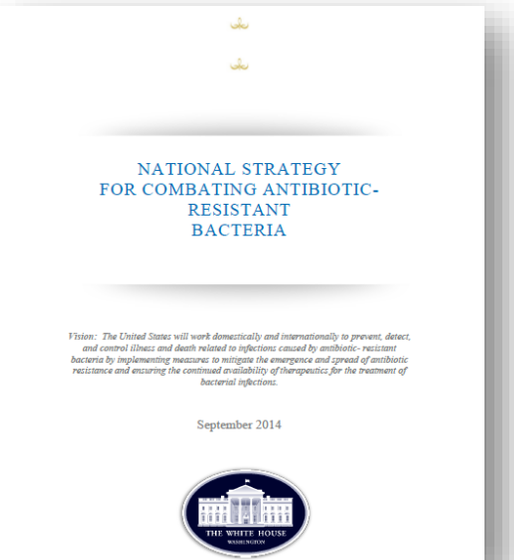
Health experts create national targets to reduce unnecessary antibiotic prescriptions

A report from THE PEW CHARITABLE TRUSTS | May 2016



National Goal Setting for AU

- **White House National Action Plan for Combating Antibiotic-Resistant Bacteria**
  - By 2020, reduce inappropriate outpatient antibiotic use by 50%
  - To reach this goal, must reduce total antibiotic use by 15%
- **Healthy People 2020**: science-based, 10-year national objectives for improving health of Americans
  - Reduce AU for ear infections for young children
  - Reduce AU for the sole diagnosis of the common cold
- **Progress as of 2017**
  - On the population level, measuring inappropriate use of oral antibiotics is more difficult than total antibiotic use
  - Little progress made in reducing overall adult prescribing
  - More progress made for overall pediatric prescribing
  - Healthy People 2020 goals not yet achieved



Healthy People Goal (% visits → antibiotic)	2006-2007	2010-2011
70%: Pediatric Ear Infection	77.8	78.9
21%: Pediatric Common Cold	28.6	30.9

National Action Plan: https://www.cdc.gov/drugresistance/us-activities/national-action-plan.html
Health People 2020: https://www.healthypeople.gov/2020/data-search/Search-the-Data?topicid=23&topic=Immunization%20and%20Infectious%20Diseases&objective=IID-5&anchor=372#topic-area=3527;source=3570

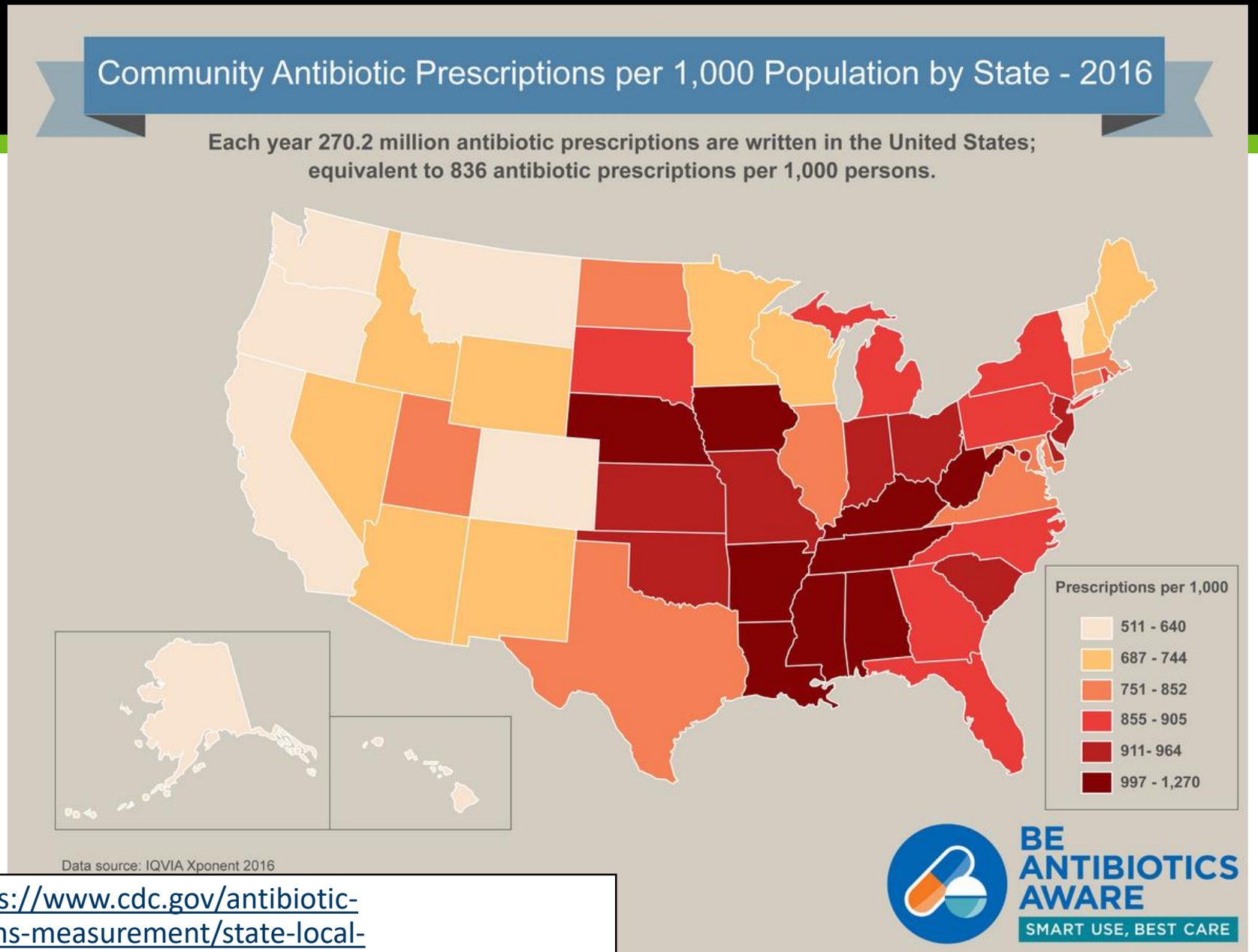
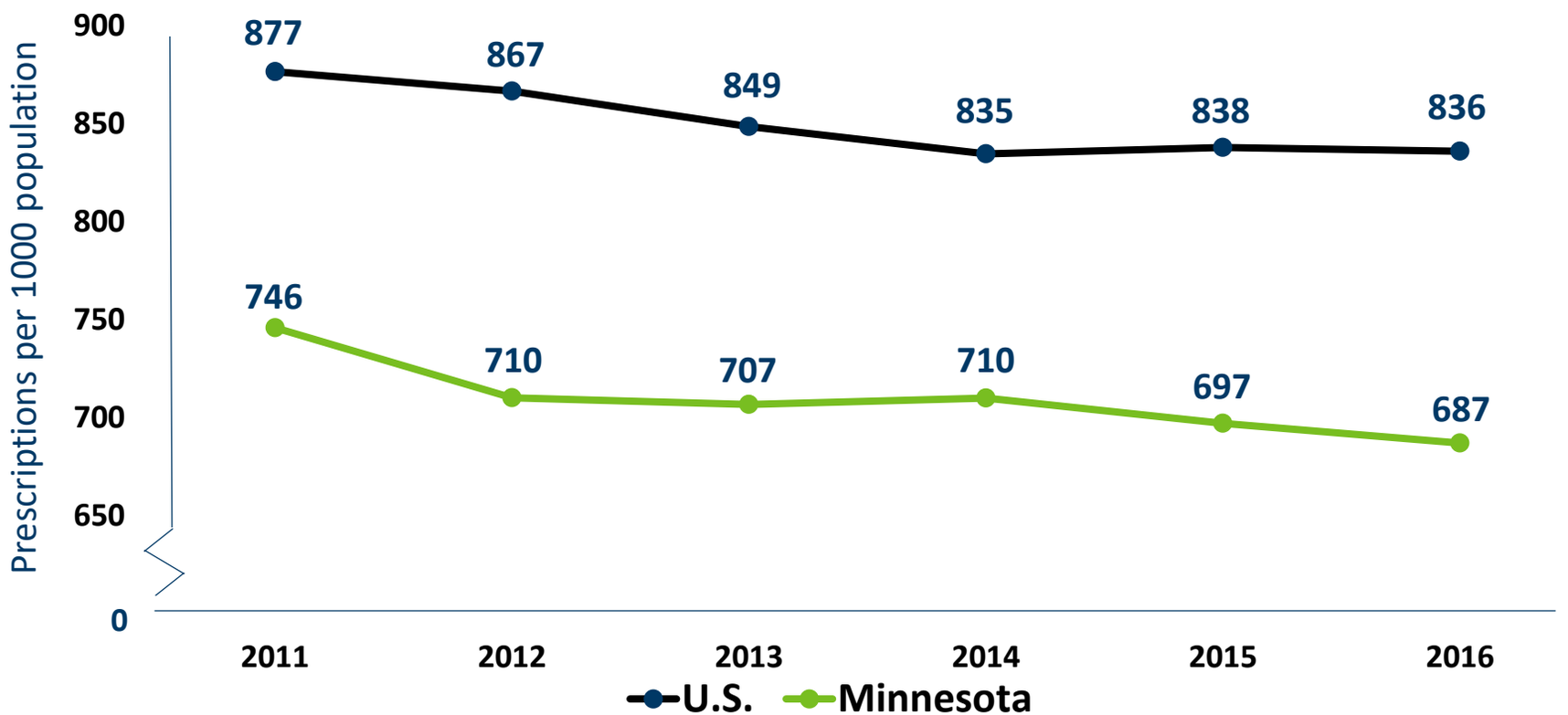


Figure Source: CDC, https://www.cdc.gov/antibiotic-use/community/programs-measurement/state-local-activities/outpatient-antibiotic-prescriptions-US-2016.html

Outpatient Antibiotic Prescriptions per 1,000 Persons, U.S. and Minnesota, 2011-2016



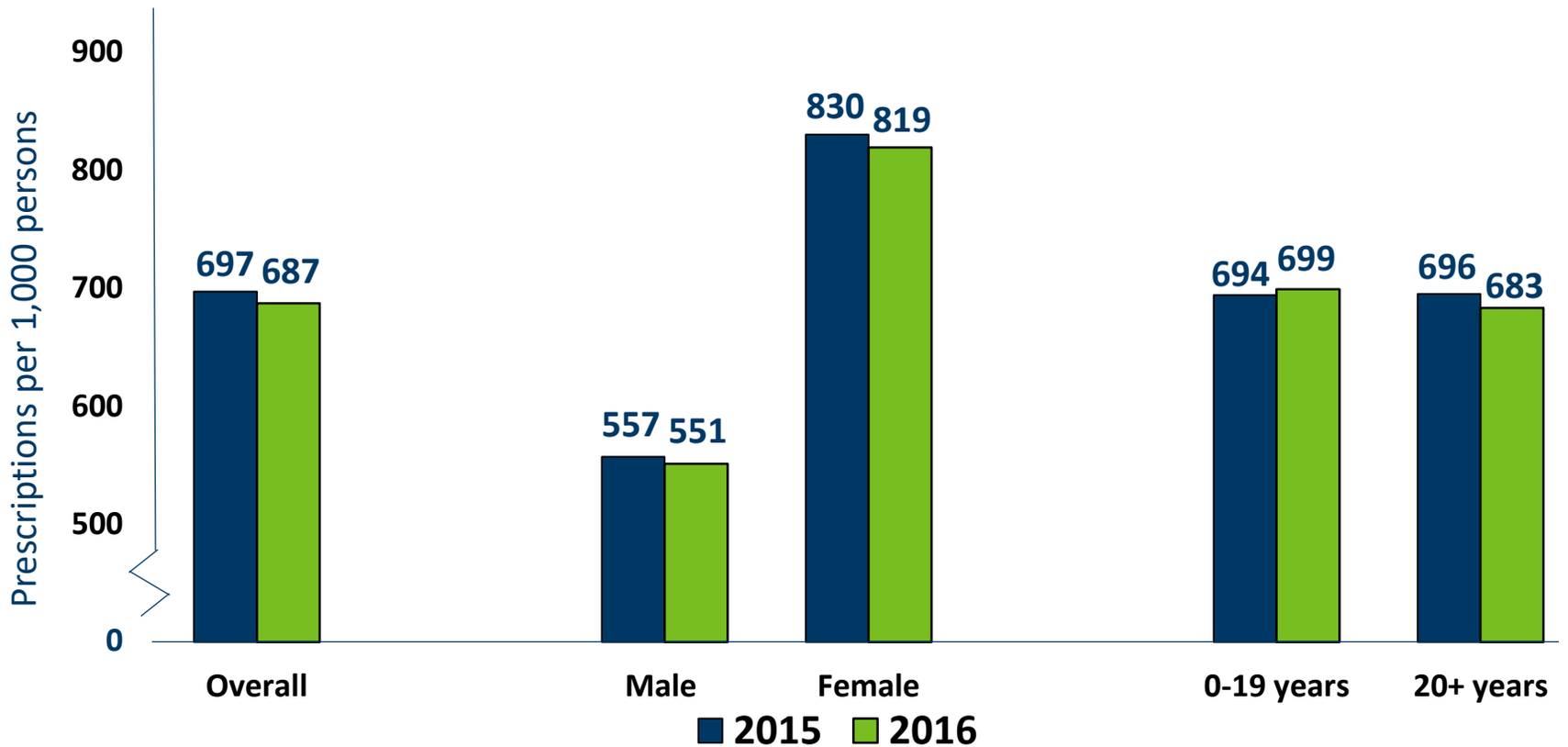
Data Source: IQVIA™ Xponent® and CDC: https://gis.cdc.gov/grasp/PSA/indexAU.html

Mean Annual Outpatient Antibiotic Prescriptions per 1,000 Persons and Percent Change by Period, Minnesota and U.S.

		2011-2012	2015-2016	
		Prescriptions per 1000 Persons	Prescriptions per 1000 Persons	Percent Change
All Antibiotics	Minnesota	728	692	-5%
	U.S.	872	837	-4%

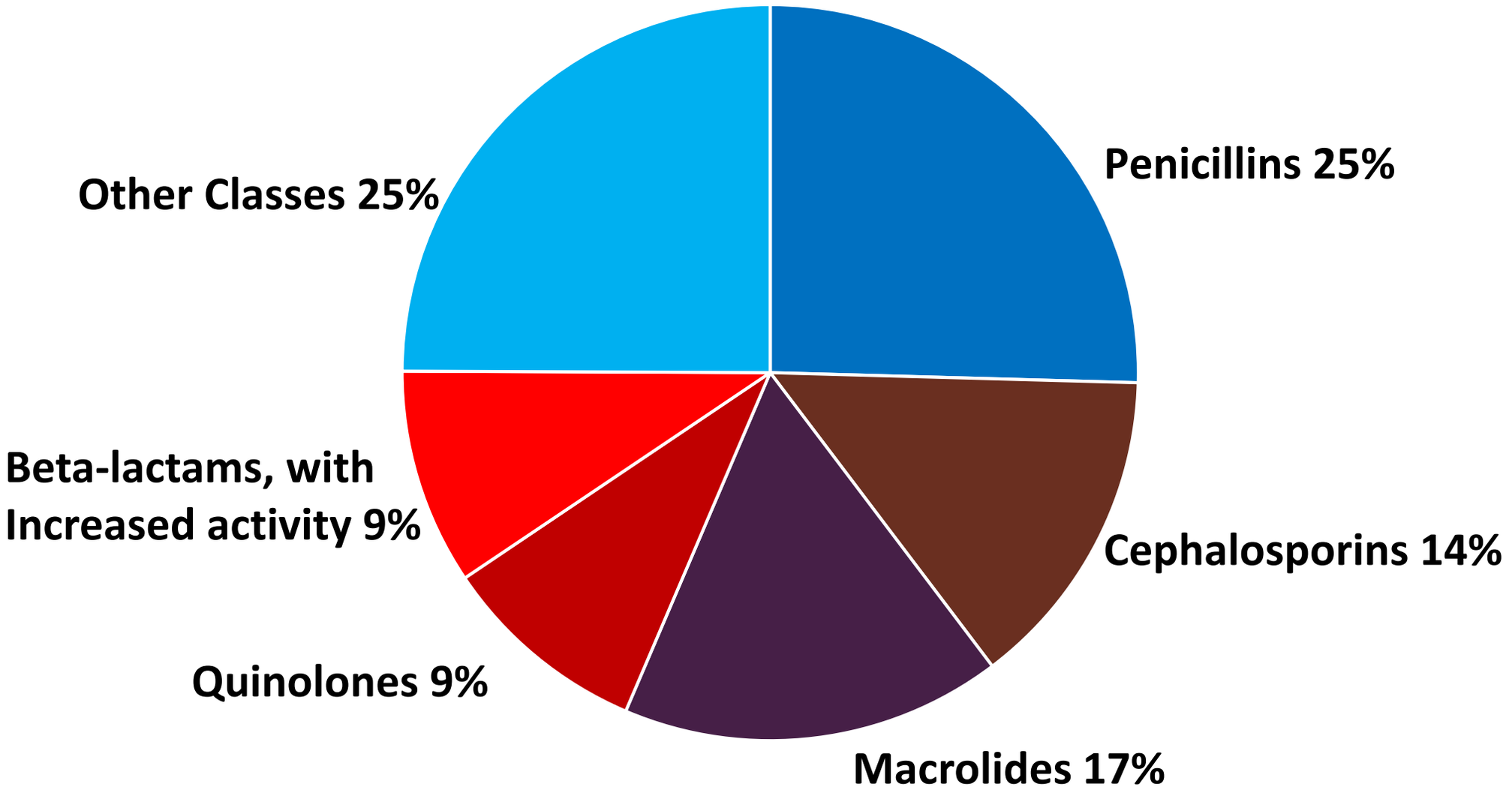
Data Source: IQVIA™ Xponent® and CDC: https://gis.cdc.gov/grasp/PSA/indexAU.html

Outpatient Antibiotic Prescriptions per 1,000 Persons Minnesota, 2015-2016



Data Source: IQVIA™ Xponent®

Outpatient Antibiotic Prescriptions by Drug Class, Minnesota, 2016



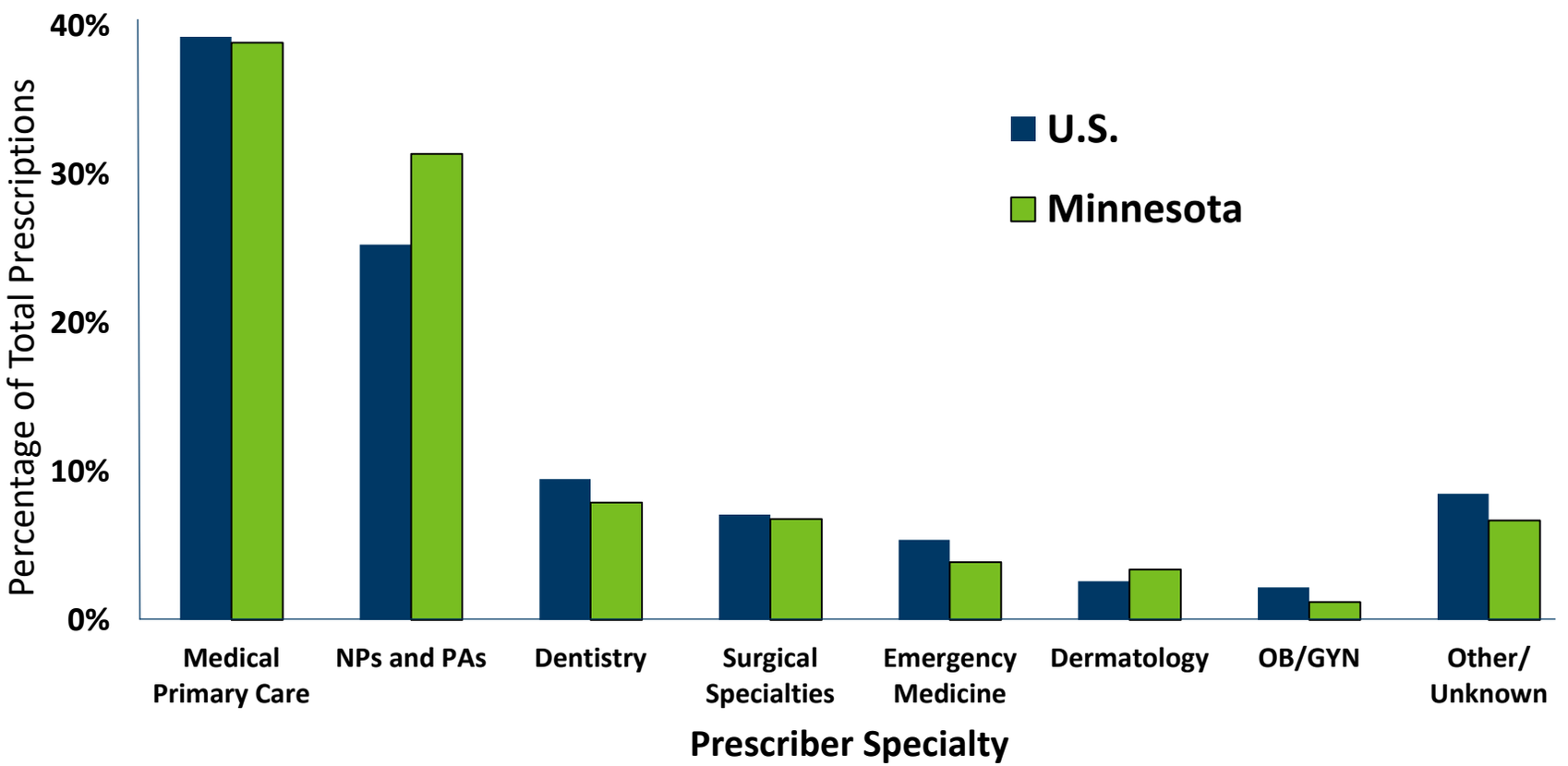
Data Source: IQVIA Xponent ™

Mean Annual Outpatient Antibiotic Prescriptions per 1,000 Persons and Percent Change by Period, Minnesota and U.S.

		2011 - 2012	2015 - 2016	
		Prescriptions per 1000 Persons	Prescriptions per 1000 Persons	Percent Change
Macrolides	Minnesota	153	117	-24%
	U.S.	186	151	-19%
Quinolones	Minnesota	76	67	-12%
	U.S.	103	97	-6%

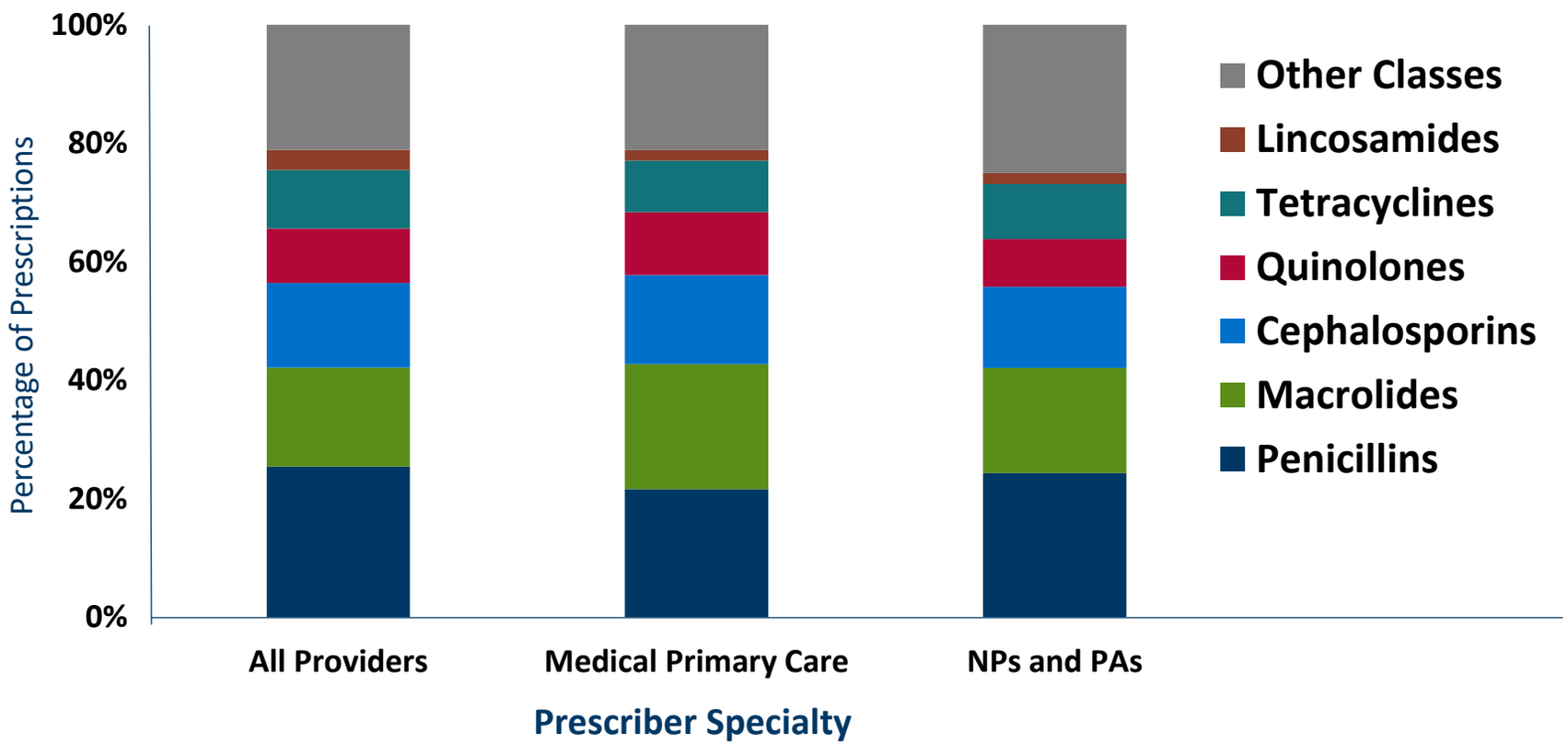
Data Source: IQVIA™ Xponent® and CDC: https://gis.cdc.gov/grasp/PSA/indexAU.html

Proportion of All Outpatient Antibiotic Prescriptions by Type of Prescriber, U.S. and Minnesota, 2016



Data Source: IQVIA™ Xponent® and CDC: https://www.cdc.gov/antibiotic-use/community/programs-measurement/state-local-activities/outpatient-antibiotic-prescriptions-US-2016.html Abbreviations: NP: Nurse Practitioner, PA: Physician Assistant, OB/GYN: Obstetrics and Gynecology

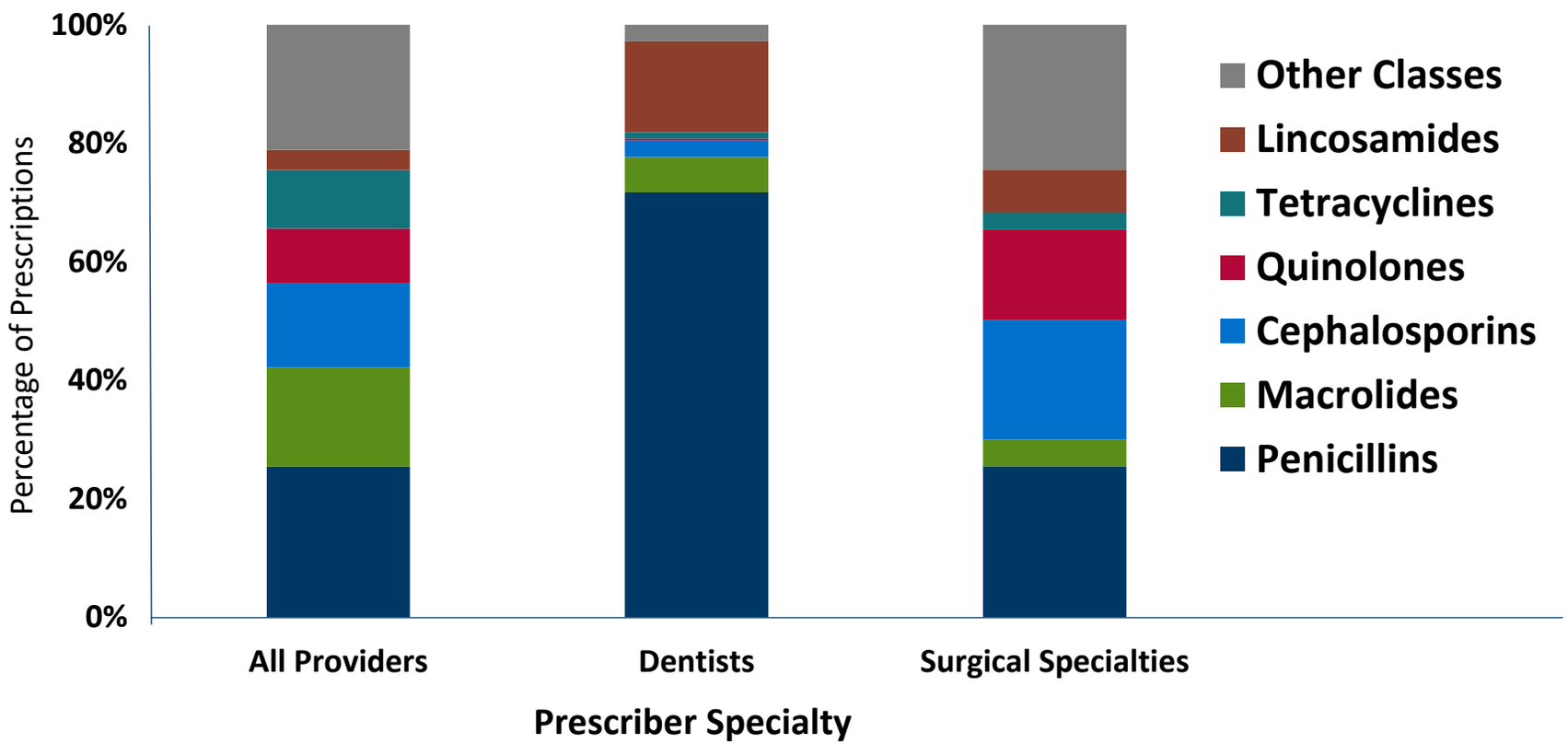
Proportion of Outpatient Antibiotic Prescriptions by Prescriber Specialty and Drug Class, Minnesota, 2016



Data Source: IQVIA™ Xponent®

Abbreviations: NP: Nurse Practitioner, PA: Physician Assistant

Proportion of Outpatient Antibiotic Prescriptions by Prescriber Specialty and Drug Class, Minnesota, 2016



Data Source: IQVIA™ Xponent®

Surgical Specialties include Surgery, Otolaryngology and Urology

Second Discussion

What do you think about statewide goalsetting?

Would goals motivate you or your team?

Thank You!

Acknowledgments

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