NHSN REPORTS FOR TARGETING STEWARDSHIP EFFORTS

LIBBY DODDS ASHLEY, PHARMD, MHS

Duke University School of Medicine

Duke Center for Antimicrobial Stewardship and Infection Prevention

dason DUKE ANTIMICROBIAL STEWARDSHIP OUTREACH NETWORK

dason.medicine.duke.edu

We all know what the SAAR is, right?

CDC - Antimicrobial Use and Resistance module

Objective: The primary objective of Antimicrobial Use option is to facilitate risk-adjusted inter- and intra-facility benchmarking of antimicrobial usage.

Primary metrics: antimicrobial days/1,000 days present

Standardized Antibiotic Administration Ratio

$$\text{SAAR} = \frac{\text{Observed (O) Antimicrobial Use}}{\text{Predicted (P) Antimicrobial Use}}$$

Predicted – Calculated by CDC based on predictive models based on nationally aggregated AU data

SAAR Baseline population

Calendar year 2017

Adult/Pediatric modeled separately

N units:

- 2156 Adult units (added 2 new unit types)
- 170 Pediatric units

Included hospitals in 49 states

- 449 hospitals in adult models
- 109 hospitals in peds models

Patient Care Locations Included in SAARs*
Medical Ward
Surgical Ward
Medical/Surgical Ward
Medical ICU
Surgical ICU
Medical/Surgical ICU
Adult Step-Down
Adult Hematology/Oncology

*NHSN unit-type category

Risk adjustments: 2017 baseline

- Adult SAAR models

Factor	BSHO	BSCA	GramPos	NSBL	Fungal	CDI	All
Location type	✓	✓	✓	✓	✓	✓	✓
Facility type	✓	✓	✓		✓	✓	✓
Medical school affiliation	✓					✓	
Total number of hospital beds		✓	✓	✓	✓	✓	
Total number of hospital ICU beds	✓				✓	✓	
Percentage of hospitals beds that are ICU beds		✓		✓			
Average hospital length of stay	✓	✓	✓	✓	✓	✓	✓

Range 3-6

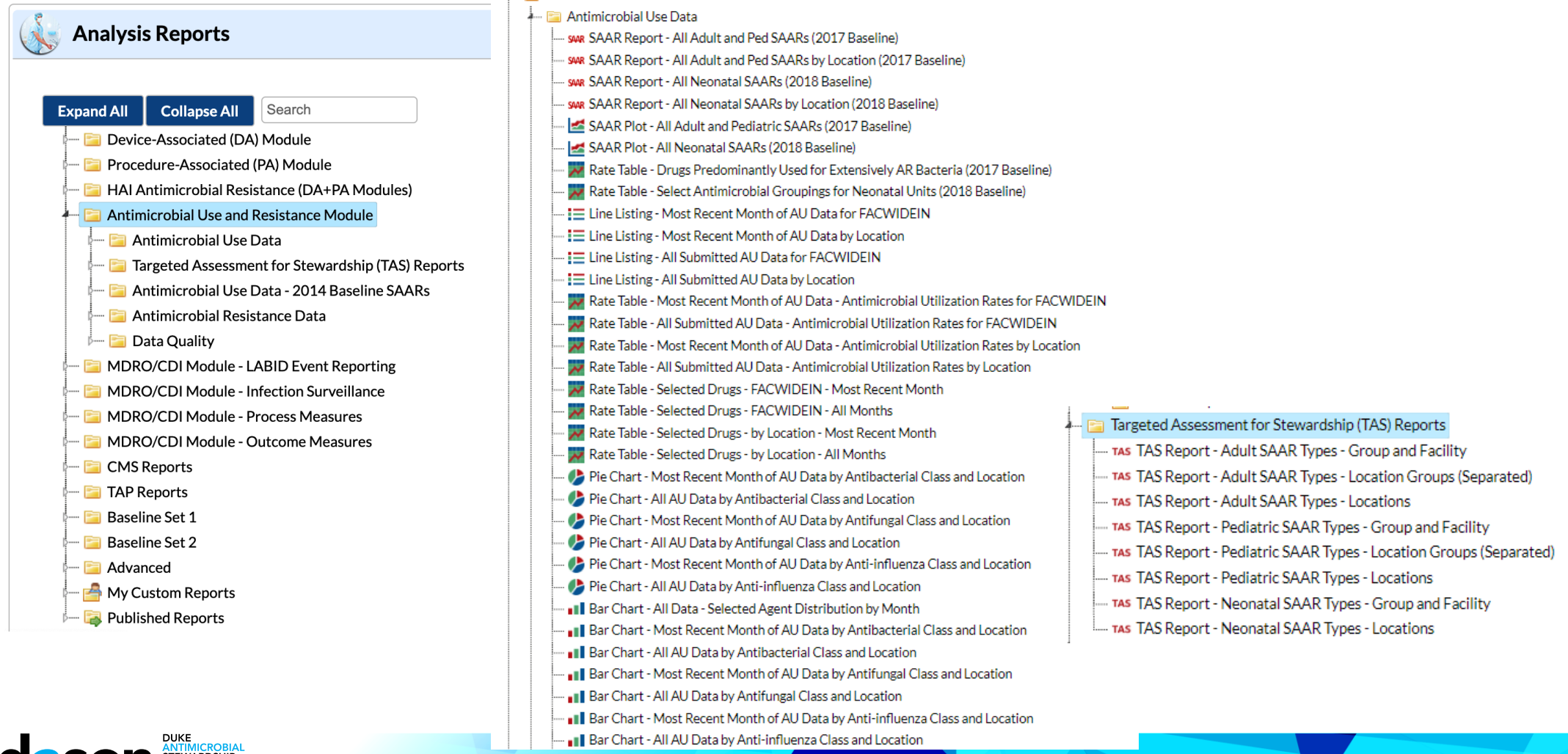
- Pediatric SAAR models

Factor	BSHO	BSCA	GramPos	NSBL	Azithro	Fungal	CDI	All
Location type		✓	✓		✓	✓	✓	
Facility type		✓					✓	
Location type with facility type	✓			✓				
Medical school affiliation								
Total number of hospital beds		✓		✓	✓		✓	✓
Total number of hospital ICU beds								
Percentage of hospitals beds that are ICU beds	✓					✓		✓
Average hospital length of stay							✓	✓

Range 1-4

NHSN SAAR Guide available at www.cdc.gov

Getting the Data Reports



Initial Output – Where do we go from here?

summaryYM	SAARType_2017	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI
2018M08	Adult_All-Antibacterial_2017	4251	4352.480	6997	0.977	0.1250	0.948, 1.006
2018M09	Adult_All-Antibacterial_2017	4660	4296.161	6872	1.085	0.0000	1.054, 1.116
2018M10	Adult_All-Antibacterial_2017	4621	4393.190	7020	1.052	0.0007	1.022, 1.083
2018M11	Adult_All-Antibacterial_2017	4248	4125.880	6575	1.030	0.0592	0.999, 1.061
2018M12	Adult_All-Antibacterial_2017	4542	4360.504	6936	1.042	0.0064	1.012, 1.072
2019M01	Adult_All-Antibacterial_2017	5191	4696.111	7587	1.105	0.0000	1.076, 1.136
2019M02	Adult_All-Antibacterial_2017	4317	4256.633	6882	1.014	0.3586	0.984, 1.045
2019M03	Adult_All-Antibacterial_2017	4960	4747.866	7677	1.045	0.0023	1.016, 1.074
2019M04	Adult_All-Antibacterial_2017	4511	4580.402	7410	0.985	0.3086	0.956, 1.014
2019M05	Adult_All-Antibacterial_2017	4817	4537.118	7356	1.062	0.0000	1.032, 1.092
2019M06	Adult_All-Antibacterial_2017	4222	4198.580	6786	1.006	0.7219	0.976, 1.036
2019M07	Adult_All-Antibacterial_2017	4257	4454.236	7224	0.956	0.0030	0.927, 0.985
2019M08	Adult_All-Antibacterial_2017	4604	4344.025	7041	1.060	0.0001	1.030, 1.091
2019M09	Adult_All-Antibacterial_2017	4252	4069.328	6575	1.045	0.0045	1.014, 1.077
2019M10	Adult_All-Antibacterial_2017	4498	4043.879	6604	1.112	0.0000	1.080, 1.145
2019M11	Adult_All-Antibacterial_2017	4402	4012.711	6493	1.097	0.0000	1.065, 1.130
2019M12	Adult_All-Antibacterial_2017	5017	4284.836	6933	1.171	0.0000	1.139, 1.204
2020M01	Adult_All-Antibacterial_2017	5267	4371.505	7069	1.205	0.0000	1.173, 1.238
2020M02	Adult_All-Antibacterial_2017	4798	4138.901	6694	1.159	0.0000	1.127, 1.192
2020M03	Adult_All-Antibacterial_2017	4223	3756.776	6099	1.124	0.0000	1.091, 1.158
2020M04	Adult_All-Antibacterial_2017	3779	3517.657	5704	1.074	0.0000	1.040, 1.109
2020M05	Adult_All-Antibacterial_2017	4155	3764.664	6074	1.104	0.0000	1.071, 1.138
2020M06	Adult_All-Antibacterial_2017	3896	3779.790	6116	1.031	0.0608	0.999, 1.064
2020M07	Adult_All-Antibacterial_2017	4509	4347.201	7037	1.037	0.0149	1.007, 1.068
2020M08	Adult_All-Antibacterial_2017	4451	4384.595	7112	1.015	0.3196	0.986, 1.045
2020M09	Adult_All-Antibacterial_2017	4245	4116.878	6660	1.031	0.0475	1.000, 1.063
2020M10	Adult_All-Antibacterial_2017	4083	4064.320	6636	1.005	0.7737	0.974, 1.036

USE CASES

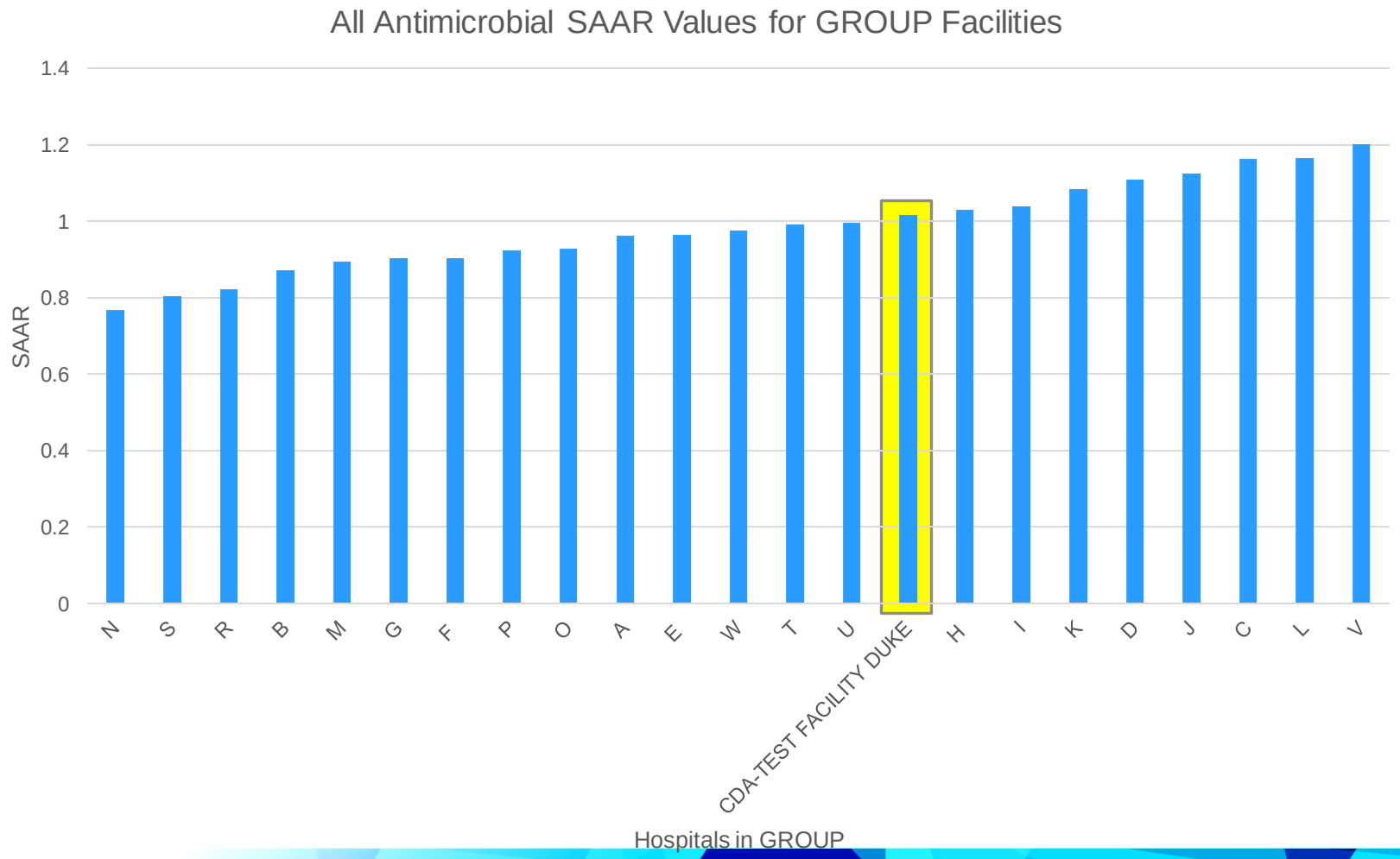
Duke University School of Medicine

Duke Center for Antimicrobial Stewardship and Infection Prevention

dason DUKE ANTIMICROBIAL STEWARDSHIP OUTREACH NETWORK

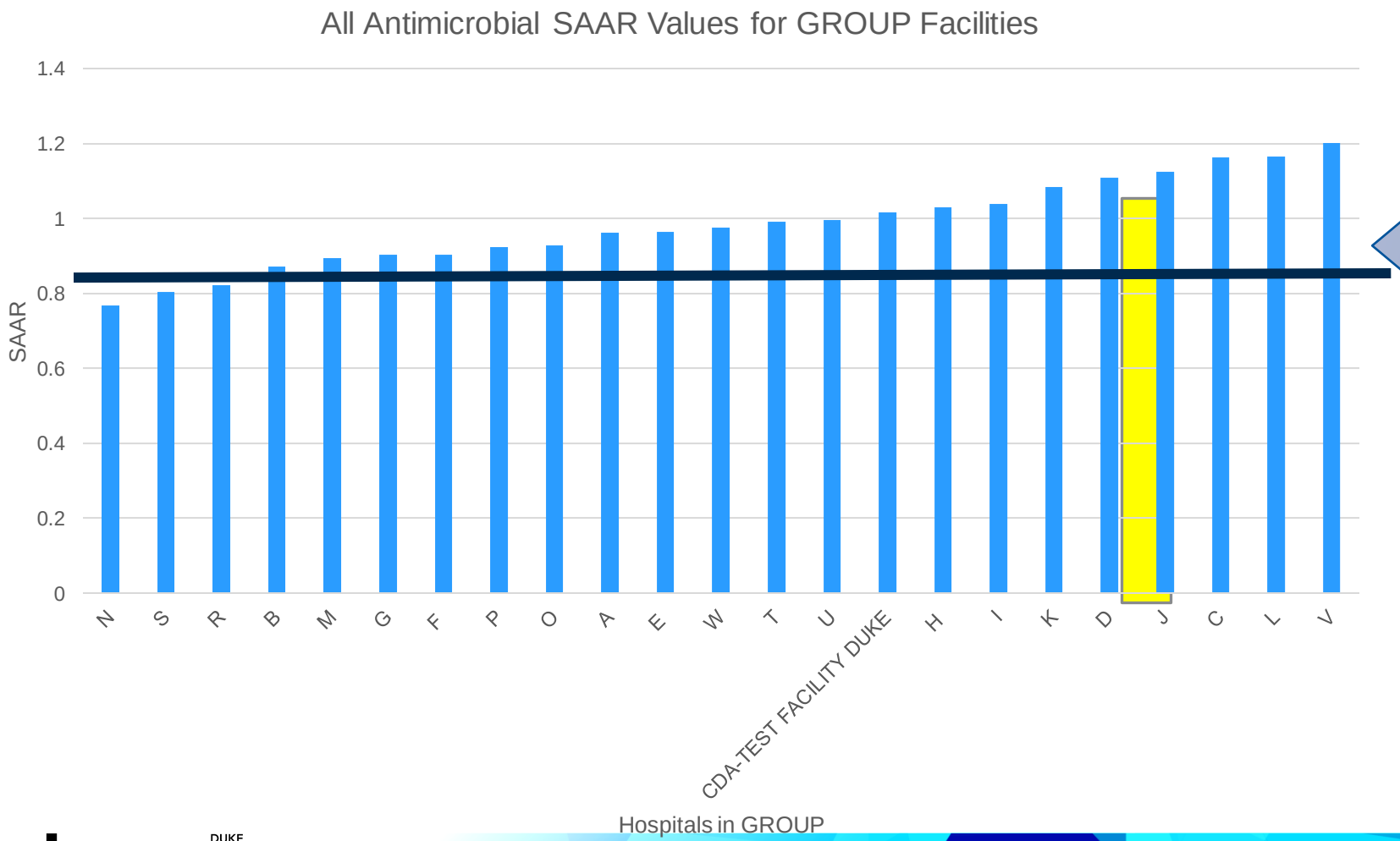
dason.medicine.duke.edu

Do we really use more?



Data created in Excel™ using export of NHSN Group Level TAS Report (Adult SAAR Types- Group and Facility)

Do we really use more?



This is the 50th Percentile for All Antibacterial Agents in Adult Locations in Adult Locations

Where did that come from?

In addition to the Annual Antibiotic Use Report…

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

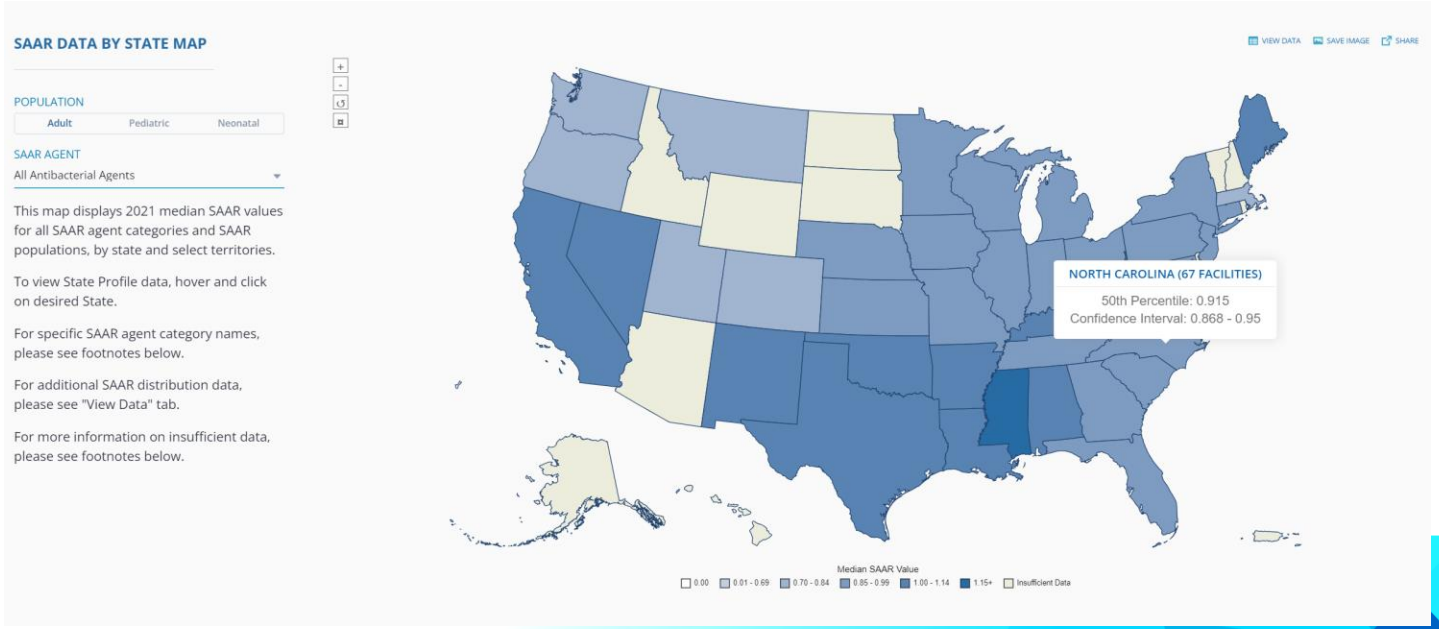
Search

Healthcare-Associated Infections (HAIs)

CDC > Healthcare-associated Infections (HAI) > HAI Data > Data Portal

Healthcare-associated Infections (HAI)

Antibiotic Resistance & Patient Safety Portal



https://www.cdc.gov/hai/data/portal/AR-Patient-Safety-Portal.html#anchor_1572284811

Slight Detour:
A Word About Benchmarks/Risk Adjustment

SAAR BASELINE POPULATION

Calendar year 2017

Adult/Pediatric modeled separately

N units:

- 2156 Adult units (added 2 new unit types)
- 170 Pediatric units

Included hospitals in 49 states

- 449 hospitals in adult models
- 109 hospitals in peds models

This allows time trends with the SAAR

ANNUAL TRENDS

Annual Antimicrobial Use Option Report

- Provides distribution by SAAR category
- AND use data for individual drugs ☺

Antibiotic Resistance & Patient Safety Portal

- Aggregate annual data
- Can drill down to state to make comparisons more local

This allows you see if you are “keeping up” as use trends change with time

Additional Resources in the Annual AU Option Report

Pooled Mean SAARS

Figure 2. Select 2019, 2020, and 2021 pooled mean SAARs, by antimicrobial agent category and quarter for **A)** adult ICUs and wards and **B)** pediatric ICUs and wards.

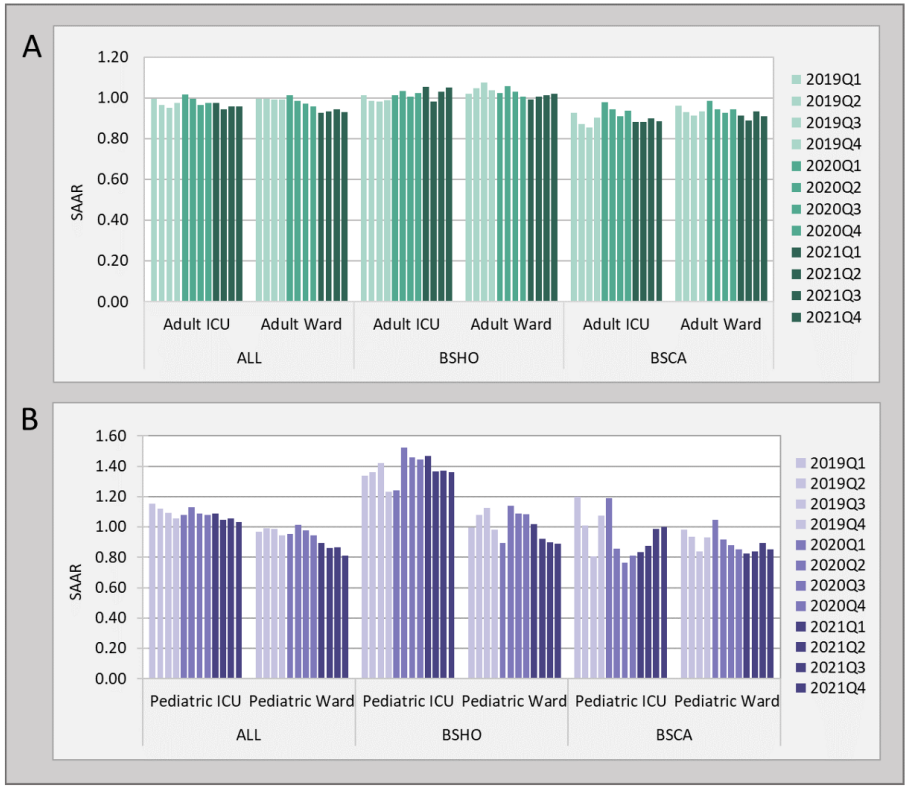


Table 3. Pooled mean SAAR values by adult location type and SAAR antimicrobial agent category.

Adult SAAR Location Type	Adult SAAR Antimicrobial Agent Categories						
	All Antibacterial	BSHO	BSCA	GramPos	NSBL	CDI	Antifungal
Medical ICUs	0.975	1.022	0.902	0.992	0.948	1.231	1.000
Medical-Surgical ICUs	0.944	1.025	0.867	0.867	0.868	1.040	0.986
Surgical ICUs	0.990	1.050	1.000	0.925	0.759	1.248	1.124
Medical Wards	0.910	0.920	0.901	0.822	0.975	0.948	0.799
Medical-Surgical Wards	0.938	1.036	0.897	0.840	0.978	0.958	0.858
Surgical Wards	0.957	1.096	1.010	0.941	0.778	1.068	0.996
Step Down Units	0.919	0.938	0.896	0.845	0.917	0.975	0.846
General Hematology-Oncology Wards	0.938	0.934	0.957	0.842	0.980	1.020	0.781

Additional Resources in the Annual AU Option Report

Drill Down Tables

		Percentile distribution of location-specific SAARs																		
Adult SAAR location type	No. of locations with ≥1 predicted antimicrobial day[2]	5th	10th	15th	20th	25th	30th	35th	40th	45th	50th	55th	60th	65th	70th	75th	80th	85th	90th	95th
Medical ICUs	507	0.597	0.683	0.724	0.761	0.802	0.835	0.864	0.897	0.934	0.963	0.985	1.013	1.047	1.072	1.102	1.141	1.190	1.236	1.363
Medical-surgical ICUs	1,190	0.613	0.698	0.748	0.781	0.814	0.845	0.872	0.897	0.925	0.952	0.982	1.006	1.031	1.062	1.095	1.127	1.170	1.213	1.321
Surgical ICUs	229	0.633	0.705	0.746	0.790	0.816	0.839	0.873	0.894	0.918	0.945	0.961	0.991	1.023	1.059	1.088	1.153	1.209	1.273	1.417
Medical wards	1,748	0.476	0.606	0.669	0.711	0.755	0.792	0.826	0.855	0.885	0.912	0.938	0.968	0.998	1.026	1.067	1.107	1.158	1.234	1.348
Medical-surgical wards	2,482	0.465	0.633	0.704	0.754	0.799	0.839	0.870	0.898	0.927	0.957	0.986	1.014	1.048	1.084	1.116	1.152	1.210	1.274	1.376
Surgical wards	805	0.591	0.703	0.762	0.802	0.838	0.861	0.894	0.915	0.941	0.966	0.995	1.018	1.045	1.077	1.112	1.150	1.197	1.244	1.313
Step down units	1,026	0.493	0.577	0.648	0.695	0.746	0.792	0.838	0.868	0.901	0.937	0.969	1.005	1.044	1.076	1.118	1.159	1.226	1.295	1.419
General hematology-oncology wards	285	0.664	0.737	0.777	0.835	0.855	0.881	0.909	0.925	0.949	0.976	1.003	1.032	1.081	1.121	1.153	1.226	1.297	1.357	1.516

2021 Data

2021 Antimicrobial Use Option Data Report – November 2022 [PDF – 2 MB]

2021 Antimicrobial Use Option Report Data Tables – November 2022 [XLS – 436 KB]

Table 2a2. Adult all antibacterial agents SAAR usage by antimicrobial agent (top 10 most commonly used agents) and SAAR location type

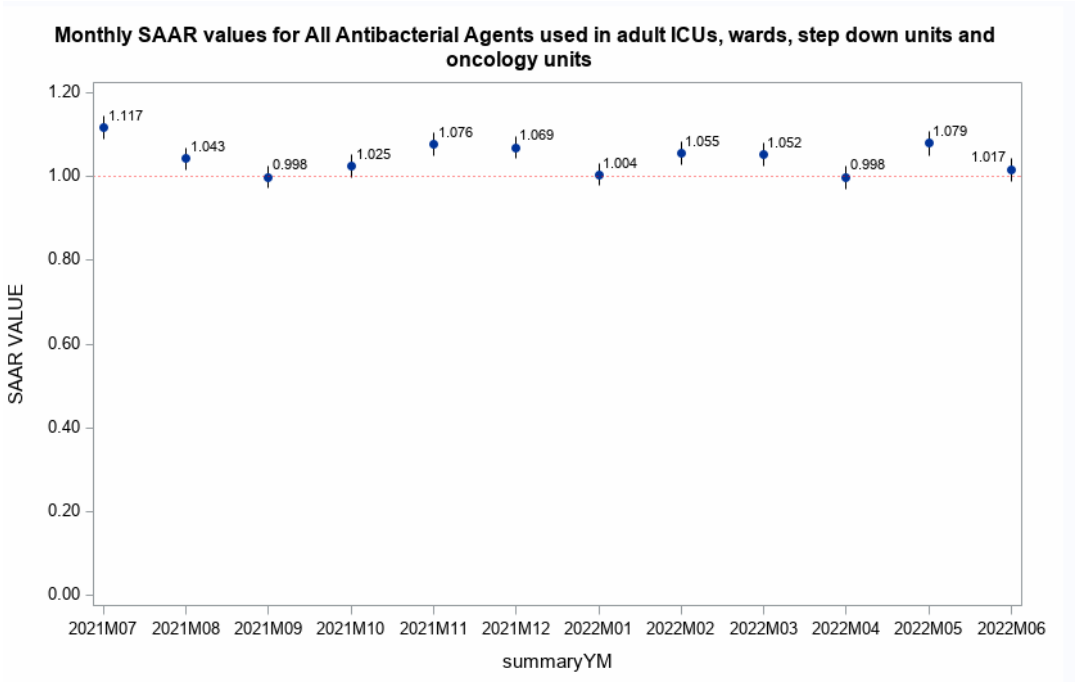
Adult SAAR location type (n)[1]	Antimicrobial[2]	Pooled antimicrobial days	Percentage of antimicrobial days
Medical ICUs (n=465)	Vancomycin	386,209	18.2
	Piperacillin/Tazobactam	333,532	15.7
	Cefepime	291,716	13.7
	Ceftriaxone	243,080	11.4
	Meropenem	169,634	8.0
	Metronidazole	112,249	5.3
	Azithromycin	110,496	5.2
	Cefazolin	61,911	2.9
	Doxycycline	60,059	2.8
	Linezolid	48,813	2.3

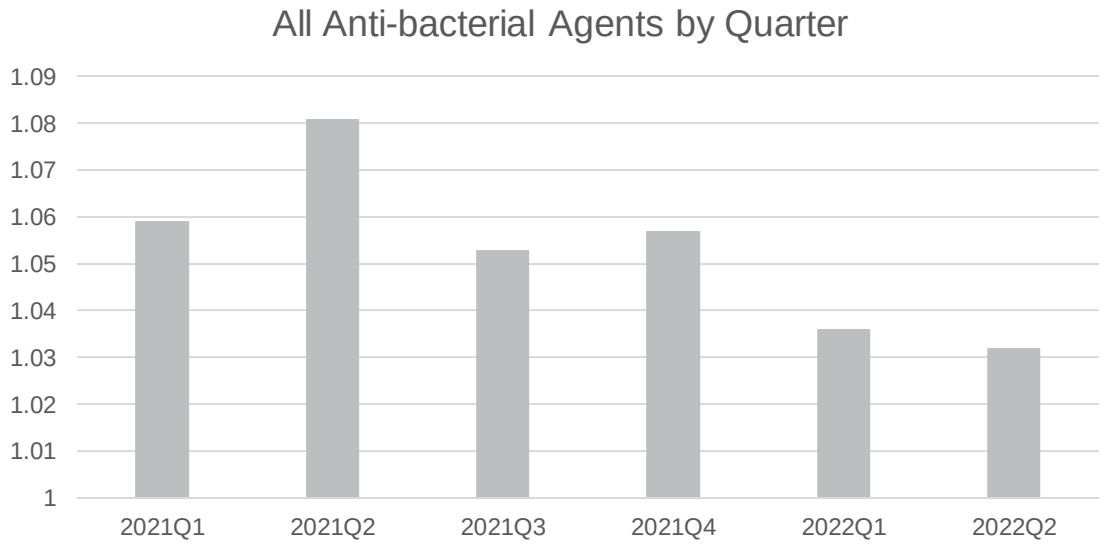
Can I easily get my percentile? Yes!

orgID	SAARType_2017	location	summaryYQ	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI	SAAR_pctl
45032	Adult_All-Antibacterial_2017	MED	2021Q1	IN:ACUTE:WARD:M	2214	2519.021	4272	0.879	0.0000	0.843, 0.916	36
45032	Adult_All-Antibacterial_2017	MED	2021Q2	IN:ACUTE:WARD:M	2870	2806.777	4760	1.023	0.2369	0.986, 1.060	62
45032	Adult_All-Antibacterial_2017	MED	2021Q3	IN:ACUTE:WARD:M	2421	2812.082	4769	0.861	0.0000	0.827, 0.896	33
45032	Adult_All-Antibacterial_2017	MED	2021Q4	IN:ACUTE:WARD:M	2579	2691.793	4565	0.958	0.0295	0.922, 0.996	50
45032	Adult_All-Antibacterial_2017	MED	2022Q1	IN:ACUTE:WARD:M	2814	2754.885	4672	1.021	0.2644	0.984, 1.060	61
45032	Adult_All-Antibacterial_2017	MED	2022Q2	IN:ACUTE:WARD:M	2269	2608.651	4424	0.870	0.0000	0.835, 0.906	35

SAAR Report -All Adults and Ped SAARs by Location (2017 Baseline) - modified to by quarter

Wait – Did you Mention Time Trends?





SAAR Plot-All Adult and Pediatric SAARs (2017 baseline)

SO, WE'RE THE PROBLEM: WHERE DO I START?

Duke University School of Medicine

Duke Center for Antimicrobial Stewardship and Infection Prevention

dason DUKE ANTIMICROBIAL STEWARDSHIP OUTREACH NETWORK

dason.medicine.duke.edu

Drilling Down to Specific Agents

Facility Name	SAARTypeCat	AU-CAD Rank	Facility AU-CAD (Rounded)	Three highest use drugs within SAAR Type (Percentage)	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	Location SAAR	95% Confidence Interval
CDA TEST FACILITY - DUKE	ALL	1	1989	CEFTRX(17); VANC(14); PIPERWT(13);	55053	53063.896	85609	1.037	1.029, 1.046
	BSCA	2	1514	CEFTRX(69); LEVO(14); CIPRO(7);	13330	11816.070	85609	1.128	1.109, 1.147
	BSHO	3	843	PIPERWT(51); CEFEP(32); MERO(15);	14437	13594.403	85609	1.062	1.045, 1.079
	CDI	4	96	CEFTRX(52); CEFEP(26); LEVO(11);	17844	17747.672	85609	1.005	0.991, 1.020
	GRAMPOS	5	-299	VANC(85); LNZ(8); DAPTO(5);	8224	8523.404	85609	0.965	0.944, 0.986
	ANTIFGL	6	-367	FLUCO(78); MICA(17); ANID(6);	1574	1941.421	85609	0.811	0.771, 0.852
	NSBL	7	-437	CEFAZ(59); AMOXWC(14); AMPIWS(12);	7133	7569.913	85609	0.942	0.921, 0.964

TAS Report-Adult SAAR Types- Facility

SAARTypeCat	AU-CAD Rank	Facility AU-CAD (Rounded)	Three highest use drugs within SAAR Type (Percentage)
ALL	1	1989	CEFTRX(17); VANC(14); PIPERWT(13);
BSCA	2	1514	CEFTRX(69); LEVO(14); CIPRO(7);
BSHO	3	843	PIPERWT(51); CEFEP(32); MERO(15);
CDI	4	96	CEFTRX(52); CEFEP(26); LEVO(11);
GRAMPOS	5	-299	VANC(85); LNZ(8); DAPTO(5);
ANTIFGL	6	-367	FLUCO(78); MICA(17); ANID(6);
NSBL	7	-437	CEFAZ(59); AMOXWC(14); AMPIWS(12);

Drilling Down to Specific Agents

FACILITY			LOCATION GI				
Facility Org ID	Facility Name	Facility AU-CAD (Rounded)	LocationGroup	SAARTypeCat	Location Group Rank	Location Group AU-CAD (Rounded)	Three highest use drugs within SAAR Type (Percentage)
45032	CDA TEST FACILITY - DUKE	1989	WARDS	ALL	1	1985	CEFTRX(17); VANC(14); PIPERWT(13);
			ONCOLOGY	ALL	2	127	CEFTRX(19); PIPERWT(13); VANC(12);
			STEPDOWN	ALL	3	35	CEFTRX(19); CEFEP(13); VANC(13);
			ICUS	ALL	4	-158	PIPERWT(19); VANC(17); CEFTRX(13);

TAS Report-Adult SAAR Types- Location Groups (Separated)

Prioritizing – By Unit

FACILITY			LOCATION GROUP									
Facility Org ID	Facility Name	Facility AU-CAD (Rounded)	LocationGroup	SAARTypeCat	Location Group Rank	Location Group AU-CAD (Rounded)	Three highest use drugs within SAAR Type (Percentage)	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	Location SAAR	95% Confidence Interval
45032	CDA TEST FACILITY - DUKE	1350	ICUS	BSCA	1	157	CEFTRX(70); LEVO(20); ERTA(5);	1287	1130.155	7911	1.139	1.078, 1.202
				BSHO	2	134	PIPERWT(51); MERO(26); CEFEP(22);	2588	2453.596	7911	1.055	1.015, 1.096
				ANTIFGL	3	72	FLUCO(46); MICA(40); ANID(13);	373	301.362	7911	1.238	1.117, 1.368
				CDI	4	-153	CEFTRX(49); CEFEP(30); LEVO(14);	1843	1996.219	7911	0.923	0.882, 0.966
				GRAMPOS	5	-209	VANC(88); LNZ(9); CEFTAR(2);	1263	1472.489	7911	0.858	0.811, 0.906
				NSBL	6	-247	CEFAZ(58); AMPIWS(30); NAF(4);	437	684.103	7911	0.639	0.581, 0.701
			STEPDOWN	CDI	1	126	CEFTRX(52); CEFEP(36); LEVO(4);	2754	2627.581	13021	1.048	1.010, 1.088
				BSHO	2	30	CEFEP(47); PIPERWT(36); MERO(12);	2111	2081.448	13021	1.014	0.972, 1.058
				BSCA	3	25	CEFTRX(82); LEVO(7); CEFDIN(5);	1733	1707.727	13021	1.015	0.968, 1.063
				ANTIFGL	4	-27	FLUCO(79); MICA(21); ANID(0);	211	237.654	13021	0.888	0.774, 1.014
				NSBL	5	-101	CEFAZ(34); AMOXWC(21); AMPIWS(15);	807	908.430	13021	0.888	0.829, 0.951
				GRAMPOS	6	-176	VANC(90); LNZ(5); DAPTO(4);	1035	1210.900	13021	0.855	0.804, 0.908
			WARDS	BSCA	1	1121	CEFTRX(66); LEVO(15); CIPRO(8);	8549	7428.174	54520	1.151	1.127, 1.175
				BSHO	2	737	PIPERWT(56); CEFEP(30); MERO(11);	7891	7154.396	54520	1.103	1.079, 1.128
				CDI	3	288	CEFTRX(52); CEFEP(22); LEVO(12);	10849	10560.911	54520	1.027	1.008, 1.047
				GRAMPOS	4	278	VANC(84); DAPTO(7); LNZ(7);	5173	4895.455	54520	1.057	1.028, 1.086
				NSBL	5	-69	CEFAZ(64); AMOXWC(13); AMPIWS(10);	5376	5444.862	54520	0.987	0.961, 1.014
				ANTIFGL	6	-87	FLUCO(88); MICA(8); ANID(4);	758	844.986	54520	0.897	0.835, 0.963

TAS Report-Adult SAAR Types- Location Groups (Separated)

Prioritizing – Overall

FACILITY			LOCATION GROUP				
Facility Org ID	Facility Name	Facility AU-CAD (Rounded)	LocationGroup	SAARTypeCat	Location Group Rank	Location Group AU-CAD (Rounded)	Three highest use drugs within SAAR Type (Percentage)
45032	CDA TEST FACILITY - DUKE	1350	WARDS	BSCA	1	1121	CEFTRX(66); LEVO(15); CIPRO(8);
			WARDS	BSHO	2	737	PIPERWT(56); CEFEP(30); MERO(11);
			WARDS	CDI	3	288	CEFTRX(52); CEFEP(22); LEVO(12);
			WARDS	GRAMPOS	4	278	VANC(84); DAPTO(7); LNZ(7);
			ONCOLOGY	BSCA	5	211	CEFTRX(70); LEVO(14); CIPRO(8);

TAS Report-Adult SAAR Types- Location Groups (Combined)

ARE YOU SETTING POSSIBLE GOALS?

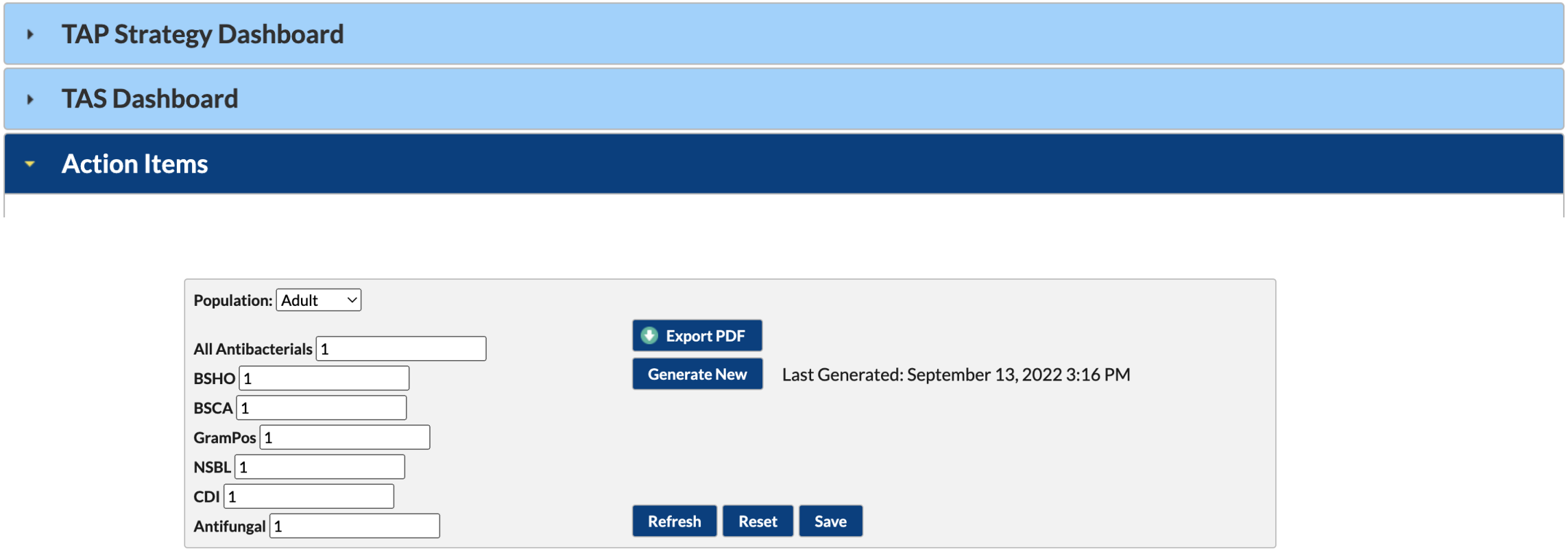
Duke University School of Medicine

Duke Center for Antimicrobial Stewardship and Infection Prevention

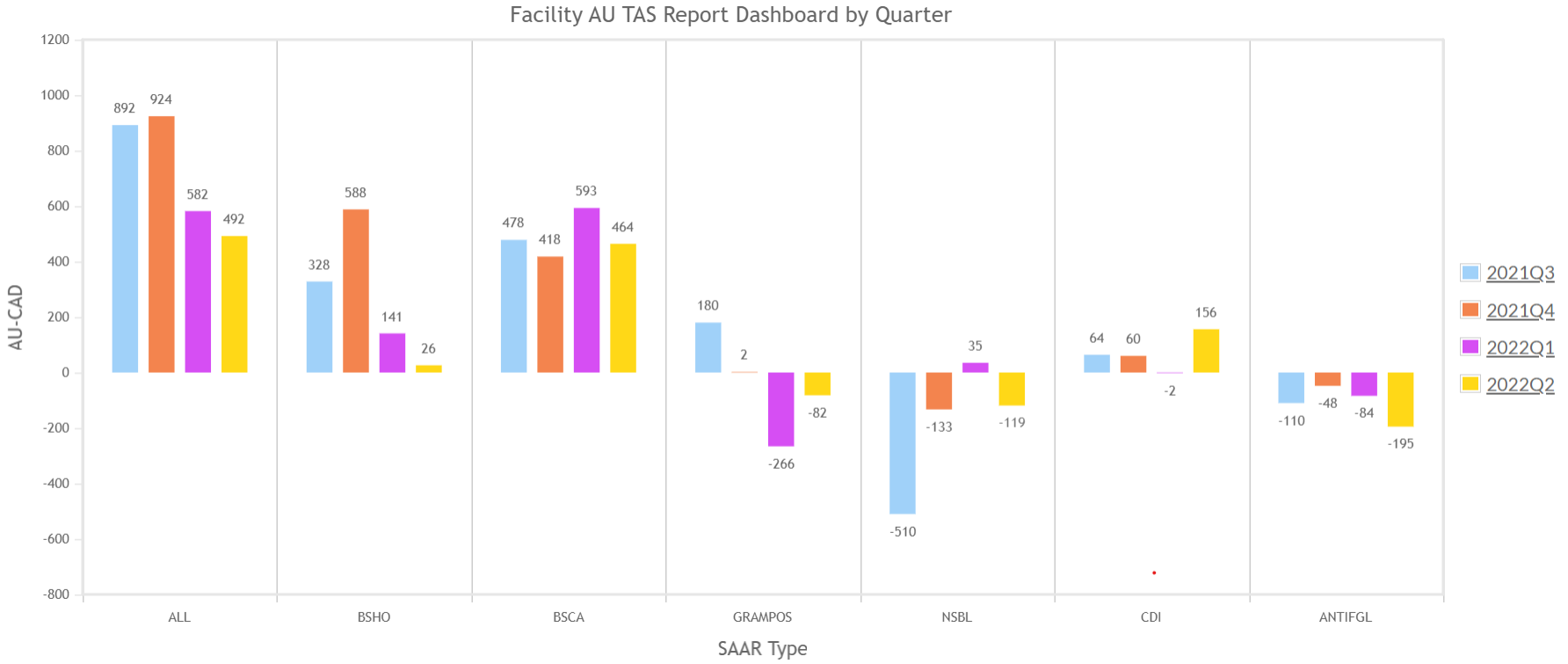
dason DUKE ANTIMICROBIAL STEWARDSHIP OUTREACH NETWORK

dason.medicine.duke.edu

New NHSN Tools!!



AU-CAD

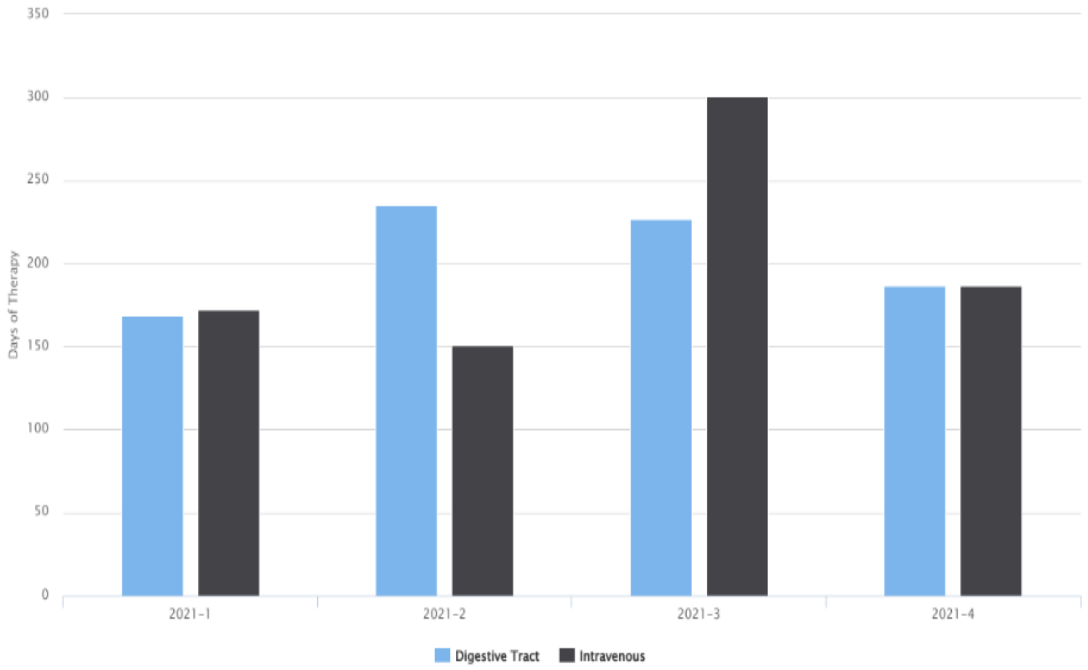


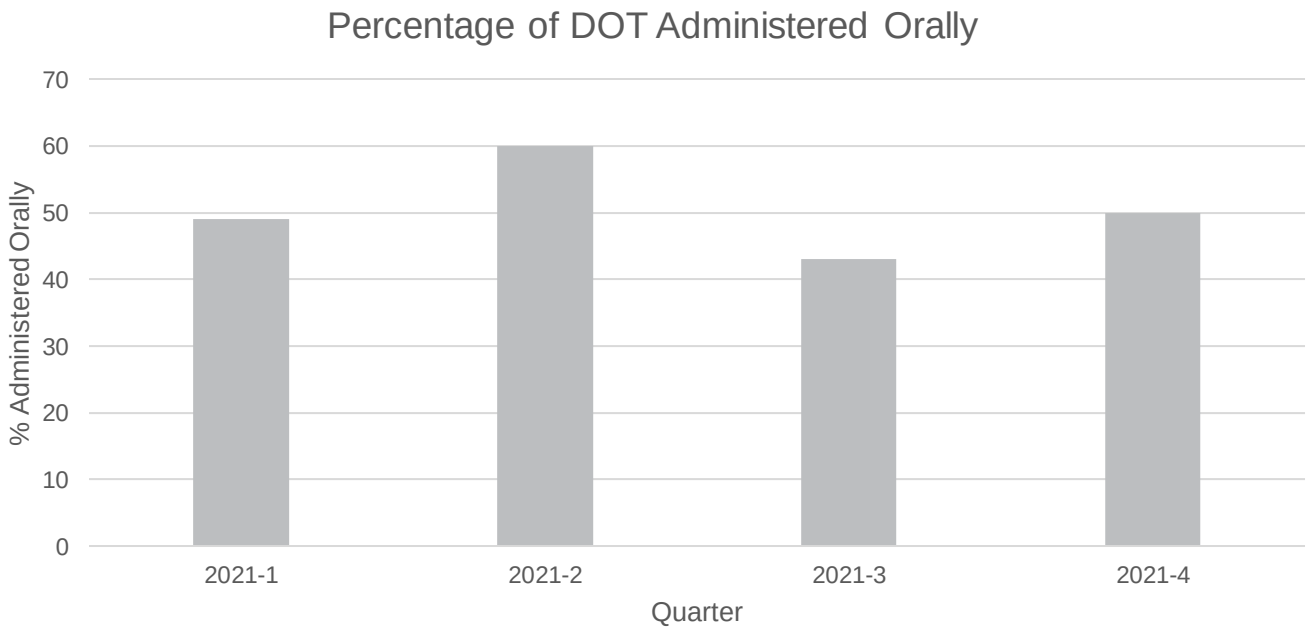
Facility AU-CAD				
SAAR Type	2021Q3	2021Q4	2022Q1	2022Q2
ALL	892	924	582	492
BSHO	328	588	141	26
BSCA	478	418	593	464
GRAMPOS	180	2	-266	-82
NSBL	-510	-133	35	-119
CDI	64	60	-2	156
ANTIFGL	-110	-48	-84	-195

CAN I TARGET SPECIFIC INTERVENTIONS?

Example: IV to PO

Quarterly Data for IV vs. PO Doxycycline





Line Listing- All Submitted AU Data for FACWIDEIN- converted to graph using Pivot Chart in Excel

Leveraging National Healthcare Safety Network Antibiotic Use Option to Inform, Implement and Assess Antibiotic Stewardship Activities

CLINICAL SCENARIOS

Category 1: Using AU Data to Identify and Inform Stewardship Opportunities for High Antimicrobial Use

+ 1. Individual SAAR category
+ 2. Targeted antimicrobial within a SAAR category
+ 3. SAAR category on a targeted unit type
+ 4. Specific antimicrobial in a select population

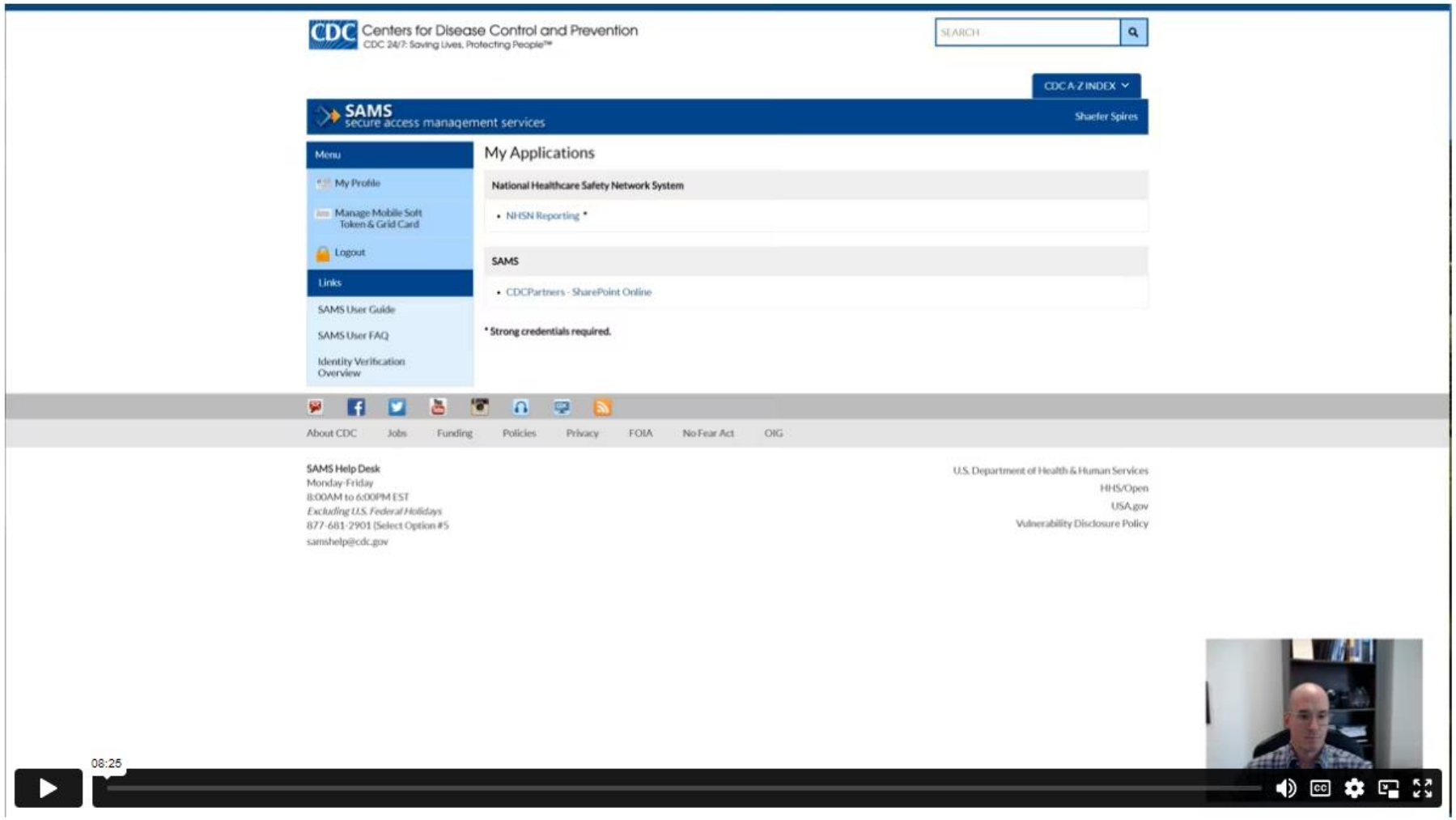
METRIC GUIDES

- **Manipulations of NHSN Extracts**
  - Specific Antimicrobial use bar chart
  - Antimicrobial use by route of delivery
  - Antimicrobial specific DOT/1000 days present
- **Combining NHSN Data with Additional Data from Local S**
  - Antimicrobial-specific Average Length of Therapy
  - NHSN Infection Rate Extracted to Combine with Antibiotic Data
- **Metrics Using Local Data Sources**
  - Antimicrobial use by Indication
  - Durations based on date of event
  - Percent of Patient Admissions receiving a Specific Antimicrobial
  - Targeted admissions denominator (diagnosis code or antibiotic use)
  - Provider Specific Prescribing (DOT)
  - Provider Specific Prescribing- Stratified by Route or Indication
  - Laboratory Test Utilization Rate
  - Culture Rates

Work Funded by Centers for Disease Control & Prevention SHEPheRD

dason DUKE ANTIMICROBIAL STEWARDSHIP OUTREACH NETWORK

Percent of Patient Admissions receiving a Specific Antimicrobial



Click the full screen icon to view the video on the full screen, press the Esc key to return to previous video window.

Reference article: Percent of Patient Admissions receiving a Specific Antimicrobial PDF

The ABCs of Using NHSN Data in Your Stewardship Program

A. Access: Get access to NHSN if you do not have it already!!!
   - There are pre-built actionable reports that you can use immediately
   - Your submitted data is there and is very easy to manipulate in basic programs like Excel™

B. Be Realistic: These data are not going to change antibiotic use data themselves – it is how YOU USE THE TOOLS that will create change
   - DO NOT underestimate the power of comparison

C. Collaborate: All around you are people who are assessing similar data with similar questions – work together! (not sure how to start? say hi to your neighbor)

Questions?

Libby.dodds@duke.edu