NHSN Antimicrobial Use Option – Advanced Analysis

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Objectives

- Modify, run, and interpret Standardized Antimicrobial Administration Ratio (SAAR) reports, including the new SAAR percentile variable

- Aggregate and compare SAAR values

- Modify, run, and interpret the Rate Table – Drugs Predominantly Used for Extensively Antimicrobial Resistant (AR) Bacteria report

- Create, save, and publish custom reports

SAAR Recap

SAAR Background

- SAAR provides a standardized metric of antimicrobial use

- SAAR is a ratio comparing observed, or reported, antimicrobial use to antimicrobial use predicted by a referent, or baseline, population

$$SAAR = \frac{Observed\ antimicrobial\ days}{Predicted\ antimicrobial\ days}$$

- Compares antimicrobial use within and across facilities to guide antimicrobial stewardship efforts

SAAR Baselines

- "Baseline" refers to the calendar year of NHSN data used to develop SAAR Models

- SAAR referent population is AU data aggregated from select patient care locations reporting to the AU Option during the baseline year

- NHSN develops new models every few years ("re-baselining")

  – Allows for assessment of AU risk in more settings

  – Updates antimicrobial groupings

  – Generates precise predicted values

Table of SAAR Baselines

SAAR Baseline	Locations	Antimicrobial Categories
2014 baseline adult and pediatric SAARs*	6 adult and pediatric ICUs and wards	5 antimicrobial categories
2017 baseline adult and pediatric SAARs	13 adult and pediatric ICUs, wards step down units, and oncology units	15 antimicrobial categories
2018 baseline neonatal SAARs	4 neonatal units	7 antimicrobial categories

*You cannot directly compare SAARs calculated under the 2014 baseline with SAARs calculated under the 2017 baseline

2014 Baseline SAAR – Locations

- 6 location groupings:
  - Adult Medical, Medical/Surgical, and Surgical Intensive Care Units (ICUs)
  - Adult Medical, Medical/Surgical, and Surgical Wards
  - Pediatric Medical, Medical/Surgical, and Surgical ICUs
  - Pediatric Medical, Medical/Surgical, and Surgical Wards
  - All Adult Medical, Medical/Surgical, and Surgical ICUs and Wards
  - All Pediatric Medical, Medical/Surgical, and Surgical ICUs and Wards

2014 Baseline SAAR – Antimicrobials

- 5 antimicrobial categories:
    - Broad spectrum antibacterial agents predominantly used for hospital-onset/multi-drug resistant infections
    - Broad spectrum antibacterial agents predominantly used for community-acquired infections (BSCA)
    - Anti-MRSA antibacterial agents
    - Antibacterial agents predominantly used for surgical site infection prophylaxis

Full list of antimicrobials in 2014 Baseline SAAR Details: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/saar-2014-508.pdf

2017 Baseline SAAR – Locations

8 adult locations:

- Medical Critical Care
- Surgical Critical Care
- Medical-Surgical Critical Care
- Surgical Ward
- Medical Ward
- Medical-Surgical Ward
- Oncology General Hematology-Oncology Ward
- Adult Stepdown Unit

5 pediatric locations:

- Pediatric Medical Critical Care
- Pediatric Medical-Surgical Critical Care
- Pediatric Medical Ward
- Pediatric Surgical Ward
- Pediatric Medical-Surgical Ward

2017 Baseline SAAR – Antimicrobials

7 adult antimicrobial categories:

- All antibacterial agents
- Broad spectrum antibacterial agents predominantly used for hospital-onset infections (BSHO)
- BSCA
- Antibacterial agents predominantly used for resistant Gram-positive infections
- Narrow spectrum beta-lactam agents (NSBL)
- Antibacterial agents posing the highest risk for *Clostridioides difficile* infection (CDI)
- Antifungal agents predominantly used for invasive candidiasis

8 pediatric antimicrobial categories:

- All antibacterial agents
- BSHO
- BSCA
- Antibacterial agents predominantly used for resistant Gram-positive infections
- NSBL
- Azithromycin
- Antibacterial agents posing the highest risk for CDI

Full list of antimicrobials in AUR Module Protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf

2018 Baseline Neonatal SAAR - Locations

4 neonatal units:

- Step down Neonatal Nursery

- Neonatal Critical Care (Level II/III)

- Neonatal Critical Care (Level III)

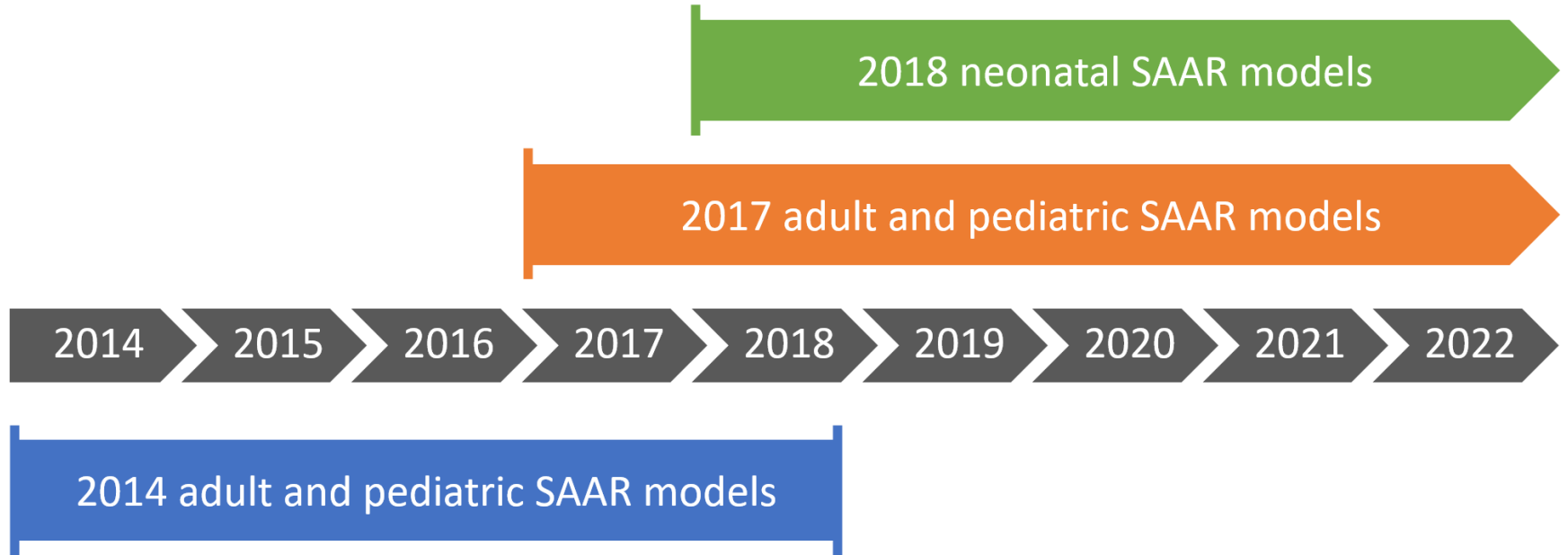- Neonatal Critical Care (Level IV)

2018 Baseline Neonatal SAAR - Antimicrobials

7 antimicrobial categories:

- All antibacterial agents
- Vancomycin predominantly used for treatment of late onset sepsis
- BSHO
- Third generation cephalosporins
- Ampicillin predominantly used for treatment of early-onset sepsis
- Aminoglycosides predominantly used for treatment of early-onset and late-onset sepsis
- Fluconazole predominantly used for candidiasis

Full list of antimicrobials in AUR Module Protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf

SAAR Baselines Timeline

2018 neonatal SAAR models

2017 adult and pediatric SAAR models

2014 2015 2016 2017 2018 2019 2020 2021 2022

2014 adult and pediatric SAAR models

Modifying the SAAR Report

Modifying the SAAR by Location Report

SAAR by Location Report — Time Period Tab

SAAR by Location Report — Filters Tab

SAAR by Location Report — Display Options Tab

SAAR Report Output

SAAR by Location Report — Output

National Healthcare Safety Network

SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: February 11, 2022 at 8:37 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M03	IN:ACUTE:WARD:M	495	557.219	916	0.888	0.0079	0.813, 0.969	35
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M04	IN:ACUTE:WARD:M	569	577.902	950	0.985	0.7313	0.906, 1.068	48
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M05	IN:ACUTE:WARD:M	579	480.570	790	1.205	0.0000	1.110, 1.306	82
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M06	IN:ACUTE:WARD:M	553	671.581	1104	0.823	0.0000	0.757, 0.894	25
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M07	IN:ACUTE:WARD:M	675	820.619	1349	0.823	0.0000	0.762, 0.886	25
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M08	IN:ACUTE:WARD:M	521	526.802	866	0.989	0.8227	0.907, 1.077	49
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M09	IN:ACUTE:WARD:M	670	564.519	928	1.187	0.0000	1.099, 1.279	80
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M10	IN:ACUTE:WARD:M	537	934.984	1537	0.574	0.0000	0.527, 0.624	9
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M11	IN:ACUTE:WARD:M	671	1068.814	1757	0.628	0.0000	0.582, 0.677	11
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M12	IN:ACUTE:WARD:M	671	889.969	1463	0.754	0.0000	0.699, 0.813	18

Any reported use of Colistin will be combined with and reported as Colistimethate. Any reported use of Amikacin Liposomal will be combined with and reported as Amikacin.

Includes data for January 2017 and forward.

The SAAR is only calculated if the number of predicted antimicrobial days (numAUDaysPredicted) is >=1.

If antimicrobial days exceed days present for any SAAR categories except the All Antibacterial SAAR, a SAAR will not be calculated and data should be validated for accuracy.

Data restricted to medical, medical-surgical, surgical, step down and oncology locations.

The SAAR percentile is not shown if the SAAR is not shown, nor is it shown for pediatric medical ICUs or pediatric surgical wards where the aggregate sample size was too small for analysis (<20).

Source of aggregate data: 2017 NHSN AU Data

Note: Data are fictitious and for example only

SAAR Components

- **Antimicrobial days:** Any amount of a specific antimicrobial agent administered in a calendar day to a patient as reported in electronic medication administration record (eMAR) or bar coding medication administration (BCMA) system

- **Predicted antimicrobial days:** Calculated using predictive models developed by CDC

- **Days present:** Aggregate number of patients housed in a patient care location or facility anytime throughout the day during a calendar month
  - Used in SAAR models to calculate predicted antimicrobial days

Interpreting a SAAR value

- Ratio comparing observed antimicrobial use to predicted antimicrobial use
  - SAAR < 1.0 indicates antimicrobial use was less than predicted
  - SAAR = 1.0 indicates antimicrobial use was equivalent to predicted use
  - SAAR > 1.0 indicates antimicrobial use was greater than predicted
- Not a definitive measure of appropriateness or judiciousness of antimicrobial use, and any SAAR value may warrant additional investigation
- Can only generate SAAR when the number of predicted antimicrobial days are ≥ 1 and total antimicrobial days do not exceed days present

SAAR *p*-value

- Statistical measure that indicates if observed antimicrobial use is statistically different from predicted antimicrobial use

  - If *p*-value ≤ 0.05, then observed antimicrobial days are significantly different from predicted antimicrobial days

  - If *p*-value > 0.05, then observed antimicrobial days are not significantly different from predicted antimicrobial days

- Due to large number of antimicrobial days recorded and included in predictive models, most SAAR p-values are statistically significant and should be interpreted with caution

95% Confidence Interval (CI)

- Range of values in which true SAAR value is likely to lie (however SAAR is the most likely value)

  - If the 95% CI does not include 1, the SAAR is statistically significantly different than 1

  - If the 95% CI includes 1, the SAAR is not statistically significantly different than 1

- SAAR p-value and 95% CI will always indicate the same statistical significance and can be interpreted interchangeably

SAAR Percentile

- Percentile a SAAR falls into based on the distribution of location-specific SAARs found in the NHSN AU Option Report Data Tables
  - More recent data than used for SAAR baseline
  - Currently 2019 data, future release will update to 2020
- SAARs were calculated for each SAAR location reporting nine or more months of data and percentiles are based on those location-year-level distributions
- Interpretation example: SAAR percentile of 90 indicates 89% of SAAR values reported from similar locations are less than that SAAR and 10% of SAAR values are greater than it
  - The 50th percentile is the median location-specific SAAR value

SAAR Report Interpretation

Example Interpretation – SAAR Type

Interpret first row of modified report as an example: SAAR data for all antibacterial agents used in medical ward in January 2021

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SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 6:54 PM

Date Range: AU_SAAR_2017 summaryYr 2021 to 2021

if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

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Note: Data are fictitious and for example only

Example Interpretation – Location

Report displays SAARs for Medical Ward (MEDWARD) location

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SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
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33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

Note: Data are fictitious and for example only

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Example Interpretation – Time Period

Each row in report represents one month/location combination

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As of: March 6, 2022 at 6:54 PM
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33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

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Note: Data are fictitious and for example only

Example Interpretation – Antimicrobial Days & Days Present

632 antimicrobial days reported for patients contributing 2009 days present in the medical ward

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As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

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33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

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Note: Data are fictitious and for example only

Example Interpretation – Predicted Antimicrobial Days

SAAR model predicted 1222.111 antimicrobial days for medical ward using 2017 baseline data from similar locations

National Healthcare Safety Network
SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)
As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))
All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
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33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

Note: Data are fictitious and for example only

Example Interpretation – SAAR

SAAR (ratio of observed to predicted antimicrobial use) was 0.517

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SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

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Note: Data are fictitious and for example only

Example Interpretation – SAAR *p*-value

Observed antimicrobial use was significantly different from predicted use (or SAAR was significantly different from 1)

National Healthcare Safety Network

SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

Note: Data are fictitious and for example only

Example Interpretation – 95% CI

High degree of confidence true SAAR between 0.478 and 0.559; 0.517 is most likely SAAR value

National Healthcare Safety Network

SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

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Note: Data are fictitious and for example only

Example Interpretation – SAAR Percentile

SAAR was in the 7th percentile of SAARs reported from similar locations;

6% of SAAR values were less than and 93% were greater than 0.517

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SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 6:54 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval	SAAR Percentile
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

Note: Data are fictitious and for example only

Comparing SAARs

SAAR Benchmarks

- By default, SAAR p-value and 95% CI compare SAAR value to 1
- Values other than 1 may be helpful benchmarks depending on past performance, stewardship goals, or patient population
  - Our SAAR value was 0.517 – 1 may not be a good benchmark so let's aim for 0.5 instead
- Many methods to develop benchmarks – more information in the SAAR Guide under "Defining your benchmark" starting on page 16: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf

Advanced SAAR Comparisons

- Can compare SAARs to value other than 1 or compare two SAAR values to each other
  - Cannot directly compare SAAR values calculated under different baselines
- NHSN Statistics Calculator, a tool within NHSN application, conducts statistical tests and determines statistical differences
- More information in the SAAR Guide under "Comparing two SAAR values" starting on page 17: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf

Example: Statistics Calculator – Navigation

Example: Statistics Calculator – Compare to Nominal Value

Statistics Calculator

- Compare Two Proportions

- Compare Two Incidence Density Rates

- Compare Single Proportion to a Benchmark

The options below can be applied to the following standardized ratios: standardized infection ratios (SIRs), standardized utilization ratios (SURs), and standardized antimicrobial administration ratios (SAARs).

- Compare Single Standardized Ratio (for example, SIR) to Nominal Value

- Compare Single Standardized Ratio (for example, SIR) to 1

- Compare Two Standardized Ratios (for example, SIRs)

Example: Statistics Calculator – SAAR

Compare Single Standardized Ratio (for example, SIR) to Nominal Value

When comparing a standardized ratio to a nominal value, the hypothesis is that the ratio is not different from the nominal value. To perform a hypothesis test and calculate a p-value, first select the type of ratio you wish to analyze. Then, enter the values for the appropriate number observed and number predicted. The standardized ratio will be displayed automatically. Enter the nominal value you wish to use for the comparison, and click Calculate.

Type of ratio: SAAR - standardized antimicrobial administration ratio

Data Source

Number Observed Antimicrobial Days of Therapy:

Number Predicted Antimicrobial Days of Therapy:

Standardized Antimicrobial Administration Ratio: 0.517

Nominal Value:

Title:

Calculate   Back

Example: Statistics Calculator – Input Data

National Healthcare Safety Network

SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: February 23, 2022 at 1:42 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

orgID	SAARType_2017	location	summaryYM	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI	SAAR_pctl
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10

Data Source

Number Observed Antimicrobial Days of Therapy: 632

Number Predicted Antimicrobial Days of Therapy: 1222.111

Standardized Antimicrobial Administration Ratio: 0.517

Nominal Value:

Title:

Calculate   **Back**

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Example: Statistics Calculator – Benchmark and Title

Example: Statistics Calculator – Output

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Compare SAAR value to 0.5
As of: February 11, 2022 at 9:29 PM

Number Observed Antimicrobial Days of Therapy	Number Predicted Antimicrobial Days of Therapy	SAAR	p-value as Compared to 0.5
632	1222.111	0.517	0.4070

- The *p*-value is 0.4070, which is > 0.05
- Our SAAR value of 0.517 is not statistically significantly different from 0.5

SAARs Over Time

- Tracking AU over time using SAARs should be limited to comparing two SAAR values across two points in time

- Do not use SAARs for trend analyses
  - Work with statistician to use crude rates and risk-adjust for factors included in the SAAR models that fit your analysis question instead

- More information in the SAAR Guide under "Assessing AU data over time" starting on page 20: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf

Example: SAARs Over Time – Compare Two Ratios

Statistics Calculator

- Compare Two Proportions

- Compare Two Incidence Density Rates

- Compare Single Proportion to a Benchmark

The options below can be applied to the following standardized ratios: standardized infection ratios (SIRs), standardized utilization ratios (SURs), and standardized antimicrobial administration ratios (SAARs).

- Compare Single Standardized Ratio (for example, SIR) to Nominal Value

- Compare Single Standardized Ratio (for example, SIR) to 1

- Compare Two Standardized Ratios (for example, SIRs)

Example: SAARs Over Time – SAAR

Compare Two Standardized Ratios (for example, SIRs)

When comparing two standardized ratios, the hypothesis is that the two ratios are not different from each other. To perform a hypothesis test and calculate a p-value, first select the type of ratio you wish to analyze. Then, enter the values for the appropriate number observed and number predicted. The standardized ratios for each data source will be displayed automatically. Click Calculate

Type of ratio: SAAR - standardized antimicrobial administration ratio ⌄

	Data Source #1	Data Source #2
Group Labels:		
Number Observed Antimicrobial Days of Therapy:		
Number Predicted Antimicrobial Days of Therapy:		
Standardized Antimicrobial Administration Ratio:		
Title:		

Calculate   **Back**

Example: SAARs Over Time – Input Data

National Healthcare Safety Network

SAARs Table - All Adult and Pediatric Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets by Location (2017 Baseline)

As of: March 6, 2022 at 9:49 PM
Date Range: AU_SAAR_2017 summaryYr 2021 to 2021
if (((location = "MEDWARD")))

All Antibacterial Agents used in adult SAAR ICUs, wards, step down units and oncology units

orgID	SAARType_2017	location	summaryYM	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI	SAAR_pctl
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M01	IN:ACUTE:WARD:M	632	1222.111	2009	0.517	0.0000	0.478, 0.559	7
33617	Adult_All-Antibacterial_2017	MEDWARD	2021M02	IN:ACUTE:WARD:M	704	1181.961	1943	0.596	0.0000	0.553, 0.641	10
33617	Adult_All-	MEDWARD	2021M03	IN:ACUTE:WARD:M	495	557.249	916	0.888	0.0079	0.818, 0.969	25

	Data Source #1	Data Source #2
Group Labels:	2021M01	2021M02
Number Observed Antimicrobial Days of Therapy:	632	704
Number Predicted Antimicrobial Days of Therapy:	1222.111	1181.961
Standardized Antimicrobial Administration Ratio:	0.517	0.596
Title:		

Calculate   **Back**

Example: SAARs Over Time – Title

Compare Two Standardized Ratios (for example, SIRs)

When comparing two standardized ratios, the hypothesis is that the two ratios are not different from each other. To perform a hypothesis test and calculate a p-value, first select the type of ratio you wish to analyze. Then, enter the values for the appropriate number observed and number predicted. The standardized ratios for each data source will be displayed automatically. Click Calculate

Type of ratio: SAAR - standardized antimicrobial administration ratio

	Data Source #1	Data Source #2
Group Labels:	2021M01	2021M02
Number Observed Antimicrobial Days of Therapy:	632	704
Number Predicted Antimicrobial Days of Therapy:	1222.111	1181.961
Standardized Antimicrobial Administration Ratio:	0.517	0.596
Title:	Compare 2021M01 SAAR value to 2021M02 SAAR value	

Calculate   Back

Example: SAARs Over Time – Output

- The *p*-value is 0.0099, which is < 0.05
- Our Jan. 2021 and Feb. 2021 SAAR values are significantly different

National Healthcare Safety Network
Compare 2021M01 SAAR value to 2021M02 SAAR value
As of: March 6, 2022 at 10:10 PM

	2021M01	2021M02
Observed Antimicrobial Administration	632	704
Predicted Antimicrobial Administration	1222.111	1181.961
SAAR	0.517	0.596

Relative ratio of SAARs (data column 2 / data column 1): 0.596/0.517 = 1.153 (115.3%)
Two-tailed p-value: 0.0099
95% Conf. Interval: 1.034, 1.282

Drugs Predominantly Used for Extensively AR Bacteria

Background

- NHSN understands importance of monitoring usage of drugs predominantly used for extensively AR bacteria

- Utilization of these drugs was too low include in SAAR models:
  - Ceftazidime/avibactam
  - Ceftolozane/tazobactam
  - Colistimethate (IV only)
  - Polymyxin B (IV only)
  - Tigecycline

- List can also be found in AUR Protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf

Rate Table Report

- Utilization was too low for an adjusted metric (e.g., SAAR), but NHSN can provide unadjusted rates

- Drugs Predominantly Used for Extensively AR Bacteria Rate Table generates unadjusted rates for antimicrobial agents predominantly used for extensively AR bacteria

- Special rate table that displays calculated rate of antimicrobial use using SAAR antimicrobial groupings and referent data

  - Uses 2017 SAAR baseline and facilities can generate it for January 2017 – present

Modifying the Rate Table Report

Modifying the Rate Table

Rate Table — Time Period Tab

Rate Table — Filters Tab

Rate Table — Display Options Tab

Rate Table Output and Interpretation

Rate Table — Output

National Healthcare Safety Network

Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)

As of: February 11, 2022 at 9:50 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	Summary Year/Month	SAAR Rate Type 2017 Baseline	Antimicrobial Days	Days Present	Rate per 1000 Days Present	RateDaysPresent95CI	Pooled Mean AU Rate	SAAR p-value	25th Percentile	50th Percentile	75th Percentile	90th Percentile
33617	2021M01	Adult_EARB_2017	58	2009	28.87	22.124, 37.058	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M02	Adult_EARB_2017	61	1943	31.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M03	Adult_EARB_2017	2149	9550	225.03	215.667, 234.694	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M04	Adult_EARB_2017	367	9439	38.88	35.054, 43.015	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M05	Adult_EARB_2017	356	7741	45.99	41.395, 50.957	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M06	Adult_EARB_2017	387	9068	42.68	38.582, 47.093	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M07	Adult_EARB_2017	439	12767	34.39	31.281, 37.719	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M08	Adult_EARB_2017	357	8609	41.47	37.330, 45.942	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M09	Adult_EARB_2017	445	11790	37.74	34.358, 41.376	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M10	Adult_EARB_2017	378	10782	35.06	31.656, 38.730	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M11	Adult_EARB_2017	519	12247	42.38	38.848, 46.144	1.21	0.0000	0.00	0.39	1.12	2.22
33617	2021M12	Adult_EARB_2017	446	10696	41.70	37.962, 45.704	1.21	0.0000	0.00	0.39	1.12	2.22

Any reported use of Colistin will be combined with and reported as Colistimethate. Any reported use of Amikacin Liposomal will be combined with and reported as Amikacin.

Includes data for January 2017 and forward.

Data restricted to adult medical, medical-surgical, surgical, step down and general hematology-oncology locations.

Source of aggregate data: 2017 NHSN AU Data

Note: Data are fictitious and for example only

Rate Table Components

- **Rate per 1,000 days present:** Antimicrobial days for drugs predominantly used for extensively AR bacteria per 1,000 days present

- **Rate days present 95% CI:** Range of values in which the true rate is likely to lie (rate per 1,000 days present is the most likely value)

- **Pooled mean AU rate:** National pooled mean rate per 1,000 days present using the 2017 baseline SAAR referent population

- **SAAR *p*-value:** Statistical measure that indicates if rate was significantly different from pooled mean rate of the referent population

- **25th – 90th percentile:** Pooled rate distribution from referent population

Rate Table Interpretation – Rate Type

Let's interpret the first row of our modified report as an example: rate for antibacterial agents predominantly used for extensively AR bacteria used in adult SAAR ICUs, wards, step down units, and oncology units in January 2021

National Healthcare Safety Network
Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)
As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	Summary Year/Month	SAAR Rate Type 2017 Baseline	Antimicrobial Days	Days Present	Rate per 1000 Days Present	RateDaysPresent95CI	Pooled Mean AU Rate	SAAR p-value	25th Percentile	50th Percentile	75th Percentile	90th Percentile
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33617	2021M02	Adult_EARB_2017	61	1943	31.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

Note: Data are fictitious and for example only

Rate Table Interpretation – Time Period

Each row in report represents one month

National Healthcare Safety Network

Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)

As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

Facility Org ID	Summary Year/Month	SAAR Rate Type 2017 Baseline	Antimicrobial Days	Days Present	Rate per 1000 Days Present	RateDaysPresent95CI	Pooled Mean AU Rate	SAAR p-value	25th Percentile	50th Percentile	75th Percentile	90th Percentile
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33617	2021M02	Adult_EARB_2017	61	1943	21.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

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Note: Data are fictitious and for example only

Rate Table Interpretation – Antimicrobial Days & Days Present

58 antimicrobial days reported for patients contributing 2009 days present

National Healthcare Safety Network

Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)

As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

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33617	2021M02	Adult_EARB_2017	61	1943	31.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

Note: Data are fictitious and for example only

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Rate Table Interpretation – Rate per 1000 Days Present

Rate of adult antibacterial agents predominantly used for extensively AR bacteria was 28.87 antimicrobial days per 1000 days present

National Healthcare Safety Network
Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)
As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

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33617	2021M02	Adult_EARB_2017	61	1943	31.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

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Rate Table Interpretation – 95% CI

High degree of confidence the true rate is between 22.124 and 37.058 antimicrobial days per 1000 days present; most likely value is 28.87 antimicrobial days per 1000 days present

National Healthcare Safety Network
Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)
As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

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33617	2021M02	Adult_EARB_2017	61	1943	21.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

Note: Data are fictitious and for example only

Rate Table Interpretation – Pooled Mean Rate

National pooled mean rate of adult antibacterial agents predominantly used for extensively AR bacteria using the 2017 baseline referent population was 1.21 antimicrobial days per 1000 days present

National Healthcare Safety Network
Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)
As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

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33617	2021M02	Adult_EARB_2017	61	1943	31.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

Note: Data are fictitious and for example only

Rate Table Interpretation – *p*-value

Rate of 28.87 antimicrobial days per 1000 days present was significantly different from national pooled mean rate

National Healthcare Safety Network
Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)
As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

Antibacterial agents predominantly used for extensively antibiotic resistant bacteria used in adult SAAR ICUs, wards, step down units and oncology units

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33617	2021M02	Adult_EARB_2017	61	1943	21.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

Note: Data are fictitious and for example only

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Rate Table Interpretation – Percentiles

Pooled rate distribution from 2017 baseline referent population was 0.00 (25th percentile) – 2.22 (90th percentile); median was 0.39 (50th percentile)

National Healthcare Safety Network
Rate Table – Antibacterial agents predominantly used for extensively antibiotic resistant bacteria (2017 Baseline)
As of: March 6, 2022 at 8:54 PM
Date Range: AU_SAARRATES_2017 summaryYr 2021 to 2021
if (((SAARRateType_2017 = "Adult_EARB_2017")))

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33617	2021M02	Adult_EARB_2017	61	1943	21.39	24.224, 40.056	1.21	0.0000	0.00	0.39	1.12	2.22

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Note: Data are fictitious and for example only

Custom Reports

Custom Reports – Modify Screen

Can save any modified analysis report as a Custom Report

Custom Reports – Saving

Custom Reports – Location

📁 Antimicrobial Use Data

— SAAR SAAR Report - All Adult and Ped SAARs (2017 Baseline)

— SAAR SAAR Report - All Adult and Ped SAARs by Location (2017 Baseline)

— SAAR SAAR Report - All Neonatal SAARs (2018 Baseline)

— SAAR SAAR Report - All Neonatal SAARs by Location (2018 Baseline)

— 📊 Bar Chart - Most Recent Month of AU Data by Antifungal Class and Location

— 📊 Bar Chart - All AU Data by Antifungal Class and Location

— 📊 Bar Chart - Most Recent Month of AU Data by Anti-influenza Class and Location

— 📊 Bar Chart - All AU Data by Anti-influenza Class and Location

📁 Custom Reports

— 👤 XGA6 - SAAR Report - 2021 MEDWARD All Adult and Ped SAARs by Location (2017 Baseline)

Custom Reports – Re-running
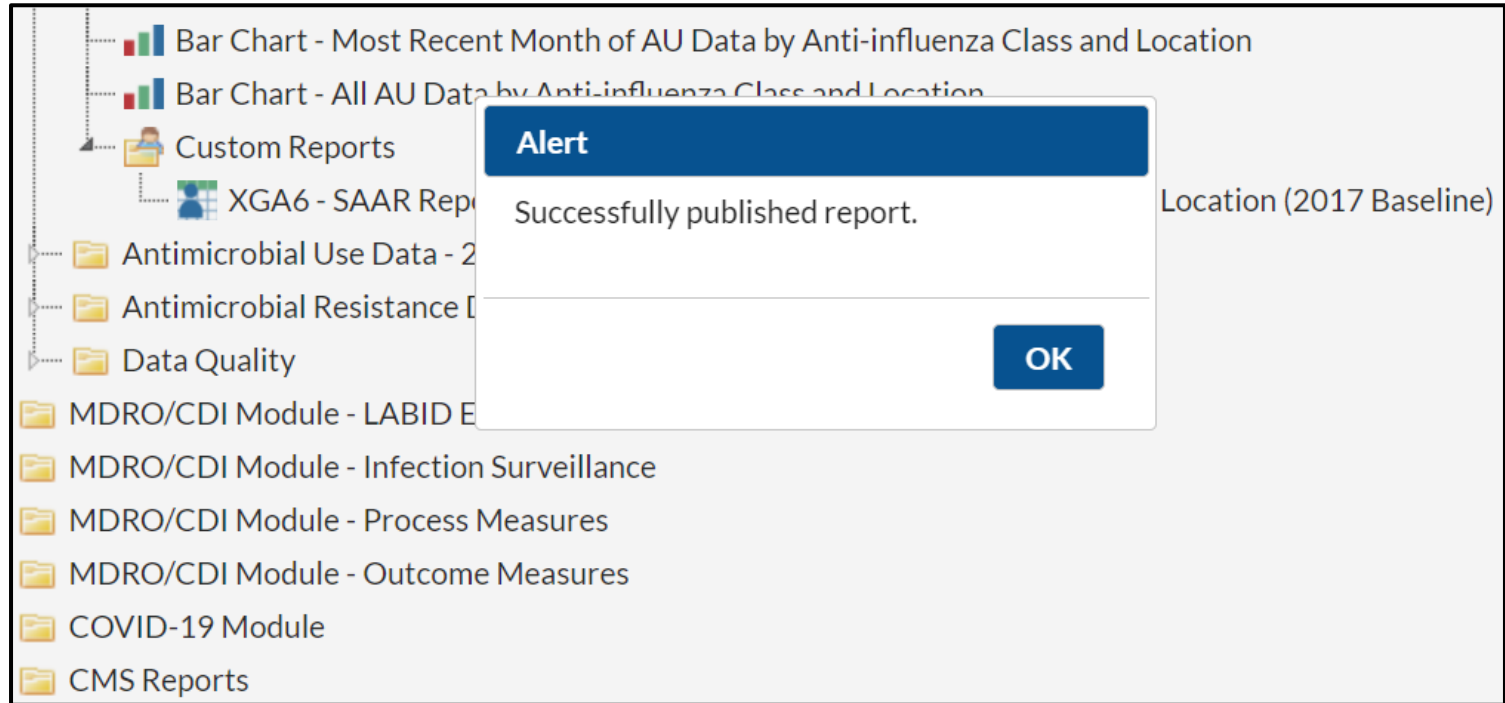
Can re-run or edit Custom Reports whenever you want
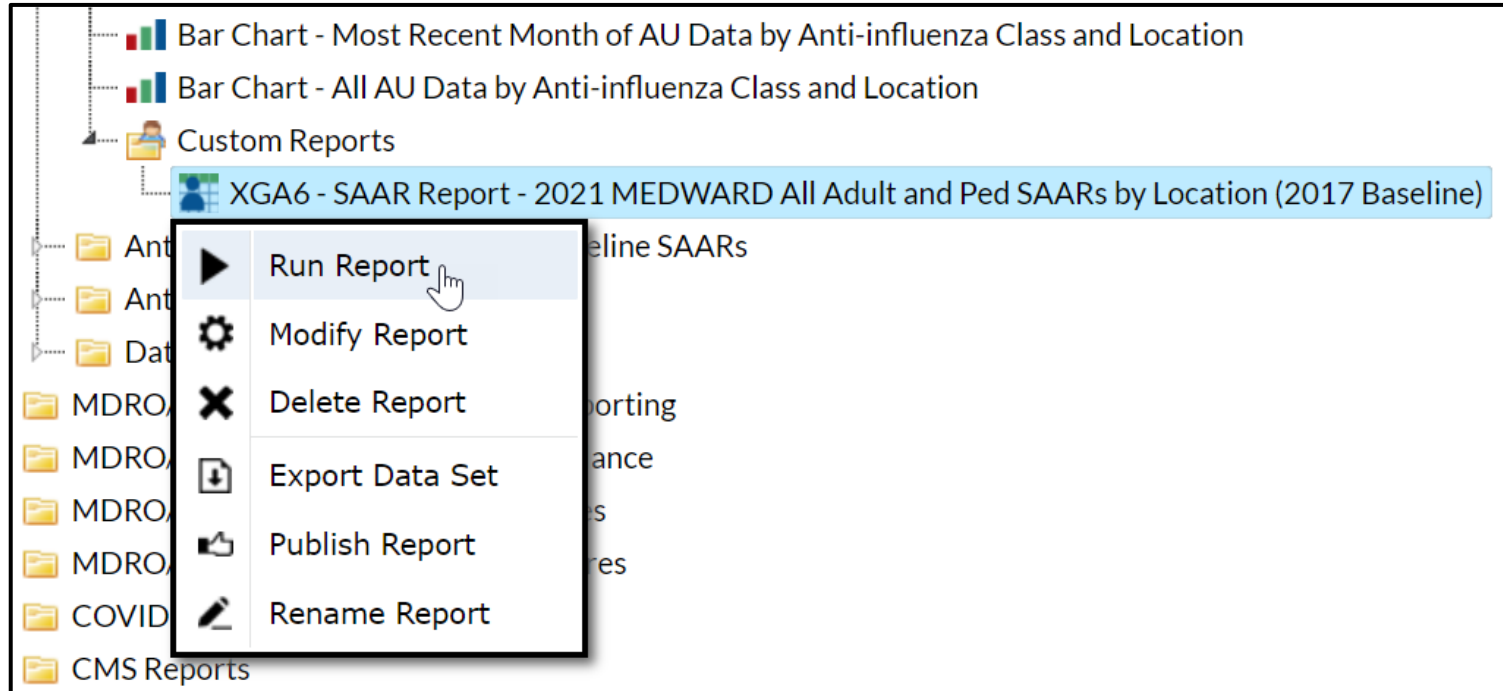
Custom Reports – Publishing

Publish Custom Report to make it visible to other users
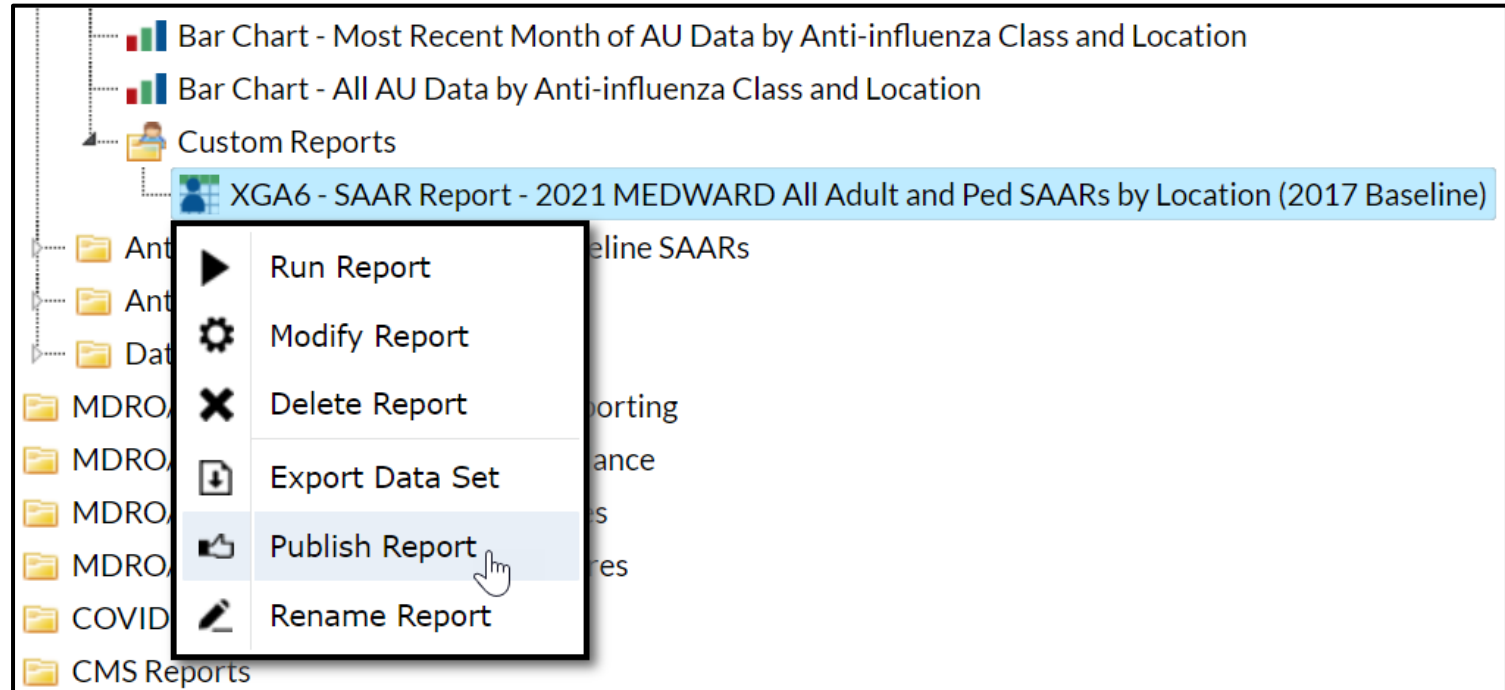
Custom Reports – Publishing (cont.)

Now all users at facility can use Custom Report we created

Advanced AU Option Analysis Resources

Resources

- AU Option Quick Reference Guides: https://www.cdc.gov/nhsn/ps-analysis-resources/reference-guides.html#accordion-1-collapse-5

- AUR Training: https://www.cdc.gov/nhsn/training/patient-safety-component/aur.html

- Keys to Success with the SAAR: https://www.cdc.gov/nhsn/ps-analysis-resources/keys-to-success-saar.html

- NHSN's Guide to the SAAR: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf

- AUR Module Reports: https://www.cdc.gov/nhsn/datastat/aur-reports.html

- NHSN Statistical Tool SAS Macros: https://www.cdc.gov/nhsn/ps-analysis-resources/index.html

Thank you!

Q&A Session: 1:00-1:15pm ET on March 24, 2022
NHSN Help Desk: NHSN@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348   www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.