AR Option Facility-Wide Antibiogram and Percent Tested

Description

The Antimicrobial Resistance (AR) Option facility-wide antibiogram is a table that displays the calculated percent susceptible (%S) for each organism-antimicrobial combination reported from all locations (inpatient and outpatient) to the AR Option. Each organism reported to the AR Option has a specific antimicrobial panel for which NHSN requires facilities report antimicrobial susceptibility testing values. The specific panel requirements for each organism are in Appendix F of the AUR Module protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf.

NHSN calculates %S for each organism-antimicrobial pairing using the following formula*:

$$\frac{Number\ isolates\ tested\ suceptible}{Number\ of\ isolates\ tested} = \%S$$

The default settings for the AR facility-wide antibiogram produce a report by quarter, but users can make modifications to display the data by month, half-year, year, or cumulative time periods. Additionally, NHSN includes all specimen types (blood, cerebrospinal fluid, urine, and lower respiratory) in the report by default but users can make modifications to show the susceptibility patterns for specific specimen types if desired. The default output includes all isolates regardless of organism category (Gram Negative, Gram Positive, and Fungal), onset (healthcare facility and community-onset), patient population (neonatal, pediatric, and adult), and location but these additional filters are also available to further modify the output.

In addition to the AR facility-wide antibiogram, within this same report, NHSN creates a table displaying the calculated percent tested (%Tested) for each organism-antimicrobial combination reported from all locations (inpatient and outpatient) to the AR Option.

NHSN calculates %Tested for each organism-antimicrobial pairing using the following formula*:

$$\frac{Number\ of\ isolates\ with\ a\ susceptibility\ result}{Total\ number\ of\ isolates} = \%Tested$$

*Note: Susceptibility results include S, S-DD, I, R, or NS.

The %Tested table can be used to prompt users to investigate unexpected %Tested values. Selective or cascade reporting (SR/CR) of antimicrobial susceptibility testing (AST) results is a widely used antimicrobial stewardship strategy. SR/CR guides prescribers toward tailored treatments rather than broad-spectrum agents. Healthcare facilities selectively report AST results to their prescribers by suppressing the AST results for the drugs that they wish to reduce usage through algorithms built into the information systems. Many facilities also submit those partially suppressed AST data to the NHSN AR Option. While SR/CR serves its purpose as an antimicrobial stewardship tool, however, using the partially suppressed AST results can bias the cumulative antibiograms. Users can use the %Tested table to understand what is being sent to the NHSN AR Option. Extracting complete data before SR/CR algorithms are applied to the data for surveillance purposes is possible. If a low %Tested is found for the antimicrobials that are routinely tested in your lab, please contact your surveillance lab and your microbiology lab to discuss potential solutions for extracting complete data for surveillance. For more information about identifying data sources to use for AR surveillance to bypass SR/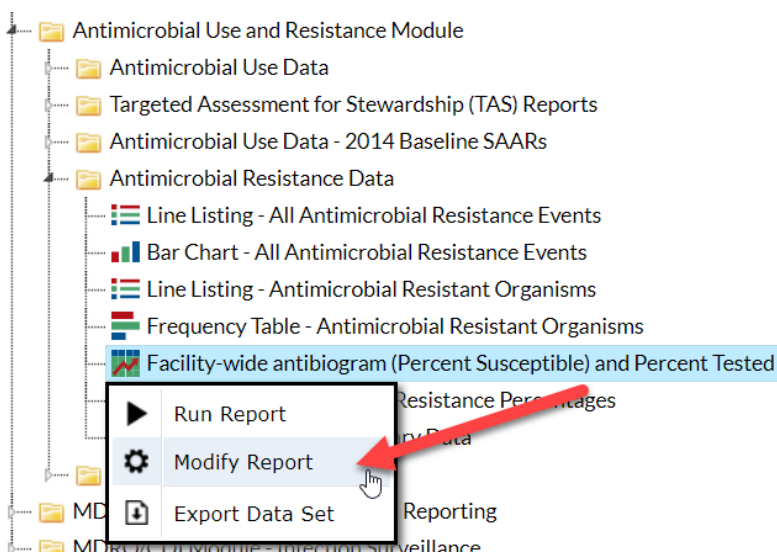CR, please refer to the AR Option Data Validation protocol (https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/ar-validation-508.pdf).

Centers for Disease Control and Prevention
National Center for Emerging and
Zoonotic Infectious Diseases

Example

Suppose you want to review the resistance patterns for *Escherichia coli* and *Enterobacter* spp. You want this report to include healthcare facility-onset isolates from invasive specimen sources submitted to the AR Option for the entire calendar year of 2020.

After generating data sets, to run an AR Option Facility-wide Antibiogram report, click Analysis > Reports > Antimicrobial Use and Resistance Module > Antimicrobial Resistance Data. After selecting the report, in this case, "Facility-wide Antibiogram (Percent Susceptible) and Percent Tested," a pop-up box will appear that will allow you to "Run Report," "Modify Report," or "Export Data Set." Select "Modify Report" to customize your report.
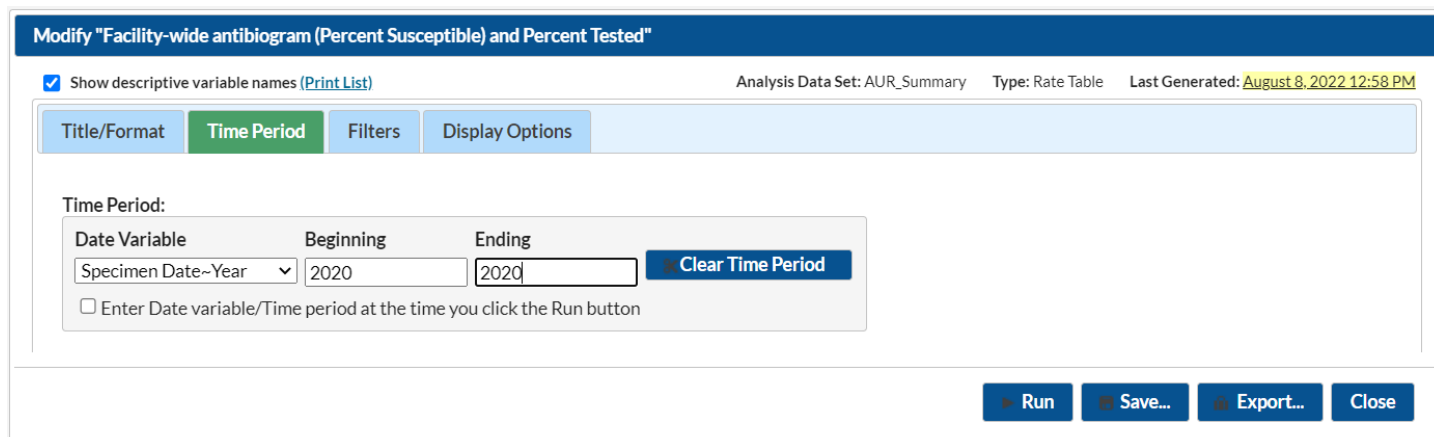

Modifying the Report

For a general, step-by-step explanation of the NHSN modification screen, please refer to this document: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/howtomodifyreport.pdf.

When you choose to modify the report, the modification screen appears showing multiple tabs containing available modifications for the given report. The "Title/Format" tab allows you to update the report title and select the format in which you want the report displayed, such as HTML or PDF. To filter the data by time period, choose the "Time Period" tab at the top of the page. To display data for 2020 only, select Specimen Date~Year with beginning and ending dates of 2020.

Tip: *For more descriptive variable labels on your report, check the box "Show descriptive variable names" that appears near the top of the modification window (recommended).*

The "Filters" tab allows you to filter the data displayed in the report. For our example, we want to filter the report to show data for healthcare facility-onset *Enterobacter* spp. and *Escherichia coli* isolates. Select Pathogen as the variable and use the "in" operator to specify more than one value. Use the drop-down menu to select the two pathogens of interest. Next, click Add Rule and select Onset as the variable. Use the "equal" operator and use the drop-down menu to select HO-Healthcare Facility-Onset. Next click Add Rule again and select Specimen Category as the variable. Use the "equal" operator and then use the drop-down menu to select Invasive.

The "Display Options" tab allows you to pick how you'd like the tables displayed in your final report. For this example, we'd like the %S and %Tested tables to include the entire 2020 calendar year instead of displaying one table per quarter. To do this, select Specimen Date~Year as the Group by value.

Final Report

The example antibiogram and percent tested tables shown below are the result of the modifications shown in this document.

Note: This example uses fictitious data for illustrative purposes only.

Percent Susceptible (%Susceptible) Table

National Healthcare Safety Network
Facility-wide antibiogram (Percent Susceptible) and Percentage of Isolates with Susceptibility Results
Percent Susceptible per 100 Isolates ①
As of: August 9, 2022 at 2:52 PM
Date Range: AUR_SUMMARY SpecimenDateYr 2020 to 2020
if (((Pathogen IN ("EC", "ESP")) AND (onset = "HO") AND (SpecimenCategory = "Invasive"))) ②

orgID=13860 CCN=999999 SpecimenDateYr=2020

		Pathogen	
		Gram-Negative ③	
Drug Class ④	**Drug**	**Enterobacter - ESP**	**Escherichia coli - EC**
Aminoglycosides	AMK	.	86.0
	GENTA	.	86.0
	TOBRA	. ⑤	.
B-lactam/ B-lactamase inhibitor combination	AMOXWC	.	86.0
	AMPIWS	.	0
	CEFTAVI	.	86.0
	CEFTOTAZ	.	86.0 ⑥
	PIPERWT	.	86.0
Carbapenems	DORI	.	86.0
	ERTA	.	86.0
	IMIPWC	.	70.0
	MERO	.	86.0

1. The title of the report specifies which table is being displayed below. Here, we are looking at the AR facility-wide antibiogram, which displays percent susceptible per 100 isolates.

2. NHSN displays the applied filters in the last line of the title of the report. This line states the output includes *Escherichia coli* and *Enterobacter* spp. isolates with healthcare facility-onset, in the invasive specimen category.

3. NHSN sorts Pathogens by organism category (Gram-Negative, Gram-Positive, Antifungal). This report shows that both *Enterobacter* spp. and *Escherichia coli* are Gram-Negative organisms.

4. The report shows all drugs NHSN requires be included in the CDA file for the organisms in the report, sorted by drug class. Full drug names are here: https://www.cdc.gov/nhsn/xls/aur/aur-eligible-antimicrobial-agents.xlsx.

5. A "." will be displayed if there were less than 30 isolates tested for that pathogen-drug combination, as shown here with the drug Tobramycin (TOBRA) for both pathogens *Enterobacter* spp. and *Escherichia coli.*

6. For 2020, there were more than 30 isolates *Escherichia coli* isolates from hospital-onset sources and 86% of *Escherichia coli* isolates tested were susceptible to CEFTOLOZANE/TAZOBACTAM (CEFTOTAZ).

    a. To see the total number of isolates tested, from the Modify screen, click Export. Then select "Export Analysis Data Set using Modifications."

Note: Cells will appear shaded in grey for non-valid pathogen/drug combinations. Refer to the AUR protocol for all valid pathogen/drug combinations.

Percent Tested (%Tested) Table

National Healthcare Safety Network
Facility-wide antibiogram (Percent Susceptible) and Percentage of Isolates with Susceptibility Results
Percent Tested per 100 Isolates ①
As of: August 9, 2022 at 2:52 PM
Date Range: AUR_SUMMARY SpecimenDateYr 2020 to 2020
if (((Pathogen IN ("EC", "ESP")) AND (onset = "HO") AND (SpecimenCategory = "Invasive")))

orgID=13860 CCN=999999 SpecimenDateYr=2020

| | | Pathogen | |
| | | Gram-Negative | |
Drug Class	Drug	Enterobacter - ESP	Escherichia coli - EC
Aminoglycosides	AMK	.	100
	GENTA	.	100
	TOBRA	.	.
B-lactam/ B-lactamase inhibitor combination	AMOXWC	.	100
	AMPIWS	.	100
	CEFTAVI	.	100
	CEFTOTAZ	.	100
	PIPERWT	.	100
Carbapenems	DORI	.	100
	ERTA	.	100
	IMIPWC	.	100
	MERO	.	100

The overall format of the %Tested table is similar to the %Susceptible table.

1. The title of the report will specify which table is being displayed below. Here, we are looking at the %Tested table, which displays percent tested per 100 isolates.

2. A "." will be displayed if there were less than 30 isolates tested for that pathogen-drug combination, as shown here with the drug Tobramycin (TOBRA) for both pathogens *Enterobacter* spp. and *Escherichia coli.*

3. For 2020, there were more than 30 isolates *Escherichia coli* isolates from hospital-onset sources and 100% of *Escherichia coli* isolates were tested for CEFTOLOZANE/TAZOBACTAM (CEFTOTAZ) and produced a susceptibility result. Further investigation may be warranted if the percent tested is unexpected for a particular pathogen/drug.

   a. To see the total number of isolates tested, from the Modify screen, click Export. Then select "Export Analysis Data Set using Modifications."

Note: Cells will appear shaded in grey for non-valid pathogen/drug combinations. Refer to the AUR protocol for all valid pathogen/drug combinations.

Additional Resources

NHSN Analysis Training: https://www.cdc.gov/nhsn/training/analysis/index.html

How to Export Data from NHSN: http://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/exportdata.pdf

AUR Module Protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf

Surveillance for AU and AR Options: https://www.cdc.gov/nhsn/acute-care-hospital/aur/