

Introduction to NHSN Analysis: A Focus on Device-associated Data

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NHSN Training Course

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Objectives

- ❑ **Discuss basic steps for analyzing HAI data in NHSN**
- ❑ **Identify and interpret various measures used to analyze device-associated HAI data**
- ❑ **Illustrate how to make internal comparisons of HAI rates over time.**

Our Focus for Today...

- ❑ **Basics of using NHSN Analysis results**
- ❑ **Mostly discussion on the types of data you can obtain from NHSN *rather than* all of the technical steps to follow in the application**
- ❑ **Teach you the various ways to look at and interpret your data**

- ❑ **NHSN Analysis Resources (e.g., reference guides, trainings, etc.) are available at:**

<http://www.cdc.gov/nhsn/PS-Analysis-resources/index.html>

National Healthcare Safety Network (NHSN)

NHSN

- About NHSN
- Enroll Here
- Materials for Enrolled Facilities
- Group Users
- Patient Safety Analysis Resources**
- Analysis Quick Reference Guides
- Annual Reports
- Newsletters
- E-mail Updates
- CMS Requirements
- Clinical Document Architecture (CDA)
- HIPAA Privacy Rule

[NHSN](#)

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Patient Safety Analysis Resources

The NHSN application provides various options that allow NHSN users to analyze surveillance data. The resources listed below are intended to help users interpret data analyzed from the Patient Safety Component of NHSN.

Analysis Resources

Guides and Training

- [Quick Reference Guides](#)
- [Analysis Training](#)

NHSN Codes and Variables

- [NHSN Data Dictionary March 2013](#) [XLS - 797 KB] Data Dictionary for NHSN Version 7.1
- [ICD9-CM Procedure Code Mapping to NHSN Operative Procedure Categories](#) [XLS - 173 KB] February 2013

Patient Safety Analysis Quick Reference Guides

These quick reference guides were created to help you understand, modify, and interpret your data.

Analyzing MBI-LCBI CLABSI Data

Description

Facilities that report CLABSI data may wish to analyze which cases, and how many, were identified as Mucosa Injury Laboratory-Confirmed Bloodstream Infections (MBI-LCBI).

CLABSI rate tables and standardized infection ratios (SIRs) generated within NHSN will include all CLABSIs, regardless of whether the MBI-LCBI definition was met. Facilities can obtain information on which CLABSIs were MBI-LCBI by using the variable **mbi_lcbi** in event-level line lists and frequency tables.

Example

You have been following CLABSIs in your hematopoietic stem cell transplant ward (HSCT). Below is a snapshot of your CLABSI rate table for January 2013:

Org ID=10018 CDC Location=IN:ACUTE:WARD:ONC_HSCT

Location	Summary Year/Month	Perm CLA BSI Count	Perm Central Line Days	Perm CLA BSI Rate	NHSN PCLAB Pooled Mean	Incidence Density p-value #1	Incidence Density Percentile #1
HSCT	2013M01	1	150	6.667	2.4	0.3055	93

					NHSN PCLAB Pooled Mean	Incidence Density p-value #1	Incidence Density Percentile #1
--	--	--	--	--	---------------------------------	------------------------------------	---------------------------------------

Why Analyze?

- ❑ **Analysis tools within NHSN help facilitate internal validation activities and help ensure accuracy!**
- ❑ **Reports generated from NHSN can help inform prioritization and success of prevention activities.**
- ❑ **Data entered into NHSN may be used by: CDC, CMS, your state health department*, your corporation*, special study groups*, etc.**
- ❑ **At the end of the day, these are YOUR data – you should know your data better than anyone else.**
- ❑ **Take ownership and discover how your data can tell a story about your facility!**

*dependent on membership to groups in NHSN and facility's acceptance of conferred rights to data.

Data Analysis

Are these
data
accurate?

Has our HAI
experience
changed over
time?

Which
measure is
used by my
state and by
CMS?

What is a
priority
for my
hospital?

**Where do
I get
started???**

What is
behind
the
number?



GENERATING DATASETS

Generating Datasets

- ❑ **Generating datasets is the first step in performing analysis in NHSN**
 - Copies and **freezes** data
 - Organizes data into defined sets for analysis
 - Allows for quicker generation of reports
 - When analyzing data in NHSN, you are using a *copy* of your data, not the live database
- ❑ **Each user has his/her own analysis datasets**
 - Based on a user's rights
- ❑ **May take several minutes to complete this process**
- ❑ **You may navigate or leave NHSN while datasets are generating**

TIP!

- ❑ Since data are **FROZEN** when you generate datasets, any changes made to your data within NHSN after that point in time will not be represented in your reports until you generate datasets again.

Generating Datasets

Generate Data Sets

HELP

Generate Patient Safety Analysis Data Sets


Datasets generated will include data for which rights have been conferred and include the 3 most recent full calendar years up until today's date for the Patient Safety Component. To include all years check the box below.

For all other components, datasets generated will include all years within the context of rights conferred. Note that any analysis options you run will be limited to the time period shown on the date range bar.

☐ Include all data reported to NHSN for this component within the parameters of rights conferred.

1/2012

2/2015



Generate New

Last Generated: Feb 2 2015 8:50AM

- ❑ Before analyzing data, generate new datasets (Analysis → Generate Datasets) to integrate any recent data entry or editing
- ❑ By default, datasets will generate for the three most recent full calendar years, through the current date.

ANALYSIS OUTPUT OPTIONS

Analysis Output Options

- ❑ After datasets are generated, you are ready to analyze your data in NHSN**
- ❑ Reports are referred to as “Output Options”**
- ❑ Output options are organized in a “tree view” that will guide you toward the data you wish to analyze**

Analysis Output Options

The screenshot displays the NHSN Home interface. The left sidebar contains a navigation menu with the following items: NHSN Home, Alerts, Reporting Plan, Patient, Event, Procedure, Summary Data, Import/Export, Analysis, Generate Data Sets, Output Options, Statistics Calculator, Surveys, Users, Facility, Group, and Log Out. The 'Analysis' item is selected. The main content area shows the 'Patient Safety Component' and 'Analysis Output Options'. At the top, it indicates the user is logged in as MAGGIE at DHQP MEMORIAL HOSPITAL (ID 10018). Below this, there are 'Expand All' and 'Collapse All' buttons. The output options are organized into a tree view with the following folders: Device-Associated (DA) Module, Procedure-Associated (PA) Module, HAI Antimicrobial Resistance (DA+PA Modules), MDRO/CDI Module - Infection Surveillance, MDRO/CDI Module - LABID Event Reporting, MDRO/CDI Module - Process Measures, MDRO/CDI Module - Outcome Measures, Antimicrobial Use and Resistance Module, CMS Reports, TAP Reports, Advanced, My Custom Output, and Published Output.

- ❑ To access the output options tree view, navigate to Analysis > Output Options.
- ❑ The output options are organized into folders, first by module (e.g., Device-associated Module)

Analysis Output Options

Device-Associated (DA) Module

Central Line-Associated BSI

CDC Defined Output

Line Listing - All CLAB Events	Run	Modify
Frequency Table - All CLAB Events	Run	Modify
Bar Chart - All CLAB Events	Run	Modify
Pie Chart - All CLAB Events	Run	Modify
Rate Table - CLAB Data for ICU-Other	Run	Modify
Run Chart - CLAB Data for ICU-Other	Run	Modify
Rate Table - CLAB Data for NICU	Run	Modify
Run Chart - CLAB Data for NICU	Run	Modify
Rate Table - CLAB Data for SCA/ONC	Run	Modify
Run Chart - CLAB Data for SCA/ONC	Run	Modify
Rate Table - CLAB Data for LTAC	Run	Modify
Run Chart - CLAB Data for LTAC	Run	Modify
Rate Table - CLAB Data for IRF	Run	Modify
Run Chart - CLAB Data for IRF	Run	Modify
SIR - In-Plan CLAB Data	Run	Modify
SIR - All CLAB Data	Run	Modify
SIR - CLAB Data for Long Term Acute Care	Run	Modify

- Then, each of the event-level folders can be expanded to show the various output options available for your use.
- Click “Run” next to any output option to obtain your data in a CDC-Defined output (report).

Analysis Output Options

CMS Reports

Expand All Collapse All

- Device-Associated Module
- Procedure-Associated Module
- MDRO/CDI Module - Infection Surveillance
- MDRO/CDI Module - LABID Event Reporting
- MDRO/CDI Module - Process Measures
- MDRO/CDI Module - Outcome Measures
- Antimicrobial Use and Resistance Module
- CMS Reports
 - Acute Care Hospitals (Hospital IQR)
 - CDC Defined Output
 - SIR - CLAB Data for CMS IPPS
 - SIR - CAUTI Data for CMS IPPS
 - SIR - Complex 30-Day SSI Data for CMS IPPS
 - SIR - CDI FacwideIN LabID Data for CMS IPPS
 - SIR - MRSA Blood FacwideIN LabID Data for CMS IPPS
 - Inpatient Rehabilitation Facilities (IRFQR)
 - Long Term Acute Care Hospitals (LTCHQR)
 - PPS-Exempt Cancer Hospitals (PCHQR)

CMS Reports are available for each reporting program and are intended to mirror the summary-level data submitted to CMS on your behalf, for each quarter.

Run
Run
Run
Run Modify
Run Modify

Analysis Output Options

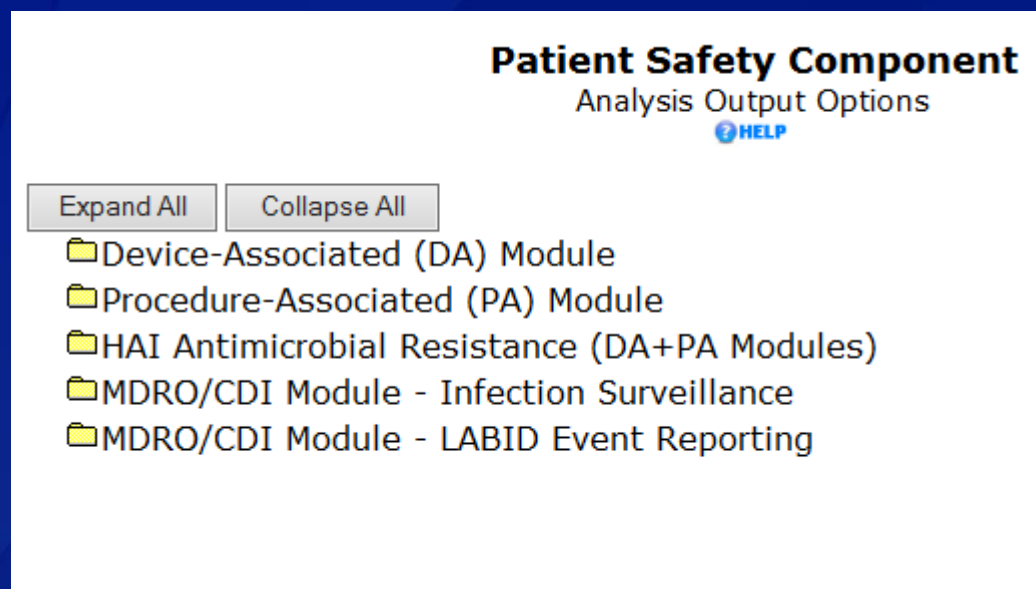
NEW CMS Reports for IRFs and LTACHs

- ❑ **SIRs have been added, using 2013 data as the baseline**
- ❑ **MRSA and CDI LabID Rate tables have been added**

CMS Reports		
Acute Care Hospitals (Hospital IQR)		
Inpatient Rehabilitation Facilities (IRFQR)		
CDC Defined Output		
SIR - CAU Data for CMS IRF PPS	Run	Modify
Rate Table - CAUTI Data for CMS IRF PPS	Run	Modify
Rate Table - MRSA Blood LabID Data for IRF PPS	Run	Modify
Rate Table - CDI LabID Data for IRF PPS	Run	Modify
Long Term Acute Care Hospitals (LTCHQR)		
CDC Defined Output		
SIR - CLAB Data for CMS LTCH PPS	Run	Modify
SIR - CAU Data for CMS LTCH PPS	Run	Modify
Rate Table - CLAB Data for CMS LTCH PPS	Run	Modify
Rate Table - CAUTI Data for CMS LTCH PPS	Run	Modify
Rate Table - MRSA blood LabID Data for LTCH PPS	Run	Modify
Rate Table - CDI LabID Data for LTCH PPS	Run	Modify



When I go to the Output Options screen, I can't see all of the folders. What happened?



- ❑ Your browser is not in “Compatibility Mode” for the NHSN application.
- ❑ Work with your IT department to update your IE browser's settings.

Metrics and Reports

- ❑ **Don't limit yourself! A number of different types of reports are helpful in analyzing your data...**
 - Line Lists
 - Frequency Tables
 - Charts/graphical reports
 - Rate Tables
 - Standardized Infection Ratios (SIRs)
 - Descriptive statistics (e.g., mean, median, mode, distribution, outliers, etc.)
- ❑ **Supplement with other data sources available to you, if needed.**

Analysis Output Options

□ Line Lists

- Allows for record-level review of data
- Helpful in pinpointing issues in data validity/quality
- Can help inform rates or identify trends
- Most customizable type of output from NHSN

National Healthcare Safety Network

CLABSI Events

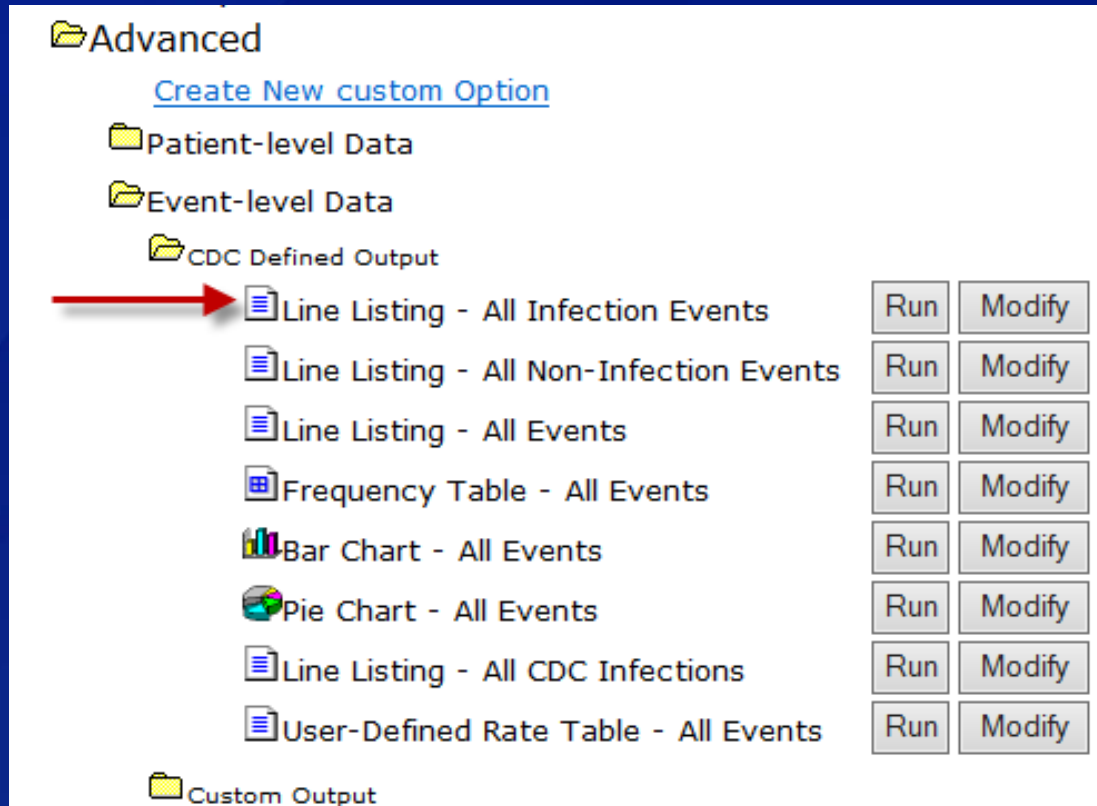
As of: January 17, 2012 at 11:01 AM

Date Range: CLAB_EVENTS evntDateYr 2011 to 2011

Event ID	Date of Birth	Gender	Fac Admission Date	Event Date	Event Type	Specific Event	Location	Days: Admit to Event	Age on Event Date
234800	09/13/1954	F	02/09/2011	02/11/2011	BSI	LCBI	MICU	3	56
234771	06/15/1956	F	03/20/2011	03/22/2011	BSI	LCBI	71ICU	3	54
234801	07/22/1976	M	02/02/2011	02/05/2011	BSI	LCBI	MICU	4	34
234747	05/13/1953	F	01/31/2011	02/03/2011	BSI	LCBI	71ICU	4	57
234818	09/21/1973	F	01/09/2011	01/12/2011	BSI	LCBI	MICU	4	37
158848	09/13/1942	F	06/10/2011	06/13/2011	BSI	LCBI	MICU	4	68
234802	01/21/2000	F	01/05/2011	01/08/2011	BSI	LCBI	MICU	4	10
234749	09/21/1974	M	03/18/2011	03/21/2011	BSI	LCBI	71ICU	4	36

Tip for Small Hospitals

- Smaller hospitals may wish to run a single line list inclusive of all HAIs identified.



Analysis Output Options

□ Frequency Tables

- Allow you to obtain counts of records meeting certain criteria
- Example: How many CAUTIs were reported as ABUTI?
- Example: How many SSIs were reported as PATOs?
- Can also perform chi-square analyses for statistical comparisons

National Healthcare Safety Network

CAUTI Events

As of: January 17, 2012 at 11:04 AM

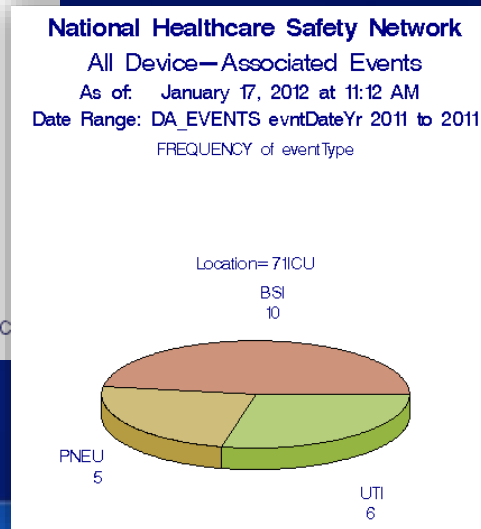
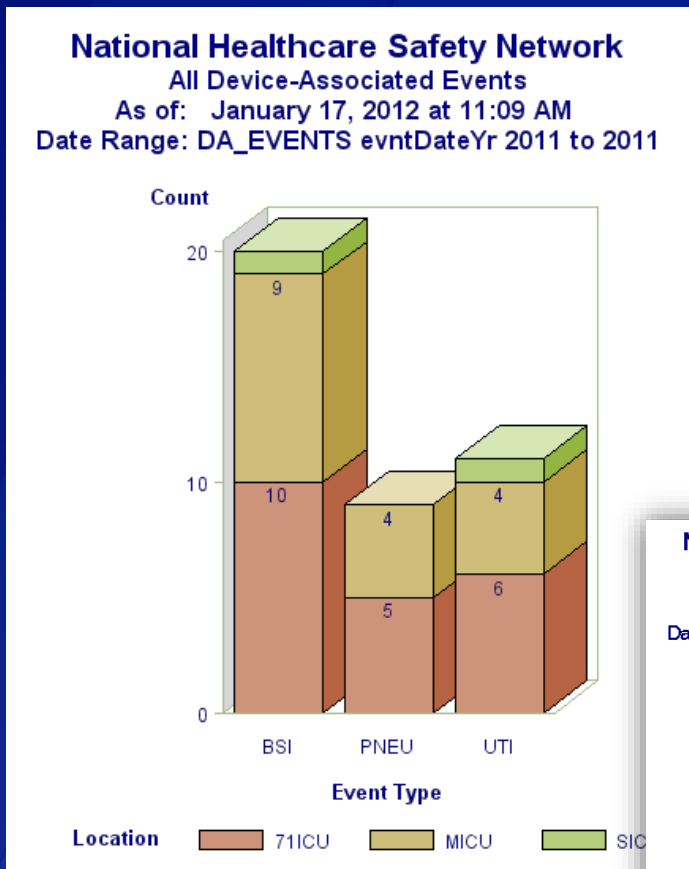
Date Range: CAU_EVENTS evntDateYr 2011 to 2011

Frequency Percent Row Pct Col Pct	Table of evntDateYQ by spcEvent			
	evntDateYQ(Event~Yr/Qtr)	spcEvent(Specific Event)		
		ABUTI	SUTI	Total
	2011Q1	2	3	5
		18.18	27.27	45.45
		40.00	60.00	
		50.00	42.86	
	2011Q2	2	4	6
		18.18	36.36	54.55
		33.33	66.67	
		50.00	57.14	
	Total	4	7	11
		36.36	63.64	100.00

Analysis Output Options

Bar Charts & Pie Charts

- Graphical report of counts of records meeting certain criteria (think of these as a graphical representation of the frequency table)
- Example: How many CLABSI events occurred in each ICU?
- NOTE: These options do not graphically present rates or standardized infection ratios.**



Analysis Output Options

□ Rate Tables

- Display your facility's calculated rates and device-utilization ratios (where appropriate)
- If available, provide NHSN published pooled means and the comparison of your facility's rates and ratios to the pooled means
- Descriptions of rates can be found in the event-specific chapters of the NHSN Manual

National Healthcare Safety Network Rate Table for Central Line-Associated BSI Data for ICU-Other

As of: January 17, 2012 at 11:18 AM

Date Range: CLAB_RATESICU summaryYr 2011 to 2011

Org ID=10018 CDC Location=IN:ACUTE:CC:CT

Location	Summary Yr/Qtr	months	CLA BSI Count	Central Line Days	CLA BSIRate	NHSN CLAB Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	CL Util Ratio	NHSN Line DU Pooled Mean	Proportion p-value	Proportion Percentile
71ICU	2011Q1	3	6	730	8.219	1.2	0.0003	100	1300	0.562	0.71	0.0000	30
71ICU	2011Q2	2	2	420	4.762	1.2	0.0880	99	1025	0.410	0.71	0.0000	9

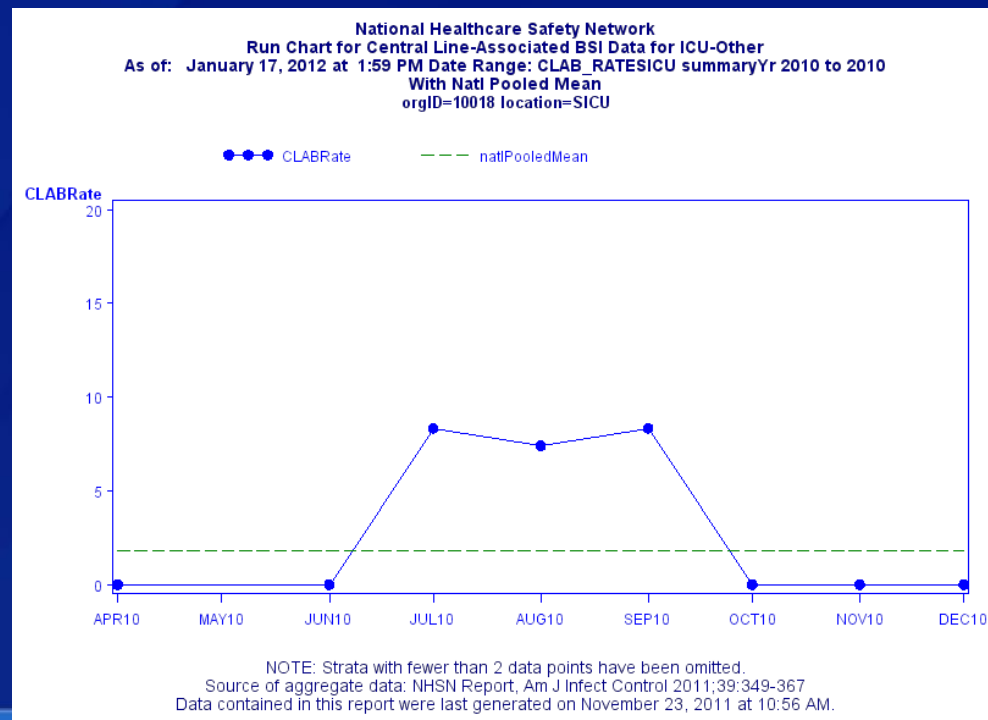
Source of aggregate data: NHSN Report, Am J Infect Control 2011;39:349-367

Data contained in this report were last generated on November 23, 2011 at 10:56 AM.

Analysis Output Options

■ Run Charts

- Allow you to graph rates and device-utilization ratios over time
- Can include NHSN pooled mean and/or other defined reference line



Analysis Output Options

□ Standardized Infection Ratios (SIRs)

- Risk-adjusted summary measure
- Available for CAUTI, CLABSI, SSI, and LabID (MRSA bacteremia and CDI) data
- Details can be found in the SIR Newsletter, available at:
http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf

National Healthcare Safety Network

SIR for All Central Line-Associated BSI Data - By OrgID

As of: January 17, 2012 at 2:03 PM

Date Range: CLAB_RATESALL summaryYr 2011 to 2011

orgid=10018

orgid	summaryYr	infCount	numExp	numCLDays	SIR	SIR_pval	SIR95CI
10018	2011H1	17	3.755	2232	4.527	0.0000	2.636, 7.249

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.

Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.

SIR excludes those months and locations where device days are missing or 0 device days were reported.

Source of aggregate data: NHSN Report, Am J Infect Control 2009;37:783-805

Data contained in this report were last generated on November 23, 2011 at 10:56 AM.

General Tips for Analyzing Data in NHSN

- ❑ **Develop a timeline to regularly enter, and analyze, your hospital's data**
 - Consider a timeline that would allow for timely feedback and interventions, if necessary
 - Example: Monthly review of rates and event-level details
- ❑ **Generate datasets regularly**
- ❑ **Read the footnotes on your reports!!!**
- ❑ **Review data for accuracy and completeness**

MODIFYING YOUR OUTPUT

Modify Output

- ❑ **All output options can be modified/customized to meet your needs**
- ❑ **Modifications can be saved as “templates” (referred to as Custom Output Options)**
 - Custom output options allow you to run the same modifications on updated datasets
 - RECOMMENDED!!
- ❑ **You can modify output options by changing the output format, changing the title, and filtering your data by multiple criteria**

Modify Output: The Design Modification Screen

- ❑ The design modification screen can be described in three main sections...

Line Listing

Analysis Data Set: CLAB_Events [Export Analysis Data Set](#)

Modify Attributes of the Output:

Last Modified On: 11/23/2011

Output Type: Line Listing

Output Name:

Output Title:

Select output format:

Output Format:

☐ Use Variable Labels

Select a time period or Leave Blank for Cumulative Time Period:

Date Variable Beginning Ending [Clear Time Period](#)

☐ Enter Date variable/Time period at the time you click the Run button

Specify Other Selection Criteria:

[Show Criteria](#) [Column +](#) [Row +](#) [Clear Criteria](#)

<input type="text" value="v"/>	<input type="text" value="v"/>	<input type="text" value="v"/>	<input type="text" value="v"/>	<input type="text" value="v"/>

Other Options: [Print Variable Reference List](#)

Modify Variables To Display By Clicking: [Modify List](#)

Specify Sort Variables By Clicking: [Modify List](#)

Select Page by variable:

[Run](#) [Save As](#) [Reset](#) [Back](#) [Export Output Data Set](#)

Design Modification Screen

- ❑ The top section is the same for all output options and allows you to modify output characteristics, such as output name, title, and format.
- ❑ **TIP: The default output format is HTML. Make sure that your browser allows pop-ups from *.cdc.gov!**

Line Listing

Analysis Data Set: CLAB_Events Export Analysis Data Set

Modify Attributes of the Output:

Last Modified On: 11/23/2011

Output Type: Line Listing

Output Name:

Output Title:

Select output format:

Output Format:

☐ Use Variable Labels

Design Modification Screen

- ❑ **TIP: Using variable labels will provide you with more descriptive column headers in your output.**

Line Listing

Analysis Data Set: CLAB_Events Export Analysis Data Set

Modify Attributes of the Output:

Last Modified On: 11/23/2011

Output Type: Line Listing


Output Name:

Output Title:

Select output format:

Output Format: ▼

☐ Use Variable Labels



Design Modification Screen

- ❑ The middle section is the same for all output options and allows you to specify which data will be considered for the output.
- ❑ You can filter by time period, as well as location, specific event type, etc.

Select a time period or Leave Blank for Cumulative Time Period:

Date Variable Beginning Ending

☐ Enter Date variable/Time period at the time you click the Run button

Specify Other Selection Criteria:

[Show Criteria](#) [Column +](#) [Row +](#) [Clear Criteria](#)

<input type="button" value="v"/>	<input type="button" value="v"/>	<input type="button" value="v"/>	<input type="button" value="v"/>	<input type="button" value="v"/>

Design Modification Screen - Example

Select a time period or Leave Blank for Cumulative Time Period: [HELP](#)

1

Date Variable Beginning Ending
evntDateYr 2014 2014 Clear Time Period

☐ Enter Date variable/Time period at the time you click the Run button

Specify Other Selection Criteria: [HELP](#)

2

[Show Criteria](#) [Column +](#) [Row +](#) [Clear Criteria](#)

locationType	▼	spcEvent	▼		▼
= CC		= SUTI			

- ❑ This is an example of modifying the “Line Listing – All CAU Events” to include:
 1. Events with an event date in 2014 (*evntDateYr 2014 to 2014*) and
 2. Those identified in ICUs (*locationType = CC*) as the specific CAUTI event type “SUTI” (*spcEvent = SUTI*).

Design Modification Screen

- ❑ The bottom section allows you to specify how the data in the output will be displayed and organized.
- ❑ These options vary by output type.

Line Lists

Other Options:

Modify Variables To Display By Clicking: [Modify List](#)

Specify Sort Variables By Clicking: [Modify List](#)

Select Page by variable:

Frequency Table

Other Options:

Selected Variables to include in output:

Row:	Column:	Page by:
location	spcEvent	

Frequency Table Options:

- ☒ Table percent - Display cell frequency divided by table total
- ☐ Missing - Include observations with missing values
- ☐ Print the table in list form

Two-Way Table Options:

- ☒ Row Percent - Display cell frequency divided by row total
- ☒ Column Percent - Display cell frequency divided by column total
- ☐ Expected - Expected cell frequencies
- ☐ Chi-square - Test for independence

Rates and SIRs

Other Options:

Group by:

summaryYM

Analysis Case Study

CAUTI DATA

Example: Analyzing CAUTI data

- ❑ **You and your colleagues have completed entering all HAI data into NHSN for the 4th quarter of 2014.**
- ❑ **The task of analyzing HAI surveillance data is distributed among you and your colleagues. You are tasked with analyzing CAUTI data.**
 - You will be expected to compare each location's rates and device utilization ratios to the national data.
 - You will also be expected to provide an overall metric representing your hospital's CAUTI experience (i.e., the SIR)

Device-associated Rates

- ❑ **Device-associated (DA) rates are calculated as Incidence Density Rates (IDRs)**
- ❑ **What is an “Incidence Density Rate”?**
 - Numerator = # of new cases during a period of time
 - Denominator = person-time during that same period of time (i.e., the population at risk)
 - Uses a multiplier for interpretation
 - Also referred to as “IDR”

Q1: What measure of person-time is used in the calculation of device-associated rates in NHSN?

- A. Patient days
- ★ B. Device days
- C. Device insertions
- D. Patient admissions

Question #1

Incidence Density Rates

What measure of person-time is used in the calculation of device-associated rates in NHSN?

Device days

WHY?

DA rates are calculated based on person-time for those at risk of infection for that HAI type.


Example:

of CAUTIs in MICU for the year

----- **x 1000**

of urinary catheter days in MICU for the year

Q2: How are DA rates presented by NHSN?

- A. Overall, by facility
- B. Combined DA rates, by location
- C. Overall by location acuity level (e.g., all ICUs combined)
-  D. By individual location for each DA event type

Question #2

How are DA rates presented by NHSN?



By individual location for each DA event type

WHY?

- Data are reported to NHSN by location, as location serves as an indicator of “like populations” for the patients receiving care in that location
- Like populations are believed to have similar risks for healthcare-associated infections (HAIs)
 - Similar medical devices
 - Similar invasive procedures
 - Similar host factors affecting susceptibility

CAUTI Rates from NHSN

- ❑ NHSN provides CAUTI rates and device utilization ratios, by location
- ❑ NEW options have been added for LTACs and IRFs

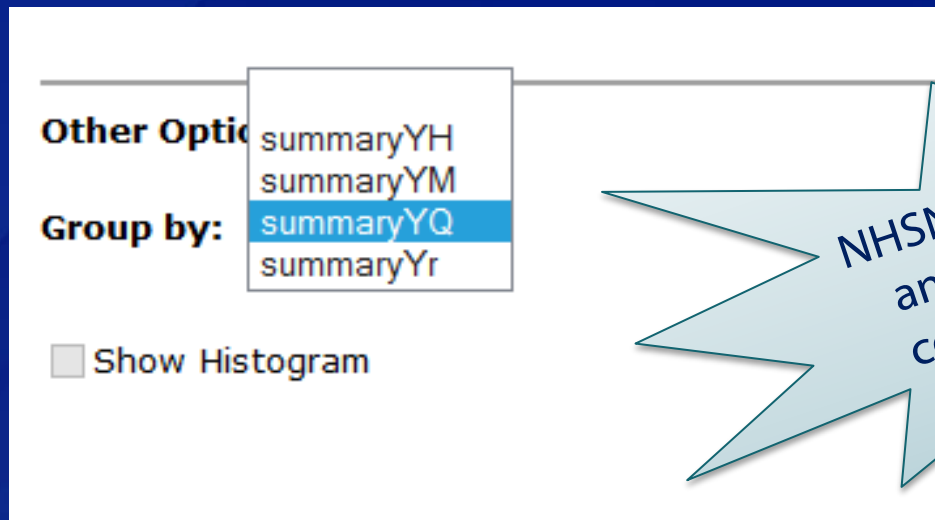
Urinary Catheter-Associated UTI

CDC Defined Output

Line Listing - All CAU Events	Run	Modify
Frequency Table - All CAU Events	Run	Modify
Bar Chart - All CAU Events	Run	Modify
Pie Chart - All CAU Events	Run	Modify
Rate Table - CAU Data for ICU-Other/SCA/ONC	Run	Modify
Run Chart - CAU Data for ICU-Other/SCA/ONC	Run	Modify
Rate Table - CAU Data for NICU	Run	Modify
Run Chart - CAU Data for NICU	Run	Modify
Rate Table - CAU Data for LTAC	Run	Modify
Run Chart - CAU Data for LTAC	Run	Modify
Rate Table - CAU Data for IRF	Run	Modify
Run Chart - CAU Data for IRF	Run	Modify
SIR - In-Plan CAU Data	Run	Modify
SIR - All CAU Data	Run	Modify
SIR - CAU Data for Long Term Acute Care	Run	Modify
SIR - CAU Data for Inpatient Rehabilitation Facilities	Run	Modify

CAUTI Rates from NHSN

- ❑ The “Group By” option on the modification screen allows you to specify how rates will be calculated, by time period.
- ❑ Can be calculated per month, quarter, half-year, year, or other cumulative time period...for each location



The screenshot shows a web interface for modifying CAUTI rates. On the left, there is a section titled "Other Options" with a "Group by:" label. A dropdown menu is open, showing four options: "summaryYH", "summaryYM", "summaryYQ" (which is highlighted with a blue background), and "summaryYr". Below the dropdown, there is a checkbox labeled "Show Histogram" which is currently unchecked.

NHSN does not provide an “overall rate” that combines locations.



Is it possible to produce rates or an SIR for my hospital's FISCAL year??

❑ **YES!**

❑ **Rates and SIRs are generated by a default time period, but this can be changed at any time.**

- Click "Modify" next to the output option
- Select your time period (e.g., summaryYM 10/2013 – 09/2014)
- Leave the "Group By" drop-down blank

Other Options: [? HELP](#)

Group by:

Quick Reference Guide for Fiscal Year/Cumulative Rates and SIRs:
<http://www.cdc.gov/nhsn/PS-Analysis-resources/PDF/FAQ-Fiscal-Year.pdf>

CAUTI Rates

- ❑ This table represents partial output from NHSN for 4 ICUs and 3 wards in our hospital.

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	1	274	3.650	3.5	0.8609	58
SICU	1	592	1.689	3.4	0.5299	27
MSICU	2	683	2.928	2.7	0.8178	61
CT ICU	3	729	4.115	1.8	0.1950	99
Med Ward	0	279	0.000	1.5	0.6521	25
Surg Ward	1	456	2.193	1.3	0.5809	76
Neuro Ward	2	270	7.407	2.2	0.1477	97

CTICU CAUTI Rate Table

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
CTICU	3	729	4.115	1.8	0.1950	99

Our hospital's data

NHSN published data and comparisons

Q3: How would you interpret the CTICU's CAUTI rate of 4.115?

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
CTICU	3	729	4.115	1.8	0.1950	99

- A. 4.1%
- B. 4.1 per 1,000 patient days
- ★ C. 4.1 per 1,000 catheter days
- D. 4.1 times higher than the national

About the Pooled Mean...

- ❑ The NHSN Pooled Mean comes from the published Annual Data Summary (“Annual Report”).
- ❑ The NHSN pooled mean is not an “average”, but rather a weighted mean that pools the data within that strata.

Table 5

Pooled means and key percentiles of the distribution of urinary catheter-associated UTI rates and urinary catheter utilization

Urinary catheter-associated UTI rate*				
Type of location	No. of locations [†]	No. of CAUTI	Urinary catheter-days	Pooled mean
Acute care hospitals				
Critical care units				
Burn	38	148	36,222	4.1
Medical				
Major teaching	99			
Medical				
All other	212 (202)	552	550,509	1.0

$$(148/36,222) \times 1,000 = 4.1$$

About the Pooled Mean...

- ❑ Why are some pooled means stratified further than location?

Table 5
Pooled means and key percentiles of the distribution of urinary

Urinary catheter-associated UTI rate*	
Type of location	No. of locations†
Acute care hospitals	
Critical care units	
Burn	38
Medical	
Major teaching	99
All other	212 (202)
Medical cardiac	211 (207)
Medical/surgical	
Major teaching	146 (145)
All other, <15 beds	793 (748)

- ❑ We compare pooled means and distributions in different strata, look for statistically significant differences
- ❑ More weight of decision given to results of percentile distributions as these are not subject to potential weighting influences

About the Pooled Mean...

- How do I know which published report NHSN is using to make these comparisons?

National Healthcare Safety Network

Rate Table for Catheter-Associated UTI Data for ICU-Other/SCA/ONC

As of: January 29, 2015 at 10:54 AM

Date Range: All CAU_RATESICU_SCA

Facility Org ID=10018 CDC Location=IN:ACUTE:CC:M

Location	Summary Yr	Months	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	Cath Util Ratio
MICU	2014	12	0	1658	0.000	3.5	0.0032	0	4797	0.346

Source of aggregate data: 2013 NHSN Data

Data contained in this report were last generated on January 28, 2015 at 9:50 AM.

Beginning January 2015, the CAUTI definition excludes all non-bacterial pathogens and therefore, the number of CAUTIs reported in 2015 and forward

About the Pooled Mean...

- ❑ How do I know which published report NHSN is using to make these comparisons?

List of Aggregate Data Sources for Rates and SIRs:

<http://www.cdc.gov/nhsn/PS-Analysis-resources/index.html>

NHSN Patient Safety Component Measures and Source of Aggregate Data Used for Comparisons

Measure	Source of Aggregate Data (as of NHSN v8.1)
CLABSI Rates*	NHSN Report, data summary for 2012, Device-associated Module Am J Infect Control 2013;41:1148-66 http://www.cdc.gov/nhsn/PDFs/2012-data-summary-nhsn.pdf
CLABSI SIRs**	NHSN Annual Report: data summary for 2006-2008, issued December 2009 Am J Infect Control 2009;37:783-805 http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF
CAUTI Rates*	NHSN Report, data summary for 2012, Device-associated Module Am J Infect Control 2013;41:1148-66 http://www.cdc.gov/nhsn/PDFs/2012-data-summary-nhsn.pdf
CAUTI SIRs**	NHSN Annual Report: data summary for 2009 Am J Infect Control 2011;39:349-67 http://www.cdc.gov/nhsn/PDFs/NHSNReport_DataSummaryfor2009.pdf

CTICU CAUTI Rate Table

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
CTICU	3	729	4.115	1.8	0.1950	99

Our hospital's data

NHSN published data and comparisons

What are the chances...?

- ❑ This probability is called the p-value
- ❑ Helps determine rarity...how rare is this outcome that it could not have happened by chance alone?
- ❑ If the p-value is very small (less than 1 in 20 or 5% or 0.05; hence $p < 0.05$):
 - Conclude that our CAUTI rate is “significantly different” than the NHSN pooled mean
 - OTHERWISE (i.e., if $p > 0.05$) conclude that our CAUTI rate is no different than the NHSN pooled mean
- ❑ **NOTE: $p < 0.05$ is a *convenient* cut-point that is widely accepted**
- ❑ Today, we will use $p < 0.05$ as our cut-point

P-values and DA Rates

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
CTICU	3	729	4.115	1.8	0.1950	99

❑ The p-value is included in the DA rates output in NHSN.

❑ What is being compared?

- Your facility's rate, by location, to the NHSN pooled mean for that same location type

- Is $\frac{3}{729}$ different than $\frac{1,715}{942,852}$?

Q4: Based on the data in this table, is our CAUTI rate significantly different from the NHSN pooled mean?

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
CTICU	3	729	4.115	1.8	0.1950	99

- ★ A. No, based on the p-value
- B. Yes, based on the p-value
- C. Yes, based on practical significance

Q5: How would you interpret the percentile for the CTICU?

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
CTICU	3	729	4.115	1.8	0.1950	99

- A. 99% of the cardiothoracic ICUs contributing to the pooled mean had a rate equal to ours.
- ★ B. 99% of the cardiothoracic ICUs contributing to the pooled mean had a rate lower than ours.
- C. 99% of the cardiothoracic ICUs contributing to the pooled mean had a rate higher than ours.

Percentiles

Urinary catheter-associated UTI rate*	Percentile					
Type of location	Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals						
Critical care units						
Burn	4.7	0.0	1.7	4.3	8.1	11.5
Medical						
Major teaching	2.9	0.4	1.3	2.3	3.9	5.5
Medical						
All other	1.7	0.0	0.0	1.0	2.3	3.7

- ❑ Percentile provides a value at which a percent of the distribution falls at or below.
- ❑ CDC publishes percentiles at specified intervals.
- ❑ Within NHSN output options, we provide an *exact* percentile of where your rate falls on the published distribution.

Why use Percentiles??

Urinary catheter-associated UTI rate*		Percentile					
Type of location		Pooled mean	10%	25%	50% (median)	75%	90%
Acute Care Hospitals							
Critical care units							
Burn		4.7	0.0	1.7	4.3	8.1	11.5
Medical							
Major teaching		2.9	0.4	1.3	2.3	3.9	5.5
Medical							
All other		1.7	0.0	0.0	1.0	2.3	3.7

- ❑ Allow you to see “where you fall” compared to those who contributed to the pooled mean
- ❑ Allow you to assess the range of rates in that type of location
- ❑ Can aid in setting goals different than the pooled mean

Device Utilization Ratios

- ❑ Device utilization (DU) ratios help assess the proportion of days in which patients were at risk for the DA infection
- ❑ Calculated as:

$$\frac{\text{\textit{\# of device days}}}{\text{\textit{\# of patient days}}}$$


Device Utilization Ratios

- ❑ Similar to DA rates, your location's DU ratio is compared to the NHSN pooled mean

Location	# UC Days	# Pt days	DU Ratio	NHSN Pooled Mean	P-value	Percentile
MICU	274	365	0.75	0.67	0.1336	65
SICU	592	911	0.65	0.72	0.0489	25
MSICU	683	1035	0.66	0.65	0.8133	45
CT ICU	729	959	0.76	0.65	0.0023	60
Med Ward	279	1395	0.20	0.15	<0.0001	80
<u>Surg Ward</u>	456	2533	0.18	0.22	0.0002	32
Neuro Ward	270	1800	0.15	0.17	0.0024	50

Q6: How would you interpret the DU Ratio results for CTICU?

Location	Urinary Catheter Days	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
CTICU	729	959	0.76	0.65	0.0023	60

- A. The DU ratio in the CTICU is not significantly higher than the NHSN pooled mean.
- B. Compared to the NHSN pooled mean, we would not consider the DU ratio in the CTICU “actionable”
-  C. The DU Ratio in the CTICU is significantly higher than the NHSN pooled mean, based on the p-value.

Elements of an interpretation

❑ Cover the basics

- How many HAIs?
- Rate, DU ratio, SIR
- Over what period of time?

❑ Interpret the statistical results

- P-value
- percentile

❑ Highlight successes or pitfalls

- Which locations experienced 0 HAIs?
- Trends – have rates gone up, or down, in any location compared to previous time period?
- If a goal is set that is different from NHSN pooled mean, how is the progress towards that goal?

Elements of an interpretation (cont'd)

❑ Supplement the data

- What were the organisms identified? Any trends?
- What special prevention efforts/education have started during this time period?
- Have there been any significant changes in staff or type of patients receiving care in the unit?
- Has surveillance been part of any special initiatives?
- Have there been any internal, or external validation programs that have taken place during this time period?
- Have NHSN surveillance definitions changed?
- Has education of NHSN definitions enhanced surveillance and understanding of definitions?

❑ Look ahead

- What are the plans to lower rates, or maintain low rates?

CAUTI Rate Example Interpretation

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	Cath Util Ratio	CathDU _Mean	Proportion p-value	Proportion Percentile
CTICU	3	729	4.115	1.8	0.1950	99	959	0.76	0.65	0.0023	60

- ❑ During the 4th quarter of 2014, there were 3 CAUTIs reported with 729 urinary catheter days in the CTICU.
- ❑ This yields a rate of 4.115 CAUTIs per 1,000 urinary catheter days.
- ❑ Based on statistical evidence, our rate is no different than the NHSN pooled mean of 1.8.
- ❑ However, this CTICU's rate is at the 99th percentile among all cardiothoracic ICUs contributing to the NHSN pooled mean.

CAUTI Rate Example Interpretation

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	Cath Util Ratio	CathDU _Mean	Proportion p-value	Proportion Percentile
CTICU	3	729	4.115	1.8	0.1950	99	959	0.76	0.65	0.0023	60

- ❑ During this same time period, there were 959 patient days reported in the CTICU.
- ❑ Dividing the number of urinary catheter days by the number of patient days, the DU ratio for the CTICU is 0.76.
- ❑ Using a CTICU is statistically significantly different from the NHSN pooled mean.
- ❑ Further, this CTICU's DU ratio is at the 60th percentile among all cardiothoracic ICUs contributing to the aggregate data, indicating that 60% had a DU ratio at or lower than our CTICU's DU ratio.

CAUTI Rate

Interpretation – A step further...

Location	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	1	274	3.650	3.5	0.8609	58
SICU	1	592	1.689	3.4	0.5299	27
MSICU	2	683	2.928	2.7	0.8178	61
CT ICU	3	729	4.115	1.8	0.1950	99
Med Ward	0	279	0.000	1.5	0.6521	25
Surg Ward	1	456	2.193	1.3	0.5809	76
Neuro Ward	2	270	7.407	2.2	0.1477	97

Take a
BREAK



Example: Analyzing CAUTI data

- ❑ **You and your colleagues have completed entering all HAI data into NHSN for the 4th quarter of 2014.**
- ❑ **The task of analyzing HAI surveillance data is distributed among you and your colleagues. You are tasked with analyzing CAUTI data.**
 - ✓ You will be expected to compare each location's rates and device utilization ratios to the national data.
 - You will also be expected to provide an overall metric representing your hospital's CAUTI experience (i.e., the SIR)

Standardized Infection Ratio

❑ What is the standardized infection ratio?

- Standardized Infection Ratio, SIR, is a summary measure used to compare the HAI experience among one or more groups of patients to that of a standard population's (e.g. NHSN)
- Indirect standardization method
- Accounts for differences in incidence of HAI within the groups
- Used in public reporting by CDC (at state and national levels) and CMS (at facility level on Hospital Compare)

❑ SIRs are currently available for:

- CLABSI
- CAUTI
- SSI
- FacWideIn MRSA Bacteremia and CDI LabID

Standardized Infection Ratio

$$\text{SIR} = \frac{\text{Observed \# of HAIs}}{\text{Expected (Predicted) \# of HAIs}}$$

- ❑ **Observed # of HAIs – the number of events that you enter into NHSN**
- ❑ **Expected or predicted # of HAIs – comes from national baseline data**
 - Calculating the # of expected HAIs can differ depending on the measure

Expected # of HAIs CLABSI & CAUTI

- ❑ **For CLABSI and CAUTI SIRs, the expected # is calculated for each individual location as:**

$$\text{\# device days} * (\text{NHSN pooled mean}/1000)$$

Where the pooled mean originates from a defined baseline report.

- ❑ **CAUTI Baseline:**

- Acute care hospitals: 2009 data (published in 2011)
- LTACHs and IRFs: 2013 data (published in 2015)

- ❑ **CLABSI Baseline:**

- Acute care hospitals: 2006-2008 data (published in 2009)
- LTACHs: 2013 data (published in 2015)

- ❑ **Baseline data have remained consistent due in part to alignment with the HHS Action Plan to Prevent HAIs.**

Example: Expected # of CAUTIs

Type of location	No. of Locations [†]	No. of CAUTIs	Urinary catheter days	Pooled mean
Critical care units				
Burn	18	92	20,921	4.4

- ❑ Screenshot above from the 2009 NHSN Data Summary for DA Module
- ❑ Pooled mean of “4.4” is read as 4.4 CAUTIs per 1,000 urinary catheter days
- ❑ This is what is used as the baseline for the CAUTI SIR – we predict that for every 1,000 catheter days, we will see 4.4 infections (if things are the same as they were in 2009)

Calculating the Number Expected for DA HAIs

Number expected = # device days * (NHSN pooled mean/1000)

Location	# CAUTIs	# expected	# UC Days	Baseline Pooled Mean	SIR	P-value	95% CI
MICU	1	0.6302	274	2.3	--	--	--
SICU	1	1.5392	592	2.6	0.650	0.7593	0.033, 3.204
MSICU	2	1.5709	683	2.3	1.273	0.6748	0.213, 4.206
CT ICU	3	1.2393	729	1.7	2.421	0.1664	0.616, 6.588
Med Ward	0	0.5301	279	1.9	--	--	--
Surg Ward	1	0.8208	456	1.8	--	--	--
Neuro Ward	2	0.8370	270	3.1	--	--	--

729 urinary catheter days in the CTICU* (1.7/1000)

= 1.2393 expected CAUTIs in the CTICU

About the Number Expected...

- ❑ **If the number of expected events is less than 1, the SIR is not calculated!**
- ❑ **Why not????**
 - To enforce a minimum precision criterion.
 - To aid in interpretation of the results
- ❑ **Imagine a facility observed 2 CAUTIs during a time period but NHSN estimates that 0.5 CAUTIs were expected**
 - If calculated, the SIR would be 4 – indicating that the facility observed 4 times the number of infections expected. Yet, only 2 were identified
- ❑ **What do we do in this case?** *More on this tomorrow...*

Calculating the SIR - Overall

Location	# CAUTIs	# expected	# UC Days	Baseline Pooled Mean	SIR	P-value	95% CI
MICU	1	0.6302	274	2.3	--	--	--
SICU	1	1.5392	592	2.6	0.650	0.7593	0.033, 3.204
MSICU	2	1.5709	683	2.3	1.273	0.6748	0.213, 4.206
CTICU	3	1.2393	729	1.7	2.421	0.1664	0.616, 6.588
Med Ward	0	0.5301	279	1.9	--	--	--
Surg Ward	1	0.8208	456	1.8	--	--	--
Neuro Ward	2	0.8370	270	3.1	--	--	--
TOTAL	10	7.167	3,283	--	1.395	0.2976	0.709, 2.487

- Although we have the total # of CAUTIs and the total # urinary catheter days, an overall rate should not be calculated.

Calculating the SIR - Overall

Location	# CAUTIs	# expected	# UC Days	Baseline Pooled Mean	SIR	P-value	95% CI
MICU	1	0.6302	274	2.3	--	--	--
SICU	1	1.5392	592	2.6	0.650	0.7593	0.033, 3.204
MSICU	2	1.5709	683	2.3	1.273	0.6748	0.213, 4.206
CTICU	3	1.2393	729	1.7	2.421	0.1664	0.616, 6.588
Med Ward	0	0.5301	279	1.9	--	--	--
Surg Ward	1	0.8208	456	1.8	--	--	--
Neuro Ward	2	0.8370	270	3.1	--	--	--
TOTAL	10	7.167	3,283	--	1.395	0.2976	0.709, 2.487

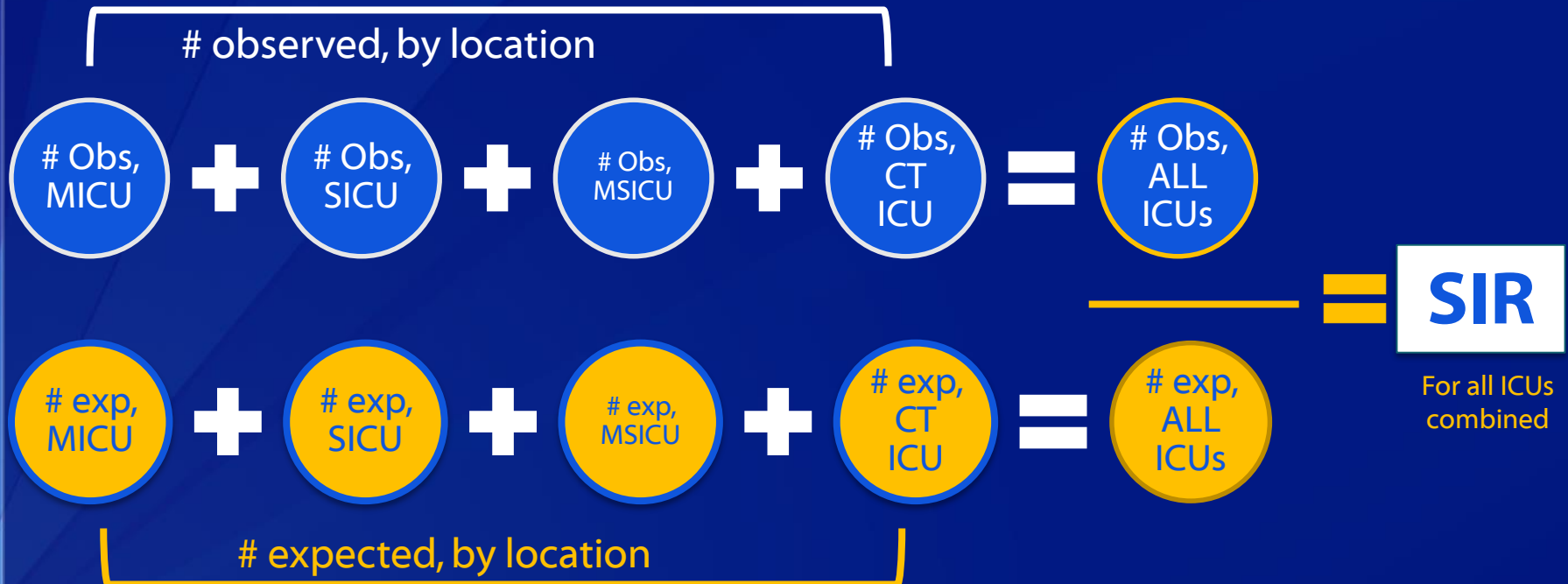
The overall SIR is not a sum of the individual SIRs, but rather is calculated as:

Total infection count/ total expected count



The “number Expected” for my ICU is <1. Is this location included in the overall SIR for my hospital?

- ❑ YES! Since the SIR is a summary measure, the calculations from individual units or procedures can be “rolled up” into a single SIR.



Interpreting an SIR

$$\text{SIR} = \frac{\text{Observed \# of HAIs}}{\text{Expected \# of HAIs}}$$

- ❑ The SIR is a ratio – if its value is 1 then the number of observed events and number of expected events is equal
- ❑ If the SIR is greater than 1, then there are more infections reported than what would be expected given the baseline experience
 - SIR of 1.25 = 25% more infections than expected
- ❑ If the SIR is less than 1, then there are fewer infections reported than what would be expected given the baseline experience
 - SIR of 0.50 = 50% fewer infections than expected

SIR as a Summary Measure

- ❑ **Standardized Infection Ratio, SIR, is a **summary measure** used to compare the HAI experience among one or more groups of patients to that of a standard population's (e.g. NHSN)**
- ❑ **Each SIR can be calculated as a summarized measure at various levels; for example:**
 - one CAUTI SIR for all ICUs combined
 - one SSI SIR for all inpatient procedures
 - one CDI SIR for all facilities in the state

Q7: How would you interpret the Overall CAUTI SIR?

Quarter	# CAUTIs	# expected	# UC Days	SIR	P-value	95% CI
2014Q2	10	7.167	3283	1.395	0.2976	0.709, 2.487

- A. Our hospital's CAUTI rate is nearly 40% higher than the national rate.
- ★ B. Our hospital identified 40% more CAUTIs than predicted.
- C. Our hospital identified significantly more CAUTIs than predicted.
- D. Our hospital's CAUTI rate is lower than the national rate.

General CAUTI SIR Interpretation

Quarter	# CAUTIs	# expected	# UC Days	SIR	P-value	95% CI
2014Q4	10	7.167	3283	1.395	0.2976	0.709, 2.487

- ❑ During the 4th quarter of 2014, we identified 10 CAUTIs in 3,283 urinary catheter days in all ICUs and wards.
- ❑ Based on the national baseline data, 7.167 CAUTIs were predicted.
- ❑ The SIR of 1.395 indicates that we identified nearly 40% more CAUTIs than what was predicted.

P-values and the SIR

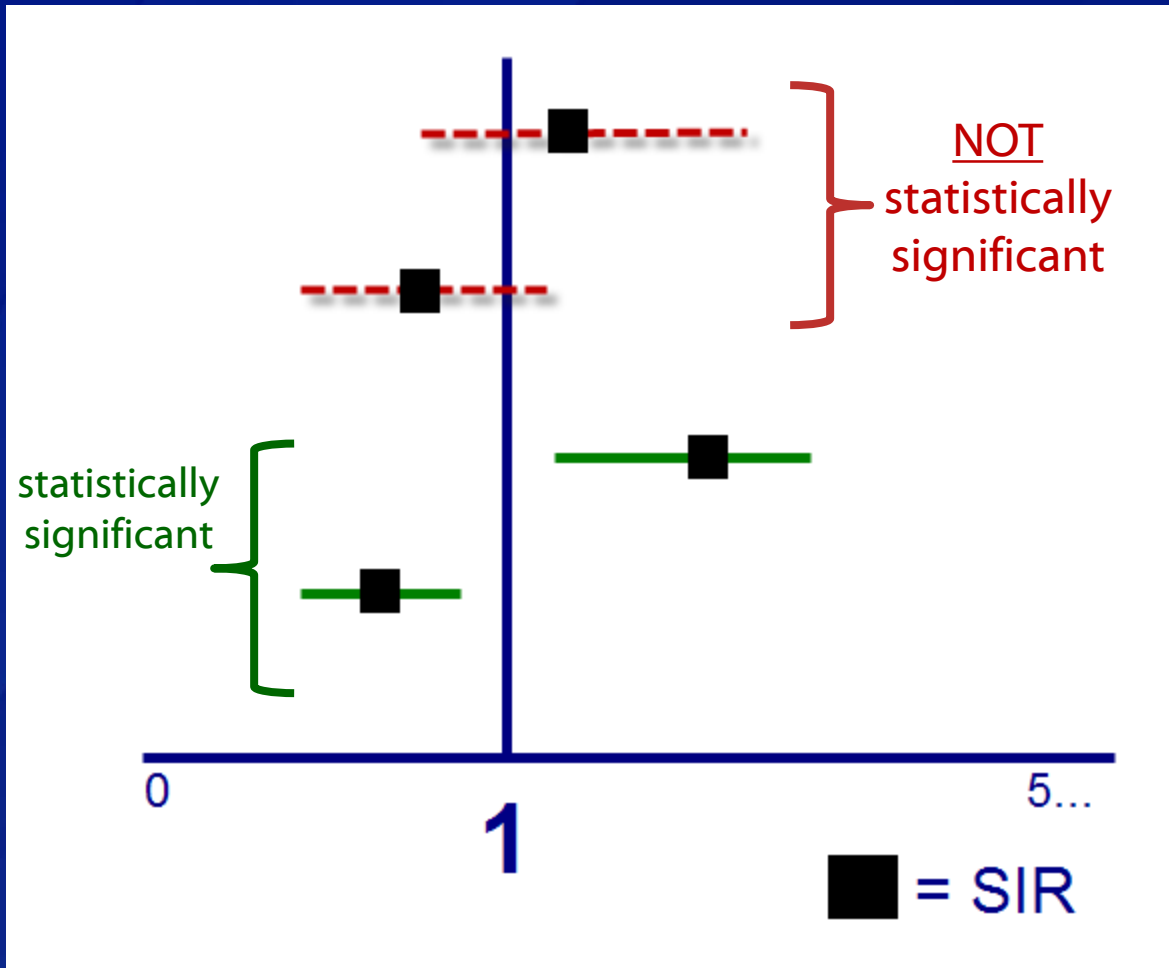
Quarter	# CAUTIs	# expected	# UC Days	SIR	P-value	95% CI
2014Q4	10	7.167	3283	1.395	0.2976	0.709, 2.487

- ❑ **The p-value is included in the SIR output options in NHSN.**
- ❑ **What is being compared?**
 - The SIR is being compared to 1
- ❑ **Why “1”?**
 - 1 represents the number of observed infections = the number of expected infections

95% Confidence Interval


- ❑ **NHSN produces a p-value and 95% confidence interval with each SIR – both can be used to assess significance of the SIR**
- ❑ **A 95% CI is an interval for which we have a high degree of confidence that it contains the true SIR**
 - The upper and lower limits are used to determine the significance and accuracy (or precision) of the SIR
- ❑ **Allows you to assess variability of an estimated SIR**
- ❑ **If the confidence interval includes the value of 1, then the SIR is not significant**
 - i.e., if the lower bound is ≤ 1 and the upper bound is ≥ 1 , then the SIR is not significant.

95% CI for SIRs



Q8: What conclusions can you make based on the statistical evidence?

Quarter	# CAUTIs	# expected	# UC Days	SIR	P-value	95% CI
2014Q4	10	7.167	3283	1.395	0.2976	0.709, 2.487

- A. Our hospital's CAUTI SIR is significantly high.
- B. Our hospital's CAUTI SIR is significantly low.
-  C. Our hospital's CAUTI SIR is no different than the national baseline.
- D. No conclusions can be made.

95% Confidence Interval



0.709 ————— 2.487

Conclusion:
NOT statistically
significant!

0

1

General CAUTI SIR Interpretation

Quarter	# CAUTIs	# expected	# UC Days	SIR	P-value	95% CI
2014Q4	10	7.167	3283	1.395	0.2976	0.709, 2.487

- ❑ During the 4th quarter of 2014, we identified 10 CAUTIs in 3,283 urinary catheter days in all ICUs and wards.
- ❑ Based on the national baseline data, 7.167 CAUTIs were predicted.
- ❑ The SIR of 1.395 indicates that we identified nearly 40% more CAUTIs than what was predicted.
- ❑ Based on statistical evidence, we can conclude that our CAUTI SIR for Q4 is not different than 1. (i.e., the number of observed CAUTIs is not significantly higher than the number predicted.)

How do our data look in NHSN?

Device-Associated (DA) Module

Central Line-Associated BSI

Ventilator-Associated PNEU

Ventilator-Associated Events

Urinary Catheter-Associated UTI

CDC Defined Output

Line Listing - All CAU Events	Run	Modify
Frequency Table - All CAU Events	Run	Modify
Bar Chart - All CAU Events	Run	Modify
Pie Chart - All CAU Events	Run	Modify
Rate Table - CAU Data for ICU-Other/SCA/ONC	Run	Modify
Run Chart - CAU Data for ICU-Other/SCA/ONC	Run	Modify
Rate Table - CAU Data for NICU	Run	Modify
Run Chart - CAU Data for NICU	Run	Modify
Rate Table - CAU Data for LTAC	Run	Modify
Run Chart - CAU Data for LTAC	Run	Modify
Rate Table - CAU Data for IRF	Run	Modify
Run Chart - CAU Data for IRF	Run	Modify
SIR - In-Plan CAU Data	Run	Modify
SIR - All CAU Data	Run	Modify
SIR - CAU Data for Long Term Acute Care	Run	Modify
SIR - CAU Data for Inpatient Rehabilitation Facilities	Run	Modify

- ❑ If your hospital has a CMS-IRF unit, you will need to run a separate SIR for those data.

CAUTI SIR Overall

National Healthcare Safety Network

SIR for All Catheter-Associated UTI Data - By OrgID

As of: January 28, 2015 at 11:29 AM

Date Range: CAU_RATESICU_SCA summaryYQ 2014Q4 to 2014Q4

orgid=10018 CCN=938772

orgid	summaryYQ	infCount	numExp	numcathdays	SIR	SIR_pval	SIR95CI
10018	2014Q4	10	7.167	3283	1.395	0.2976	0.709, 2.487

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.

Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.

SIR excludes those months and locations where device days are missing.

Beginning January 2015, the CAUTI definition excludes all non-bacterial pathogens and therefore, the number of CAUTIs reported in 2015 and forward may be lower than in previous years.

Source of aggregate data: NHSN Report, Am J Infect Control 2009;37:783-805

Data contained in this report were last generated on January 28, 2015 at 9:50 AM.

- ❑ **The first table will include all units for which your hospital reported data during that time period.**

CAUTI SIR By Location

National Healthcare Safety Network

SIR for All Catheter-Associated UTI Data - By OrgID/Location

As of: January 28, 2015 at 11:29 AM

Date Range: CAU_RATESICU_SCA summaryYQ 2014Q4 to 2014Q4

orgid=10018 CCN=938772

orgid	location	summaryYQ	months	infcount	numExp	numucathdays	SIR	SIR_pval	SIR95CI
10018	MICU	2014Q4	2	1	0.6302	274	.	.	.
10018	SICU	2014Q4	3	1	1.5392	592	0.650	0.7593	0.033, 3.204
10018	MSICU	2014Q4	3	2	1.5709	683	1.273	0.6748	0.213, 4.206
10018	CTICU	2014Q4	3	3	1.2393	729	2.421	0.1664	0.616, 6.588
10018	MedWard	2014Q4	3	0	0.5301	279	.	.	.
10018	SurgWard	2014Q4	3	1	0.8208	456	.	.	.
10018	NeuroWard	2014Q4	3	2	0.8370	270	.	.	.

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.

Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.

SIR excludes those months and locations where device days are missing.

Beginning January 2015, the CAUTI definition excludes all non-bacterial pathogens and therefore, the number of CAUTIs reported in 2015 and forward may be lower than in previous years.

Source of aggregate data: NHSN Report, Am J Infect Control 2009;37:783-805

Data contained in this report were last generated on January 28, 2015 at 9:50 AM.

- ❑ The fourth table will display SIRs by location.
- ❑ Be sure to look at the “months” column!!!



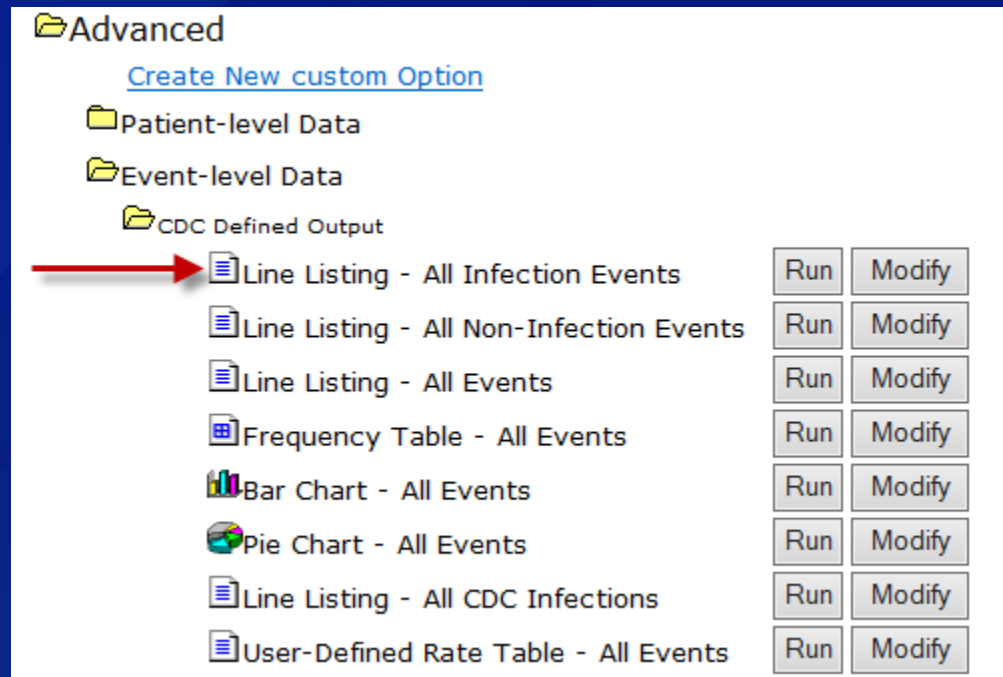
Where to go from here?

Quarter	# CAUTIs	# expected	# UC Days	SIR	P-value	95% CI
2014Q4	10	7.167	3283	1.395	0.2976	0.709, 2.487

- ✓ Where did the CAUTIs occur?
- ✓ How do our CAUTI rates compare to the current National data?
- ✓ What is each unit's device utilization for this time period?
- ❑ When did the CAUTIs occur?
- ❑ What type of CAUTI were identified (i.e., SUTI, ABUTI)
- ❑ What pathogens were reported with each CAUTI?
- ❑ What is the average length of time between hospital admission and CAUTI event date

CAUTI Details...

- ❑ A line list can help answer these questions
- ❑ The “Line Listing – All Infection Events” will allow you to include pathogen information



CAUTI Details...

- ❑ The “Line Listing – All Infection Events” will need to be modified to limit the report to CAUTI data only

Select a time period or Leave Blank for Cumulative Time Period: [HELP](#)

Date Variable	Beginning	Ending	
evntDateYQ ▾	2014Q4	2014Q4	Clear Time Period

☐ Enter Date variable/Time period at the time you click the Run button

Specify Other Selection Criteria: [HELP](#)

[Show Criteria](#) [Column +](#) [Row +](#) [Clear Criteria](#)

eventType ▾	urinaryCath ▾	
= UTI	IN (INPLACE, REMOVE)	

Other Options: [HELP](#)

Modify Variables To Display By Clicking: [Modify List](#)

Specify Sort Variables By Clicking: [Modify List](#)

Select Page by variable: ▾

Click Here

Select Variables to include in Line Listing:

Available Variables		Selected Variables
medicareID		orgID
modifyDate		patID
modifyUserID		dob
mrsa		gender
mssa		admitDate
multiProc		eventID
outpatient		eventDate
patGName		eventType
pathIdentified		location
pathogen1	>>	pathogenDesc1
pathogen2	All >>	pathogenDesc2
pathogen3		pathogenDesc3
patMName	<<	
patos	All <<	
patRaceAAB		
patRaceAMIN		
patRaceASIAN		
patRaceNH_PI		
patRaceWHITE		
patSurname		
permCentralLine		
postProc		
procCode		
procCodeDesc		
procDate		

Up Down

Save Reset Close

CAUTI Details...

Event	Location	Event Date	Specific CAUTI	# days adm to event	Age at event	Pathogen
1	SICU	10/10/2014	ABUTI	4	46	Coag negative staph
2	CTICU	10/15/2014	SUTI	4	2	<i>Pseudo. aeruginosa</i>
3	MICU	10/30/2014	ABUTI	4	42	Coag negative staph
4	Surg Ward	11/02/2014	SUTI	3	58	<i>E. coli</i>
5	CTICU	11/11/2014	SUTI	29	61	<i>Enterobacter spp.</i>
6	Neuro Ward	11/16/2014	ABUTI	13	38	<i>E. faecium</i>
7	MSICU	12/07/2014	SUTI	13	48	<i>E. faecalis</i>
8	Neuro Ward	12/12/2014	SUTI	36	43	<i>Pseudo. aeruginosa</i>
9	MSICU	12/13/2014	SUTI	18	71	<i>Candida albicans</i>
10	CTICU	12/22/2014	SUTI	12	42	<i>S. aureus</i>

Going a step further...

- ❑ How does your hospital's CAUTI experience compare to the previous quarter?**
- ❑ How does your hospital's CAUTI SIR (or rates) look for year-to-date?**
 - Longer time periods = greater precision in rates and SIRs
- ❑ Are there any outliers in your data (either with the event-level details, or in the denominators)?**
- ❑ How are the national data defined? (How are we being compared to the national data?)**

Summarizing our CAUTI Data

- ❑ **The CAUTI SIR for Q4 indicates that we observed about 40% more infections than what would be predicted for our facility; however, statistical evidence indicates that our experience is no different than the historic national baseline.**
- ❑ **We looked at the CAUTI SIRs, rates and DURs for each unit, we noted the following:**
 - Med Ward was the only unit for which there were 0 CAUTIs identified.
 - CT ICU had the highest DUR among our 7 locations; Neuro ward had the lowest DUR
 - Although not significant, the SICU's CAUTI rate was lower than the 2013 National Pooled Mean
 - The highest CAUTI rate was seen in the Neuro Ward, which reported a rate of 7.4 per 1,000 catheter days; 99% of all neuro wards contributing to the pooled mean had a lower rate
 - The CTICU had the highest SIR (2.421), although this is not statistically significant

Summarizing our CAUTI Data (cont'd)

- ❑ We did not observe any clusters of CAUTI events by time and location.**
- ❑ The average age of patients with CAUTI was 45.1.**
- ❑ The average # of days from admission to event was 13.6**

High-level Summary about SIRs

- ❑ The SIR is a summary measure that compares the number of events of a given type observed/identified in our facility with the number expected (or predicted) of that type.**
- ❑ The number of expected events is calculated based on the types of data we have reported and the NHSN baseline data.**
- ❑ The SIR uses past data (i.e., baseline) in order to predict future incidence.**
- ❑ The SIR is scalable and can be easier to interpret when assessing incidence.**



With the CAUTI definition change in effect for 2015, what will happen to our CAUTI rates and SIRs this year? Will we have a benchmark?

- ❑ **CAUTI data for 2015 will be compared to the existing pooled means:**
 - CAUTI rates will be compared to 2013 published pooled means
 - CAUTI SIRs will use the 2009 baseline
- ❑ **2015 data will be used as a new baseline for future SIRs.**
- ❑ **A footnote has been added to all CAUTI output which states:**
“Beginning January 2015, the CAUTI definition excludes all non-bacterial pathogens and therefore, the number of CAUTIs reported in 2015 and forward may be lower than in previous years.”

SIRs for CLABSI

- ❑ **The CLABSI SIR is calculated using the same methodology described for CAUTI, but with a different baseline for ACHs.**
- ❑ **There are options to run an SIR using either In-Plan CLABSI Data or ALL CLABSI Data.**
- ❑ **REMINDER: Currently, all CLABSI SIRs and rates will include those events identified as MBI-LCBI.**



How are the CLABSI and CAUTI SIRs calculated for CMS?

- ❑ **The same baselines and methods just described are also used for CMS reporting.**
- ❑ **Key components of CMS reporting:**
 - Includes only data from all **in-plan** ICUs (adult, pediatric, and neonatal)
 - In 2015, this will expand to include all in-plan adult and pediatric medical, surgical, and medical/surgical wards.
 - Data are submitted per quarter, by CCN
 - Data posted on Hospital Compare are published for a rolling 4-Quarters time period (e.g., 2013Q4 – 2013Q4)



When I run the CLABSI and CAUTI SIRs in NHSN, some locations are excluded. Why?

- ❑ **The CLABSI and CAUTI SIRs for Acute care hospitals will exclude all locations for which there were no published, pooled means in the corresponding baseline report.**

This includes:

- Telemetry Wards
- Mixed Acuity Units
- Long Term Acute Care Hospitals
- Inpatient Rehab Facilities (IRFs) and IRF wards

**Now
available!!**

Analysis Case Study

INTERNAL COMPARISONS

Internal Comparisons

- ❑ You work at a Long Term Acute Care Hospital (LTACH) that has been performing surveillance for CLABSI and CAUTI.**
- ❑ You'd like to measure how your facility is doing compared to National data, as well as how your facility is doing over time, comparing 2 6-month time periods.**

Internal Comparisons

- ❑ **NOTE! The methods we are about to discuss can be applied to other location types or facility types. For example:**
 - Telemetry wards
 - Mixed Acuity Wards
 - IRFs and IRF units
- ❑ **Can also use this to compare your VAE rates or LabID rates over time**

CAUTI Output Options

Device-Associated (DA) Module

Central Line-Associated BSI

Ventilator-Associated PNEU

Ventilator-Associated Events

Urinary Catheter-Associated UTI

CDC Defined Output

Line Listing - All CAU Events

Run Modify

Frequency Table - All CAU Events

Run Modify

Bar Chart - All CAU Events

Run Modify

Pie Chart - All CAU Events

Run Modify

Rate Table - CAU Data for ICU-Other/SCA/ONC

Run Modify

Run Chart - CAU Data for ICU-Other/SCA/ONC

Run Modify

Rate Table - CAU Data for NICU

Run Modify

Run Chart - CAU Data for NICU

Run Modify

Rate Table - CAU Data for LTAC

Run Modify

Run Chart - CAU Data for LTAC

Run Modify

Rate Table - CAU Data for IRF

Run Modify

Run Chart - CAU Data for IRF

Run Modify

Internal Comparisons LTAC ICU CAUTI Rates

Location	Summary Yr/Half	Months	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
ICU	2014H1	6	4	678	5.900	2.5	0.1367	85
ICU	2014H2	6	2	685	2.920	2.5	0.7888	65

- ❑ Here we have the output from NHSN for our LTAC ICU location.
- ❑ We have the NHSN pooled mean (“external comparison”)
- ❑ BUT...have we made significant progress when comparing to ourselves???

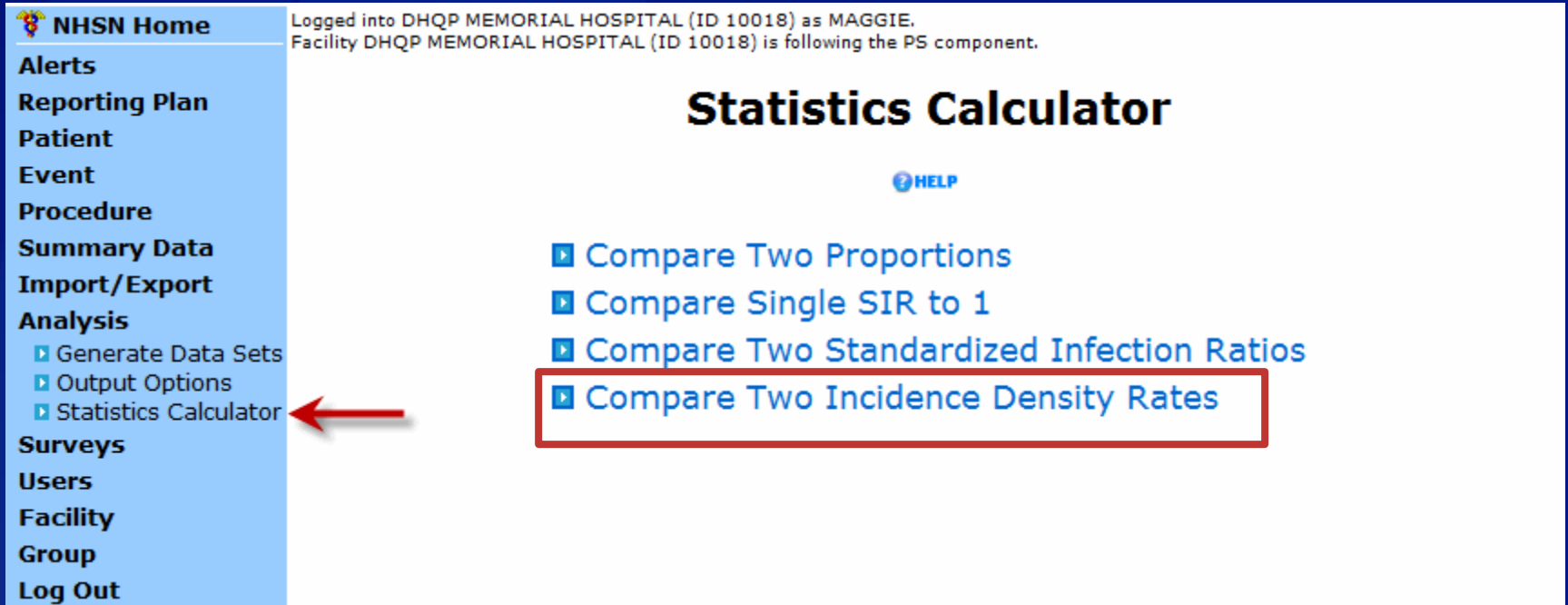
LTAC ICU CAUTI Rates

Location	Summary Yr/Half	Months	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
ICU	2014H1	6	4	678	5.900	2.5	0.1367	85
ICU	2014H2	6	2	685	2.920	2.5	0.7888	65

❑ What can we say about these data, without running a statistical test?

- The CAUTI rate decreased over the two periods.
- The number of urinary catheter-days was nearly the same.
- The catheter use is unknown, given the data shown above.

Statistics Calculator



The screenshot displays the NHSN Home interface. On the left is a navigation menu with the following items: Alerts, Reporting Plan, Patient, Event, Procedure, Summary Data, Import/Export, Analysis, Surveys, Users, Facility, Group, and Log Out. The 'Analysis' section is expanded, showing sub-options: Generate Data Sets, Output Options, and Statistics Calculator. A red arrow points to the 'Statistics Calculator' link. The main content area shows the user is logged into DHQP MEMORIAL HOSPITAL (ID 10018) as MAGGIE, following the PS component. The title 'Statistics Calculator' is centered, with a 'HELP' link below it. A list of four calculator options is shown: 'Compare Two Proportions', 'Compare Single SIR to 1', 'Compare Two Standardized Infection Ratios', and 'Compare Two Incidence Density Rates'. The last option is highlighted with a red rectangular border.

NHSN Home

Logged into DHQP MEMORIAL HOSPITAL (ID 10018) as MAGGIE.
Facility DHQP MEMORIAL HOSPITAL (ID 10018) is following the PS component.

Statistics Calculator

[HELP](#)

- ▶ Compare Two Proportions
- ▶ Compare Single SIR to 1
- ▶ Compare Two Standardized Infection Ratios
- ▶ Compare Two Incidence Density Rates

Quick Reference Guide: <http://www.cdc.gov/nhsn/PS-Analysis-resources/PDF/StatsCalc.pdf>

Statistics Calculator

Compare Two Incidence Density Rates



When comparing two incidence density rates (i.e. person-time), the hypothesis is that the rates are not different from each other. To perform a statistical test and calculate a p-value, enter the number of events as the numerator, the number of person-time units (i.e. exposure) as the denominator, and choose the multiplier you wish for the rate calculation. Press calculate. (See examples below)

	Data Source #1	Data Source #2
Group Labels:	<input type="text" value="Jan-June"/>	<input type="text" value="July-Dec"/>
Numerator(Number of events):	<input type="text" value="4"/>	<input type="text" value="2"/>
Denominator(Number of person-time units):	<input type="text" value="678"/>	<input type="text" value="685"/>
Multiplier:	<input type="text" value="1000"/>	
Title:	<input type="text" value="LTAC ICU CAUTI Rates"/>	

Statistics Calculator - Results

	Jan-June	July-Dec
Numerator	4	2
Denominator	678	685
Incidence Density Rate	5.900	2.920
IDR p-value	0.4459	

- ❑ Based on statistical evidence, we did not observe a significant change in this location's CAUTI rate
- ❑ **HOWEVER** – this decrease is significant in a *practical* sense.

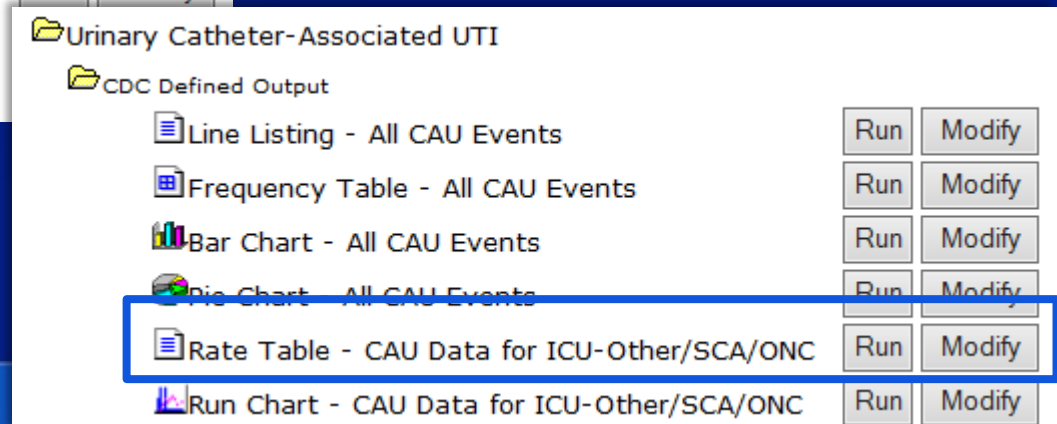
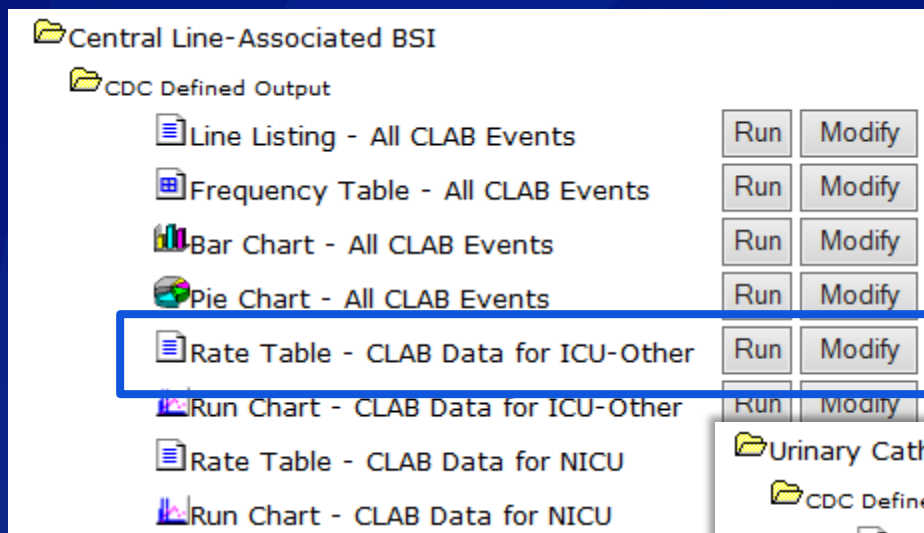
DENOMINATOR SAMPLING: ASSESSING ELIGIBLE LOCATIONS

Denominator Sampling

- ❑ To ensure the accuracy of the estimated denominator data, only non-oncology ICU and ward location types with 75 or more device-days per month are eligible to use the alternative method.
- ❑ Review of each location's prior year (i.e., 12 months) of CLABSI or CAUTI denominator data in NHSN will help determine which locations are eligible.

Obtaining the Prior Year's Device Day Monthly Average

- ❑ The Rate Table output options in NHSN can be used to obtain the total number of device days per location for the prior year.



Obtaining the Prior Year's Device Day Monthly Average

❑ Each rate table will need to be modified in the following manner:

- Limit to time period of interest (e.g., summaryYr 2014 to 2014)

Select a time period or Leave Blank for Cumulative Time Period: [?HELP](#)

Date Variable	Beginning	Ending	
summaryYr ▼	2014	2014	Clear Time Period

☐ Enter Date variable/Time period at the time you click the Run button

- Group By: summaryYr (if analyzing calendar year) or leave blank (if analyzing other 12-month time period)

Other Options: [?HELP](#)

Group by: summaryYr ▼

Obtaining the Prior Year's Device Day Monthly Average

- ❑ For example, here are the resulting 2014 annual rate tables for two locations:



location	summaryYr	months	clabcount	numcldays	CLABRate	CLAB_Mean	IDR_pval	IDR_pctl
22ICU	2014	12	2	863	2.317	1.3	0.3981	83



location	summaryYr	months	clabcount	numcldays	CLABRate	CLAB_Mean	IDR_pval	IDR_pctl
MICU	2014	12	6	3495	1.717	1.1	0.2797	77

- ❑ To calculate the average number of device days, per month, divide the total number of device days (numcldays) by the number of months.



22ICU: 863 CL days / 12 = 71.92 average CL days per month



MICU: 3495 CL days / 12 = 291.25 average CL days per month

Updates to CLABSI and CAUTI Analysis

- ❑ **CLABSI and CAUTI analysis datasets and output options will be modified so that facility and group users will be able to identify those months in which the new denominator sampling protocol was used.**
 - Variables added to “Line List – All Summary Data” as well as the analysis datasets for Rate Tables and SIRs
 - Footnote added to applicable tables in rates and SIRs when at least one month of data was reported using the denominator sampling protocol

NHSN ANALYSIS UPDATES - 2015

Analysis Updates for 2015

- ❑ Annual update to CLABSI, CAUTI and Pediatric VAP Pooled Means**
- ❑ Addition of “Indicator” variables to LabID line lists to determine which events are included in FACWIDE measures**

Analysis Updates for 2015

❑ Addition of Ward Locations in the CLABSI and CAUTI CMS IPPS SIRs*

- The following locations will be included in the CMS IPPS CLABSI and CAUTI SIRs, beginning with Q1 2015 data:

CDC Location Label	CDC Location Code
Medical Ward	IN:ACUTE:WARD:M
Medical/Surgical Ward	IN:ACUTE:WARD:MS
Surgical Ward	IN:ACUTE:WARD:S
Pediatric Medical Ward	IN:ACUTE:WARD:M_PED
Pediatric Medical/Surgical Ward	IN:ACUTE:WARD:MS_PED
Pediatric Surgical Ward	IN:ACUTE:WARD:S_PED

*Per the CMS Final Rule, published August 22, 2014: <http://www.gpo.gov/fdsys/pkg/FR-2014-08-22/pdf/2014-18545.pdf>

Analysis Updates for 2015

■ Addition of Ward Locations in the CLABSI and CAUTI CMS IPPS SIRs (cont'd)

- Each of the two SIRs will continue to have an “Overall SIR” table in the output that will include data for the select wards for 2015 and forward only
- A new table will be added that will include an SIR for all adult, pediatric, and neonatal ICUs combined only.

CMS Reports		
Acute Care Hospitals (Hospital IQR)		
CDC Defined Output		
SIR - CLAB Data for CMS IPPS	Run	Modify
SIR - CAUTI Data for CMS IPPS	Run	Modify
SIR - Complex 30-Day SSI Data for CMS IPPS	Run	Modify
SIR - CDI FacwideIN LabID Data for CMS IPPS	Run	Modify
SIR - MRSA Blood FacwideIN LabID Data for CMS IPPS	Run	Modify

New Analysis Output Options for 2015

- ❑ **CLABSI and CAUTI SIRs for LTACHs (2013 Baseline)**
- ❑ **CAUTI SIRs for IRFs (2013 Baseline)**
- ❑ **TAP Reports for CLABSI, CAUTI, and CDI LabID**
- ❑ **CMS-related reports for LTACH and IRF MRSA and CDI LabID surveillance**
- ❑ **HAI Antimicrobial resistance reports**
- ❑ **Output options for CRE-*Enterobacter***
- ❑ **Output options for all CRE combined (*coming in Summer 2015*)**

Summary

- ❑ **Analyzing your data in NHSN gives you the power to OWN your data and tell a story.**
- ❑ **There are various output options that can be modified to meet your needs and the needs of your facility.**
- ❑ **Obtaining rates, DU ratios, and SIRs from NHSN can help you assess how your facility compares to the latest NHSN pooled means.**

Additional Resources

- ❑ Analysis Resource page:
<http://www.cdc.gov/nhsn/PS-Analysis-resources/index.html>
- ❑ More Analysis training:
<http://www.cdc.gov/nhsn/Training/analysis/index.html>
- ❑ NHSN Annual Reports:
<http://www.cdc.gov/nhsn/dataStat.html>

Questions?
nhsn@cdc.gov



All Facilities: Helpful Hints for CMS Quality Reporting

- ❑ All documents related to CMS Quality reporting through NHSN can be found here:
<http://www.cdc.gov/nhsn/cms/index.html>
- ❑ Utilize the CMS Reports Output Options within NHSN – these data will *mirror* the data that will be submitted to CMS of behalf of your facility for that quarter's upcoming deadline.
 - NOTE: Once a quarter's deadline has passed, no data updates are submitted to CMS.

All Facilities: Helpful Hints for CMS Quality Reporting

- ❑ **Run CMS Reports in NHSN Analysis before each quarterly deadline to view data that will be sent to CMS**
 - SAVE/PRINT THESE REPORTS for future reference!!!
 - Any changes or updates made to your data after the quarterly deadlines will never be sent to CMS and will not be reflected on CMS preview reports
 - However, changes to your data will be reflected in the CMS Reports within **NHSN Analysis Options**
- ❑ **Give yourself enough time to enter and review data *before* the quarterly deadlines**