

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

Maggie Dudeck, MPH, CPH

Epidemiologist

NHSN Training Course

March 12-14, 2014

Atlanta, GA

Objectives

- ❑ Apply statistical methods in the interpretation of rates and SIR comparisons for CAUTI and CLABSI, and identify methods behind statistical measures used in NHSN and for CMS Quality Reporting Programs.
- ❑ Correctly apply NHSN analytical functions to case scenarios to illustrate analysis features and identify problems and successes within a reporting facility.
- ❑ Identify how various metrics obtained from NHSN can be interpreted and used to drive prevention of HAIs.

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](#)

Recommend Tweet Share

Patient Safety Analysis Resources

The NHSN application provides various options that allow NHSN users to analyze and interpret 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

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.

GENERATING DATASETS

Generating Datasets

- ❑ **Generating datasets is the first step in performing analysis in NHSN**
 - Organizes data into defined sets for analysis
 - Copies and **freezes** data
 - 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 after that point in time will not be represented in your reports until you generate datasets again.

Generating Datasets

Generate Data Sets

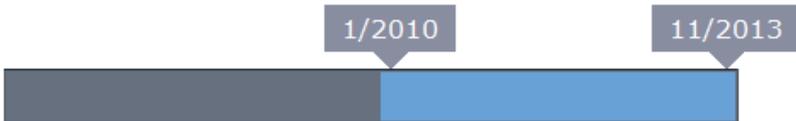
[HELP](#)

Generate Patient Safety Analysis Data Sets

Datasets generated will include data for 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. 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.



Last Generated: Nov 14 2013 2:10PM

- ❑ 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 shows the NHSN (National Healthcare Safety Network) interface. At the top left is the CDC logo. The header text reads "Department of Health and Human Services" and "Centers for Disease Control and Prevention". Below this is a navigation bar with "NHSN Home", "My Info", "Contact us", "Help", and "Log Out". The main content area is titled "Patient Safety Component" and "Analysis Output Options". It features two buttons: "Expand All" and "Collapse All". Below these buttons is a tree view of output options organized into folders:

- 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
- Vaccination Module
- Advanced
- My Custom Output
- Published Output

The left sidebar contains a navigation menu with the following items: NHSN Home, Reporting Plan, Patient, Event, Procedure, Summary Data, Import/Export, Analysis (with sub-items: Generate Data Sets, Output Options, Statistics Calculator), Surveys, Users, Facility, Group, and Log Out.

- ❑ 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

Patient Safety Component
Analysis Output Options

Expand All Collapse All

- Device-Associated Module
 - All Device-Associated Events
 - Central Line-Associated BSI
 - Ventilator-Associated PNEU
 - Urinary Catheter-Associated UTI
 - Central Line Insertion Practices
 - Dialysis Events
- Procedure-Associated Module
- MDRO/CDI Module - Infection Surveillance
- MDRO/CDI Module - LABID Event Reporting
- MDRO/CDI Module - Process Measures
- MDRO/CDI Module - Outcome Measures
- Vaccination Module

- As you click on the folder for each module, the folder will expand to show you the event-level options within that folder.

Analysis Output Options

Patient Safety Component
Analysis Output Options

Expand All Collapse All

- Device-Associated Module
 - All Device-Associated Events
 - 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 - UCAB/CLAB Data for NICU Run Modify
 - Run Chart - UCAB/CLAB Data for NICU Run Modify
 - Rate Table - CLAB Data for SCA Run Modify
 - Run Chart - CLAB Data for SCA Run Modify
 - SIR - In-Plan CLAB Data Run Modify
 - SIR - All CLAB Data 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

Advanced

[Create New custom Option](#)

CMS Reports

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
- Line Listing - CMS ESRD QIP Rule
- Rate Table - CLAB Data for CMS LTCH PPS
- Rate Table - CAUTI Data for CMS LTCH PPS
- Rate Table - CAUTI Data for CMS IRF PPS
- Rate Table - CLAB Data for CMS PPS-Exempt Cancer...mo
- Rate Table - CAUTI Data for CMS PPS-Exempt Cance...mo

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.

SIRs are utilized for Acute Care Hospitals, and rates are submitted for all others (due to the current unavailability of baseline data for SIRs).

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.

The screenshot displays a software interface with a folder structure under the heading "Advanced". The folders listed are "CMS Reports", "Patient-level Data", "Event-level Data", and "CDC Defined Output". Under "CDC Defined Output", there is a list of report options, each with a "Run" and "Modify" button to its right. A red arrow points to the first option: "Line Listing - All Infection Events".

Report Name	Run	Modify
Line Listing - All Infection Events	Run	Modify
Line Listing - All Dialysis and Non-Infection Events	Run	Modify
Line Listing - All Events	Run	Modify
Frequency Table - All Events	Run	Modify
Bar Chart - All Events	Run	Modify
Pie Chart - All Events	Run	Modify
Line Listing - All CDC Infections	Run	Modify
User-Defined Rate Table - All Events	Run	Modify

At the bottom of the interface, there is a folder icon labeled "Custom Output".

Analysis Output Options

□ Frequency Tables

- Allows you to obtain counts of records meeting certain criteria
- Example: How many CAUTIs were reported as ABUTI?
- Example: What is the distribution of ASA Score for each of our colon surgery procedures?
- 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

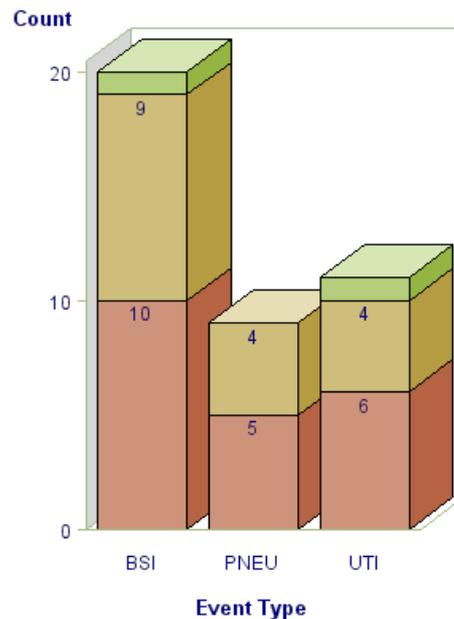
Frequency Percent Row Pct Col Pct	Table of evntDateYQ by spcEvent		
	evntDateYQ(Event~Yr/Qtr)	spcEvent(Specific Event)	
		ABUTI	SUTI
2011Q1	2	3	5
	18.18	27.27	45.45
	40.00	60.00	
	50.00	42.86	
2011Q2	2	4	6
	18.18	36.36	54.55
	33.33	66.67	
	50.00	57.14	
Total	4	7	11
	36.36	63.64	100.00

Analysis Output Options

Bar Charts & Pie Charts

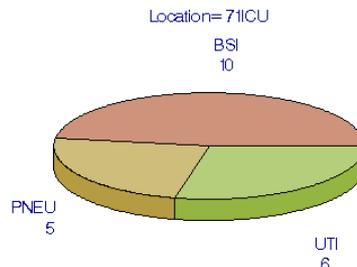
- Graphical report of counts of records meeting certain criteria (think of these as a graphical representation of the frequency table)
- Example: How many CLABSI events occurred in each ICU?
- NOTE: These options do not graphically present rates or standardized infection ratios.**

National Healthcare Safety Network
All Device-Associated Events
As of: January 17, 2012 at 11:09 AM
Date Range: DA_EVENTS evtDateYr 2011 to 2011



Location 71ICU MICU SICU

National Healthcare Safety Network
All Device-Associated Events
As of: January 17, 2012 at 11:12 AM
Date Range: DA_EVENTS evtDateYr 2011 to 2011
FREQUENCY of eventType



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

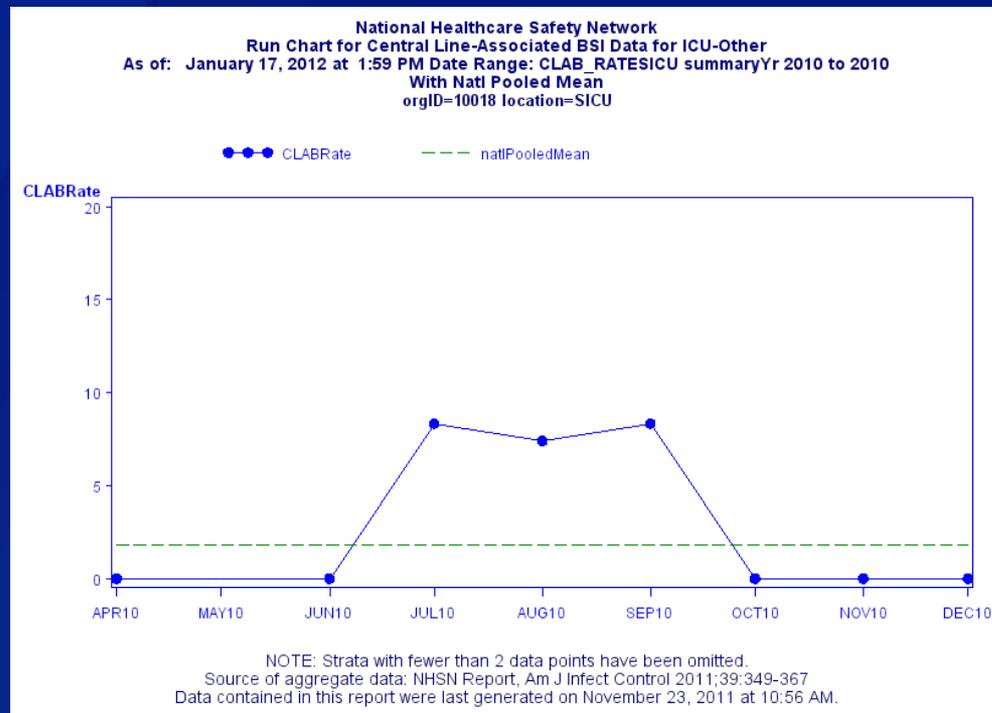
Location	Summary Yr/Qtr	months	CLA BSI Count	Central Line Days	CLA BSI Rate	NHSN CLAB Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	CL Util Ratio	NHSN Line DU Pooled Mean	Proportion p-value	Proportion Percentile
711ICU	2011Q1	3	6	730	8.219	1.2	0.0003	100	1300	0.562	0.71	0.0000	30
711ICU	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	summaryYH	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.

New Analyses in 2013 & 2014

- ❑ Various output options (e.g., line list, rate tables) for ventilator-associated events (VAE)
- ❑ Variables for distinguishing MBI-LCBIs from all other CLABSIs
- ❑ New NHSN Annual Report of Device-associated Rates includes rates specific to Critical Access Hospitals
 - All critical care areas combined
 - All non-critical care areas combined
- ❑ SIRs for MRSA Bacteremia and CDI LabID events (FacWideIn only!)
- ❑ Variable for distinguishing procedures with closure method other than primary (2014)

General Tips for Analyzing Data in NHSN

- ❑ Read the footnotes on your reports!!!
- ❑ Generate datasets regularly
- ❑ Review data for accuracy and completeness

MODIFYING YOUR OUTPUT

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=""/> |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

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:

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

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"/> |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

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:

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:

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

Modifying and Interpreting Output

REAL WORLD EXAMPLES

Example #1 CLABSI Line List

- Let's say you would like a list of all of the central line-associated bloodstream infections (CLABSIs) that your facility has reported to NHSN for the time period January – December 2013. You need the list sorted by event date. Additionally, you would like to include information on which CLABSIs met the MBI-LCBI definition.

Example #1

A note about MBI...

- ❑ CLABSIs that are identified as MBI-LCBI will be included in CLABSI rates and SIRs at this time, including for CMS reporting.
- ❑ Once we have at least one full-year of reporting using the MBI definition, we at CDC can determine how these events should be handled in future measures.

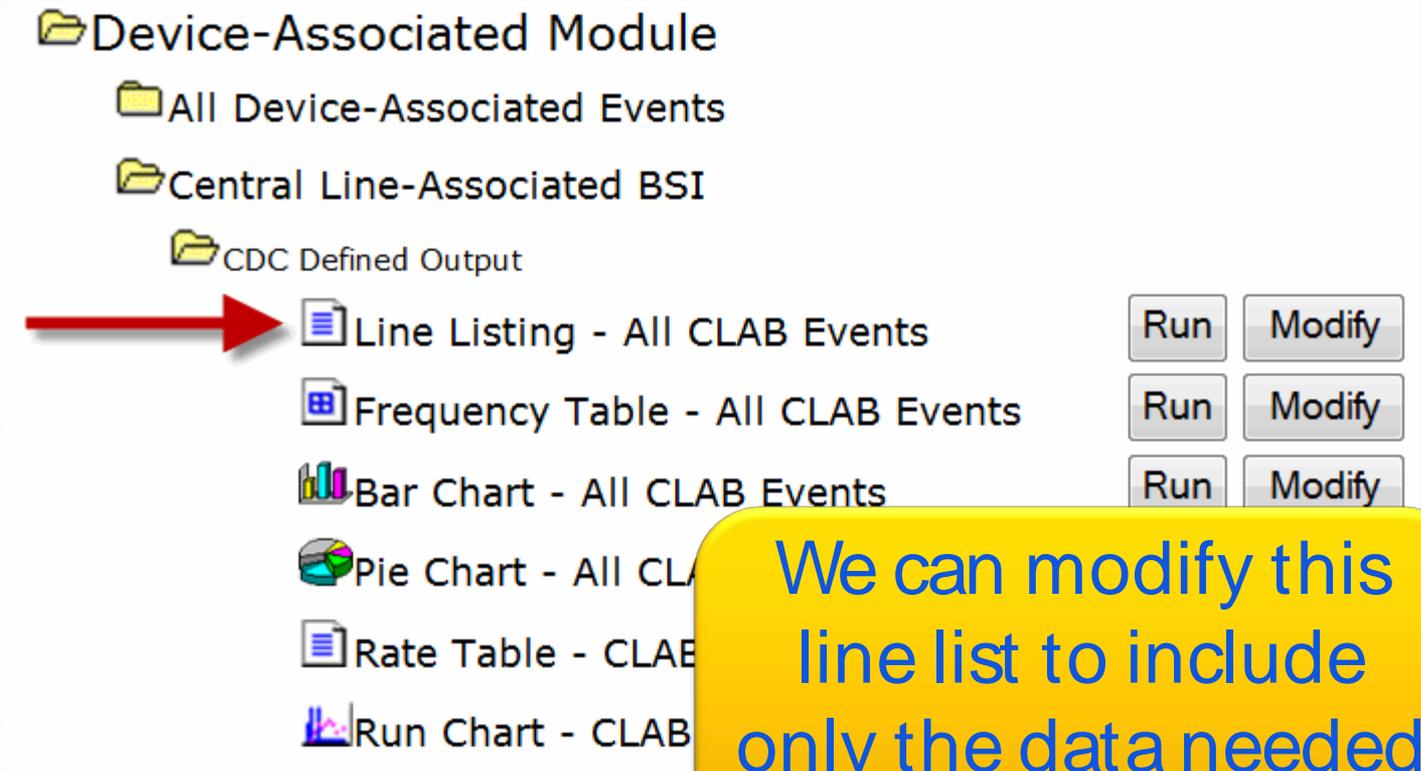
Example #1

Taking it a step further...

- ❑ You may also be interested in obtaining information on which of the MBI-specific criteria were met for each MBI-LCBI
- ❑ You can also add these variables to the line list:
 - cr_mbineutropenia: Neutropenia
 - cr_mbiSCTwDiarr: Allo-SCT with diarrhea
 - cr_mbiSCTwGVHD: Allo-SCT with Grade ≥ 3 GVHD

Example #1

Line Listing – All CLAB Events



The screenshot displays a hierarchical folder structure within a software application:

- Device-Associated Module
 - All Device-Associated Events
 - Central Line-Associated BSI
 - CDC Defined Output
 - Line Listing - All CLAB Events** (highlighted with a red arrow)
 - Frequency Table - All CLAB Events
 - Bar Chart - All CLAB Events
 - Pie Chart - All CLAB Events
 - Rate Table - CLAB Events
 - Run Chart - CLAB Events

Each file in the 'CDC Defined Output' sub-folder has two buttons to its right: 'Run' and 'Modify'.

We can modify this line list to include only the data needed for this example.

Example #1 RESULTS



Event ID	Age on Event Date	Event Date	Days: Admit to Event	Event Type	Location	Location Type	Specific Event	MBI LCBI
319146	23	1/04/2013	4	BSI	HEM	WARD_ONC	LCBI	Y
317081	52	3/13/2013	4	BSI	MICU	CC	LCBI	N
319565	56	4/20/2013	19	BSI	MICU	CC	LCBI	Y
319141	32	7/06/2013	5	BSI	SICU	CC	LCBI	N
319140	8	9/21/2013	9	BSI	22ICU	CC	LCBI	N
319566	34	12/01/2013	12	BSI	MICU	CC	LCBI	Y

- ❑ Numerous variables can be added to a line list – we opted to include only a few of the variables of interest
- ❑ NHSN calculates some variables for you; e.g., Age on event date, days: admit to event

Example #2 CAUTI Rate Table

- It's Annual Report time!
 - You need to compile various annual reports for your infection control committee meeting, including a report of annual CAUTI rates (i.e., one rate for the year) for 4 ICU locations: MSICU, MICU, CT ICU, SICU.
 - You will be expected to compare each location's rates and device utilization ratios to the national data.

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
 - Uses a multiplier for interpretation
 - Also referred to as “IDR”

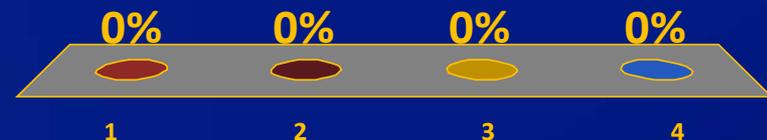
10

Countdown

Question #1 Incidence Density Rates

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

1. Patient days
2. Catheter insertions
3. Patient admissions
4. Catheter days



Question #1

Incidence Density Rates

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

Catheter 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

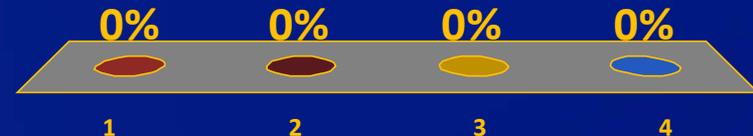
----- x 1000

of urinary catheter days in MICU for the year

Question #2

How are DA rates presented by NHSN?

1. Combined DA rates, by location
2. Overall by facility
-  3. By individual location for each DA event type
4. Overall by location acuity level (e.g., all ICUs combined)



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

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]
 - SIR - In-Plan CAU Data [Run] [Modify]
 - SIR - All CAU Data [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

Other Options:

Group by:

- summaryYH
- summaryYM
- summaryYQ
- summaryYr

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

CAUTI Rates

Location	Year	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	6	3284	1.827	2.9	0.2347	47
SICU	2013	6	2369	2.111	3.2	0.5862	40
MSICU	2013	5	2735	1.828	2.4	0.5507	59
CT ICU	2013	7	2916	2.401	1.8	0.4094	60

- ❑ This table represents partial output from NHSN for the 4 ICUs of interest.

Question #3 MICU CAUTI Rate

Location	Summary Yr	Months	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	12	6	3284	1.827	2.9	0.2347	47

How would you interpret the MICU's CAUTI rate of 1.827?



- 1.8 per 1,000 catheter days
- 1.8%
- 1.8 per 1,000 patient days
- 1.8 times higher than the national

0%

10

Countdown

1 2 3 4

Example #2 MICU CAUTI Rate Table

Location	Summary Yr	Months	CAUTI Count	Urinary Catheter Days	CAUTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	12	6	3284	1.827	2.9	0.2347	47

Our hospital's data

NHSN published data and comparisons

Example #2 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

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

Example #2

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
Medical	
All other	212 (202)
Medical cardiac	211 (207)
Medical/surgical	
Major teaching	146 (145)
Medical/surgical	
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: November 25, 2013 at 1:43 PM

Date Range: CAU_RATESICU_SCA summaryYr 2012 to 2012

Org ID=10000 CDC Location=IN:ACUTE:CC:MS

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	Ca Ut Ra
3 MS	2012	3	0	552	0.000	1.4	0.4550	10	1089	0.5

Source of aggregate data: Am J Infect Control 2013;41:286-300

Data contained in this report were last generated on November 6, 2013 at 7:50 AM.

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/PDFs/sir/RatesSIRs-Reference_Jan2014.pdf

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

Example #2 MICU CAUTI Rate Table

Location	Summary Yr	Months	CAUTI Count	Urinary Catheter Days	CAUTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	12	6	3284	1.827	2.9	0.2347	47

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	Summary Yr	Months	CAUTI Count	Urinary Catheter Days	CAUTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	12	6	3284	1.827	2.9	0.2347	47

- ❑ 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

QUESTION #4

The p-value...

Location	Summary Yr	Months	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	12	6	3284	1.827	2.9	0.2347	47

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

0%

1. Yes, based on the p-value
2. No, based on the p-value
3. Yes, based on practical significance

Why? Because the p-value is >0.05 .

QUESTION #5

Percentile

Location	Summary Yr	Months	CA UTI Count	Urinary Catheter Days	CA UTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile
MICU	2013	12	6	3284	1.827	2.9	0.2347	47

How would you interpret the percentile for the MICU?

- 47% of the medical ICUs contributing to the pooled mean had a rate **equal to** ours.
-  47% of the medical ICUs contributing to the pooled mean had a rate **lower than** our rate.
- 47% of the medical ICUs contributing to the pooled mean had a rate **higher** than ours.

0%

Percentiles

Urinary catheter-associated UTI rate*	Percentile					
	Pooled mean	10%	25%	50% (median)	75%	90%
Type of location						
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					
	Pooled mean	10%	25%	50% (median)	75%	90%
Type of location						
Acute Care Hospitals						
Critical care units						
Burn	4.7	0.0	1.7	4.3	8.1	11.5
Medical	2.9	0.4	1.3	2.3	3.9	5.5
Major teaching						
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 aide in setting goals different than the pooled mean

Device Utilization Ratios

Location	Summary Yr	Months	Urinary Catheter Days	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
MICU	2013	12	3284	4943	0.664	0.70	0.028	29

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

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

Device Utilization Ratios

Location	Summary Yr	Months	Urinary Catheter Days	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
MICU	2013	12	3284	4943	0.664	0.70	0.028	29

- ❑ Similar to DA rates, your location's DU ratio is compared to the NHSN pooled mean
- ❑ A p-value and a percentile are included in the results

10

Countdown

QUESTION #6

The DU Ratio p-value

Location	Summary Yr	Months	Urinary Catheter Days	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
MICU	2013	12	3284	4943	0.664	0.70	0.028	29

How would you interpret these results?

0%



1. The DU ratio in the MICU is significantly different than the NHSN pooled mean based on statistical evidence.

0%

2. The DU ratio in the MICU is not significantly lower than the NHSN pooled mean.

0%

3. Compared to the NHSN pooled mean, we would not consider our DU ratio actionable.

QUESTION #6

The DU Ratio p-value

Location	Summary Yr	Months	Urinary Catheter Days	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
MICU	2013	12	3284	4943	0.664	0.70	0.028	29

How would you interpret these results?

-  The DU ratio in the MICU is significantly different than the NHSN pooled mean based on statistical evidence.

WHY??

The p-value is <0.05

Elements of an interpretation

❑ Cover the basics

- How many HAIs?
- Rate and DU ratio
- 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?
- 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	Summary Yr	CAUTI Count	Urinary Catheter Days	CAUTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
MICU	2013	6	3284	1.827	2.9	0.2347	47	4943	0.664	0.70	0.028	29

- During 2013, there were 6 CAUTIs reported with 3284 urinary catheter days in the MICU.
- This yields a rate of 1.827 CAUTIs per 1,000 urinary catheter days.
- Based on statistical evidence, our rate is no different than the NHSN pooled mean of 2.9.
- Further, this MICU's rate is at the 47th percentile among all medical ICUs contributing to the aggregate data.

CAUTI Rate Example Interpretation

Location	Summary Yr	CAUTI Count	Urinary Catheter Days	CAUTI Rate	NHSN CAU Pooled Mean	Incidence Density p-value	Incidence Density Percentile	Patient Days	Cath Util Ratio	CathDU_Mean	Proportion p-value	Proportion Percentile
MICU	2013	6	3284	1.827	2.9	0.2347	47	4943	0.664	0.70	0.028	29

- During this same time period, there were 4943 patient days reported in the MICU.
- Dividing the number of urinary catheter days by the number of patient days, the DU ratio for the MICU is 0.664.
- Using a cutpoint of $p < 0.05$, the p-value indicates that the DU ratio in this MICU is statistically significantly different from the NHSN pooled mean.
- Further, this MICU's DU ratio is at the 29th percentile among all medical ICUs contributing to the aggregate data, indicating that 29% had a DU ratio at or lower than the MICU'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	Patient Days	Cath Util Ratio	CathDU_ Mean	Proportion p-value	Proportion Percentile
MICU	6	3284	1.827	2.9	0.2347	47	4943	0.664	0.70	0.028	29
SICU	6	2369	2.111	3.2	0.5862	40	4450	0.532	0.76	0.0000	9
MSICU	5	2735	1.828	2.4	0.5507	59	6066	0.451	0.69	0.0000	9
CT ICU	7	2916	2.401	1.8	0.4094	60	6426	0.454	0.67	0.0000	15

- While not statistically significant, there is concern over the high CAUTI rate in the CT ICU and additional investigation may be necessary.
- All DU ratios are significantly lower than the pooled means, based on the p-value, however the MICU is not much lower than the pooled mean.
- Internal comparisons over time would give us additional information on improvement in CAUTI incidence within our facility.

Overall Measure...

You've been asked by your hospital administration to provide a single overall rate for your hospital's CAUTI experience for 2013. What is your response?

A. "Sure! I can provide you with a single rate!"

B. "Ha ha ha ha! You're kidding, right??"



"A single rate would not be risk-adjusted. However, I'm happy to provide an SIR!"

D. Silence. You pause, looking for the nearest exit.

LUNCH BREAK!!!



Example #3

- ❑ Given the continued use of SIRs by federal and state agencies, you have been asked to provide a brief, SIR “refresher training” to your committee.

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:

device days * (NHSN pooled mean/1000)

Where the pooled mean originates from a defined baseline report.

- ❑ CAUTI Baseline: 2009 data (published in 2011)
- ❑ CLABSI Baseline: 2006-2008 data (published in 2009)
- ❑ Baseline data have remained consistent due in part to alignment with the HHS Action Plan to Prevent HAIs.
- ❑ Don't worry...we do have plans at CDC to update the baseline data!

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	infcount	Number Expected	Urinary Catheter Days	NHSN Pooled Mean	SIR	SIRp-value	95% Confidence Interval
MICU	6	7.55	3284	2.3	0.795	0.6074	0.322, 1.653
SICU	6	6.16	2369	2.6	0.974		0.395, 2.026
MSICU	5	6.29	2735	2.3	0.795	0.6484	0.291, 1.762
CTICU	7	4.96	2916	1.7	1.411	0.3612	0.617, 2.792

3284 urinary catheter days in the MICU * (2.3/1000)

= 7.55 expected CAUTIs in the MICU

Calculating the SIR - Overall

Location	infcount	Number Expected	Urinary Catheter Days	NHSN Pooled Mean	SIR	SIRp-value	95% Confidence Interval
MICU	6	7.55	3284	2.3	0.795	0.6074	0.322, 1.653
SICU	6	6.16	2369	2.6	0.974		0.395, 2.026
MSICU	5	6.29	2735	2.3	0.795	0.6484	0.291, 1.762
CTICU	7	4.96	2916	1.7	1.411	0.3612	0.617, 2.792
TOTAL	24	24.96	11304	----	0.962	0.8735	0.630, 1.409

- ❑ 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	infcount	Number Expected	Urinary Catheter Days	NHSN Pooled Mean	SIR	SIR p-value	95% Confidence Interval
MICU	6	7.55	3284	2.3	0.795	0.6074	0.322, 1.653
SICU	6	6.16	2369	2.6	0.974		0.395, 2.026
MSICU	5	6.29	2735	2.3	0.795	0.6484	0.291, 1.762
CTICU	7	4.96	2916	1.7	1.411	0.3612	0.617, 2.792
TOTAL	24	24.96	11304	----	0.962	0.8735	0.630, 1.409

The infection count and number of expected infections are summed.

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

Calculating the SIR - Overall

Location	infcount	Number Expected	Urinary Catheter Days	NHSN Pooled Mean	SIR	SIR p-value	95% Confidence Interval
MICU	6	7.55	3284	2.3	0.795	0.6074	0.322, 1.653
SICU	6	6.16	2369	2.6	0.974		0.395, 2.026
MSICU	5	6.29	2735	2.3	0.795	0.6484	0.291, 1.762
CTICU	7	4.96	2916	1.7	1.411	0.3612	0.617, 2.792
TOTAL	24	24.96	11304	----	0.962	0.8735	0.630, 1.409

The overall SIR is not a sum of the individual SIRs, but rather is calculated by:
Total infection count/ total expected count

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

Interpreting an SIR

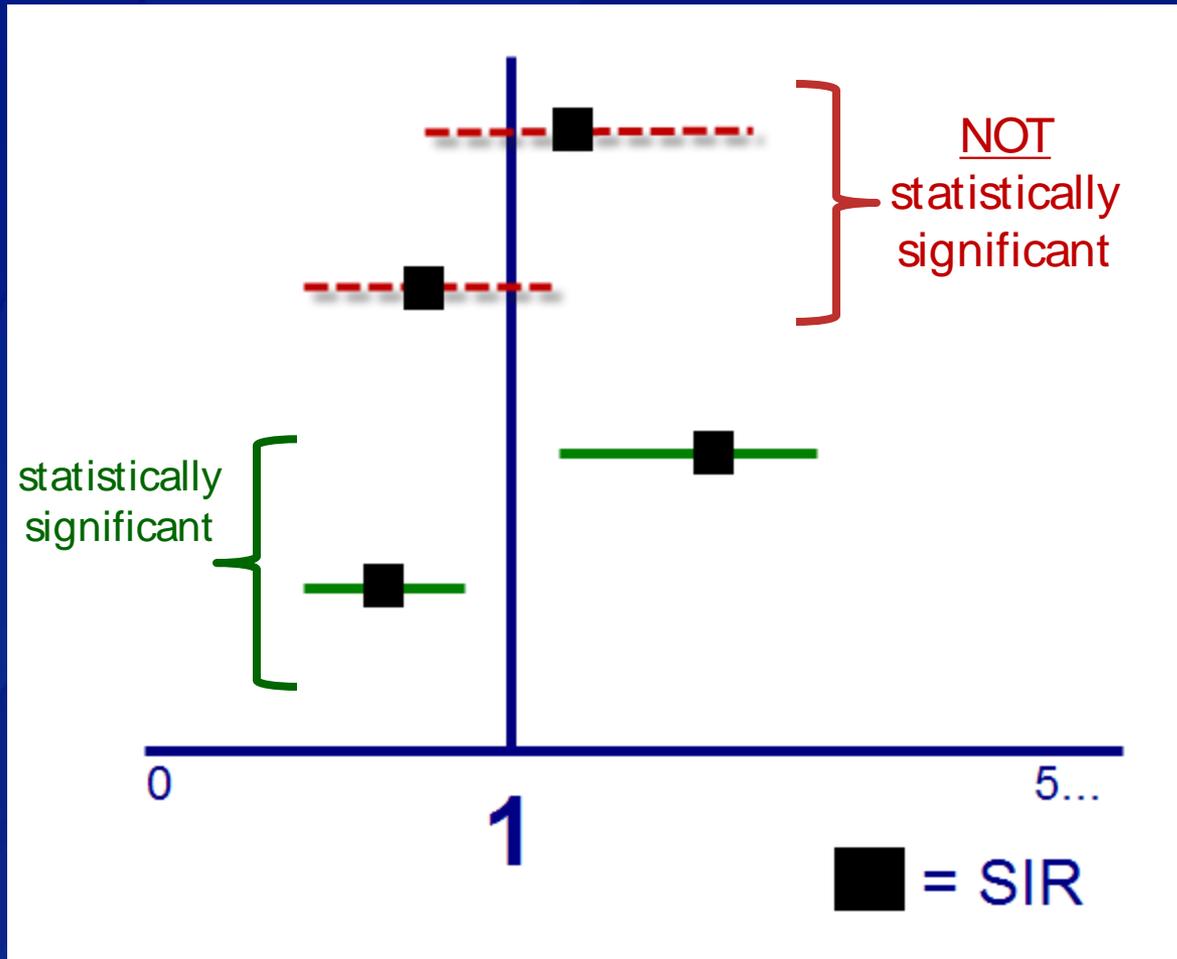
$$\text{SIR} = \frac{\text{Observed \# of HAIs}}{\text{Expected \# of HAIs}}$$

- ❑ 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

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



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

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.

Example #4 CAUTI SIR

- ❑ You received a preview report from your state health department with your hospital's 2013 CAUTI SIR, which is inclusive of the 4 ICUs. You will be discussing this preview report with your committee.
- ❑ Before you present to the committee, you want to understand unit level data from each ICU and how the SIR is being compared to national data.

QUESTION #7

Your Overall CAUTI SIR is 0.962 . How would this be interpreted?

1. Observed more infections than expected
2. Observed a 4% higher rate than the national rate
-  3. Observed fewer infections than expected
4. Observed a 4% lower rate than the national rate

0%

- 1
- 2
- 3
- 4

10

Countdown

QUESTION 7

ANSWER

Your Overall CAUTI SIR is 0.962. How would this be interpreted?

Observed fewer infections than expected

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

SIR > 1: More HAIs observed than expected

SIR < 1: Less HAIs observed than expected

How do our data look in NHSN?

- ❑ NHSN will calculate SIRs for you

The screenshot displays a software interface with a hierarchical folder structure. The top-level folder is 'Device-Associated Module', which is highlighted in yellow. Underneath it are several sub-folders: 'All Device-Associated Events', 'Central Line-Associated BSI', 'Ventilator-Associated PNEU', and 'Ventilator-Associated Events'. Below these is another top-level folder, 'Urinary Catheter-Associated UTI', also highlighted in yellow. Under this folder is a sub-folder 'CDC Defined Output'. Inside 'CDC Defined Output', there is a list of data visualization options, each with a small icon and a 'Run' and 'Modify' button to its right. The options are: 'Line Listing - All CAU Events', 'Frequency Table - All CAU Events', 'Bar Chart - All CAU Events', 'Pie Chart - All CAU Events', 'Rate Table - CAU Data for ICU-Other/SCA/ONC', 'Run Chart - CAU Data for ICU-Other/SCA/ONC', 'Rate Table - CAU Data for NICU', 'Run Chart - CAU Data for NICU', 'SIR - In-Plan CAU Data', and 'SIR - All CAU Data'. The 'SIR - All CAU Data' item is highlighted in yellow.

Item	Run	Modify
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
SIR - In-Plan CAU Data	Run	Modify
SIR - All CAU Data	Run	Modify

CAUTI SIR for ICUs – 2013 Overall

National Healthcare Safety Network

SIR for All Catheter-Associated UTI Data - By OrgID

As of: February 24, 2014 at 12:11 PM

Date Range: CAU_RATESICU_SCAsummaryYr 2013 to 2013

if(((location IN ("71ICU", "MICU", "MSICU", "SICU"))))

Org ID=10018 CMS Certification Number=N/A

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

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.

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

Data contained in this report were last generated on February 21, 2014 at 10:39 AM.

CAUTI SIRs for ICUs – 2013

Overall Interpretation

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

- ❑ During this time period, we identified 24 CAUTIs in 11,304 urinary catheter days.
- ❑ Based on national baseline data, 24.960 CAUTIs were expected/predicted.
- ❑ Dividing the number of CAUTIs identified (24) by the number expected (24.960), we get an SIR of 0.962, indicating that we observed approx. 4% fewer infections than expected.

Review

What are the chances...?

- ❑ This probability is called the p-value
- ❑ If the p-value is very small (less than 1 in 20 or 5% or 0.05; hence $p < 0.05$):
 - Conclude that the number of CAUTIs observed is “significantly different” than what was expected/predicted
 - OTHERWISE (i.e., if $p > 0.05$) conclude that the number of CLABSIs observed is no different than what was expected/predicted.
- ❑ 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 the SIR

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

- ❑ 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

QUESTION #8

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

Based on the p-value, is the number of observed infections statistically significantly different from the number expected?

1. Yes



No

3. Not sure

10

Countdown

0%

0%

0%

1

2

3

QUESTION #8

ANSWER

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

Based on the **p-value**, is the number of observed infections statistically significantly different from the number expected?

B. No

The p-value is >0.05 .

QUESTION #9

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

Based on the **95% Confidence Interval**, is the number of observed infections statistically significantly different from the number expected?

1. Yes
2. No
3. Not sure

10

Countdown



QUESTION #9

ANSWER

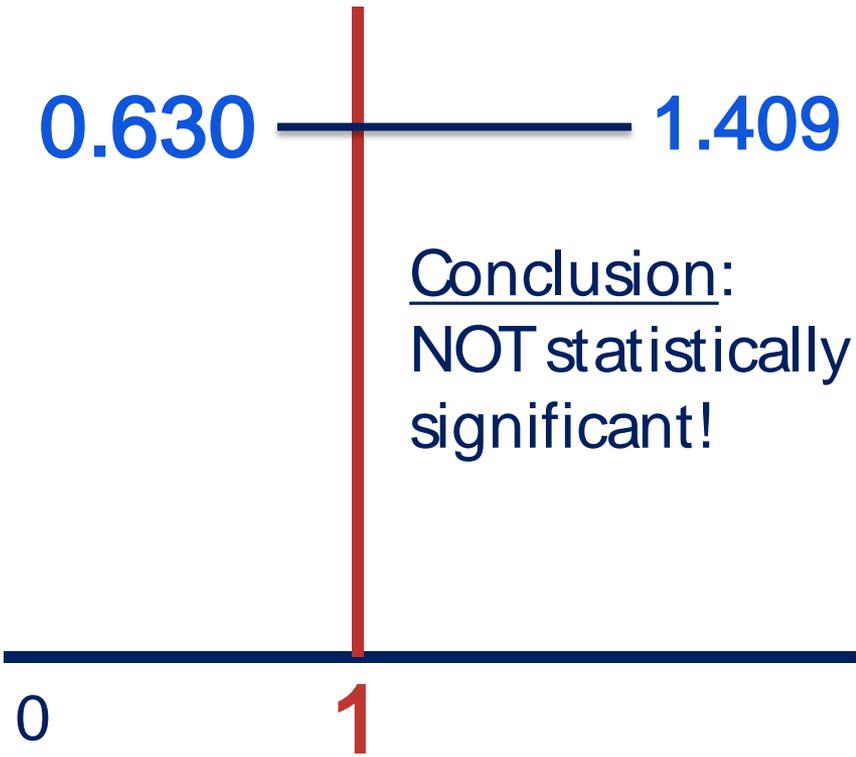
Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

Based on the **95% Confidence Interval**, is the number of observed infections statistically significantly different from the number expected?

B. No

The 95% CI crosses over the boundary of 1.

95% Confidence Interval



0.630 ————— 1.409

Conclusion:
NOT statistically
significant!

0

1

CAUTI SIRs for ICUs – 2013

Overall Interpretation

Org ID	Summary Yr	infCount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	2013	24	24.960	11304	0.962	0.8735	0.630, 1.409

- ❑ During this time period, we identified 24 CAUTIs in 11,304 urinary catheter days.
- ❑ Based on national baseline data, 24.960 CAUTIs were expected/predicted.
- ❑ Dividing the number of CAUTIs identified (24) by the number expected (24.960), we get an SIR of 0.962, indicating that we observed approx. 4% fewer infections than expected.
- ❑ Based on statistical evidence, we can conclude that our SIR is no different than 1

Notes on Interpreting an SIR

- ❑ 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...*

Notes for our meeting...

- The CAUTI SIR for the ICUs for calendar year 2013 indicates that we observed about 4% fewer infections than what would be predicted for our facility and our experience is no different than the national baseline, based on statistical evidence.

CAUTI SIR for ICUs –2013 By Location

Org ID	Location	Summary Yr	Months	infcount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	CTICU	2013	12	7	4.957	2916	1.412	0.3605	0.618, 2.793
10018	MICU	2013	12	6	7.553	3284	0.794	0.6066	0.322, 1.652
10018	MSICU	2013	11	5	6.291	2735	0.795	0.6483	0.291, 1.762
10018	SICU	2013	12	6	6.159	2369	0.974	1.0000	0.395, 2.026

- ❑ CAUTI SIRs by Location allow you to assess contributions to the overall SIR for each time period.
- ❑ This table also allows you to determine if there are any months or locations missing from the overall SIR.

QUESTION #10

Based on the information in this table, which location's data are you most concerned about?



1. CTICU
2. MICU
3. MSICU
4. SICU

0%

0%

0%

0%

1

2

3

4

Org ID	Location	Summary Yr	Months	infcount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	CTICU	2013	12	7	4.957	2916	1.412	0.3605	0.618, 2.793
10018	MICU	2013	12	6	7.553	3284	0.794	0.6066	0.322, 1.652
10018	MSICU	2013	11	5	6.291	2735	0.795	0.6483	0.291, 1.762
10018	SICU	2013	12	6	6.159	2369	0.974	1.0000	0.395, 2.026

QUESTION #10 ANSWER

- ❑ Based on the information in this table, which location's data are you most concerned about

CTICU

- ❑ But WHY?

- *While both the p-value and 95% CI indicate that the CTICU's SIR is no different than 1, this location happens to have the highest SIR – which happens to be > 1.*

Org ID	Location	Summary Yr	Months	infcount	Number Expected	Urinary Catheter Days	SIR	SIR p-value	95% Confidence Interval
10018	CTICU	2013	12	7	4.957	2916	1.412	0.3605	0.618, 2.793
10018	MICU	2013	12	6	7.553	3284	0.794	0.6066	0.322, 1.652
10018	MSICU	2013	11	5	6.291	2735	0.795	0.6483	0.291, 1.762
10018	SICU	2013	12	6	6.159	2369	0.974	1.0000	0.395, 2.026

Notes for our meeting...

- ❑ The CAUTI SIR for the ICUs for calendar year 2013 indicates that we observed about 4% fewer infections than what would be predicted for our facility and our experience is no different than the national baseline, based on statistical evidence.
- ❑ We looked at the CAUTI SIRs for each ICU for the same time period and noticed that all ICUs had SIRs < 1 , except for the CTICU; this location observed approx. 40% more infections than predicted.

SIRs for CLABSI

- ❑ The CLABSI SIR is calculated using the same methodology described for CAUTI
- ❑ There are options to run an SIR using either In-Plan CLABSI Data or ALL CLABSI Data

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

