

NHSN For Beginners Optional Session

2018 CSTE Conference

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Outline

- History and purpose of NHSN
- Creating a “Group” and accessing data
- Analyzing HAI data; data quality checks
- Understanding how to measure HAIs: rates, SIRs, and statistics
- How does CDC use these data?
- FAQs

Interactive Session

- Who has used or logged in to NHSN before?
 - Anyone with more than 6 months of experience with NHSN?
 - Exported and analyzed NHSN data?
 - Familiar with SAS?
-
- Feel free to ask questions at any time!

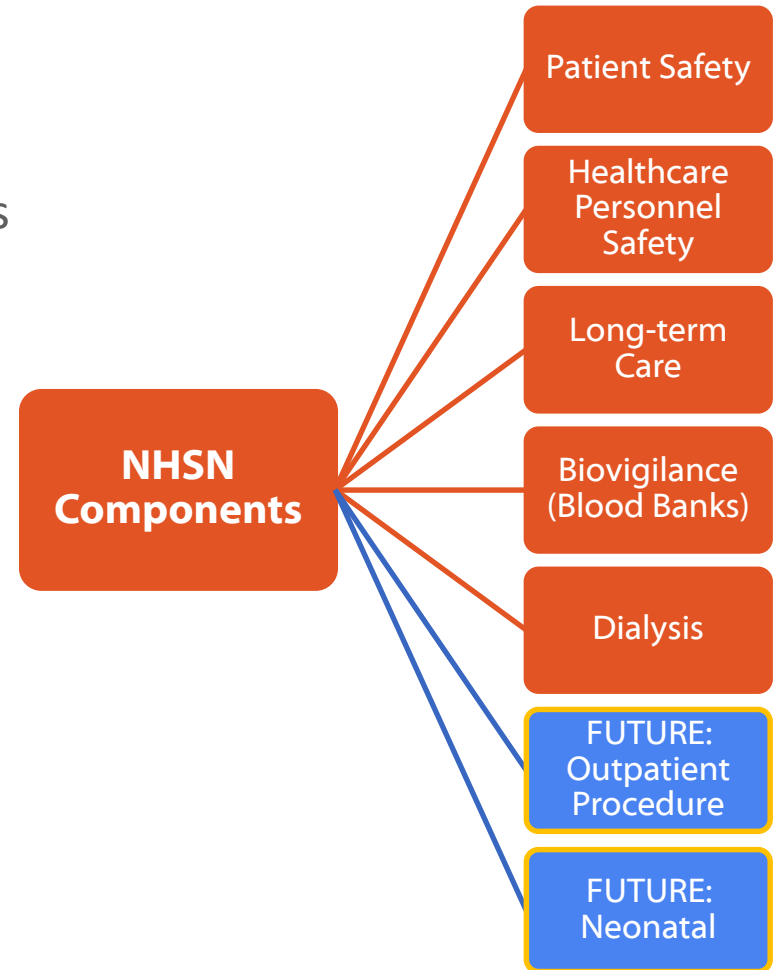
NHSN Initial Launch

- 2005: NHSN was launched as a voluntary, confidential, secure, Internet-based surveillance system that integrated 3 surveillance systems previously managed separately at CDC

NNIS	National Nosocomial Infections Surveillance System
NaSH	National Surveillance System for Healthcare Workers
DSN	Dialysis Surveillance Network

NHSN: All Grown Up!

- Nation's largest tracking system for HAIs
 - Over 24,000 healthcare facilities
 - All U.S. states and most territories
 - State and federal reporting requirements
- Covers a range of facilities and reportable conditions
 - Dialysis facilities, Military/VA hospitals, Nursing Homes, etc.

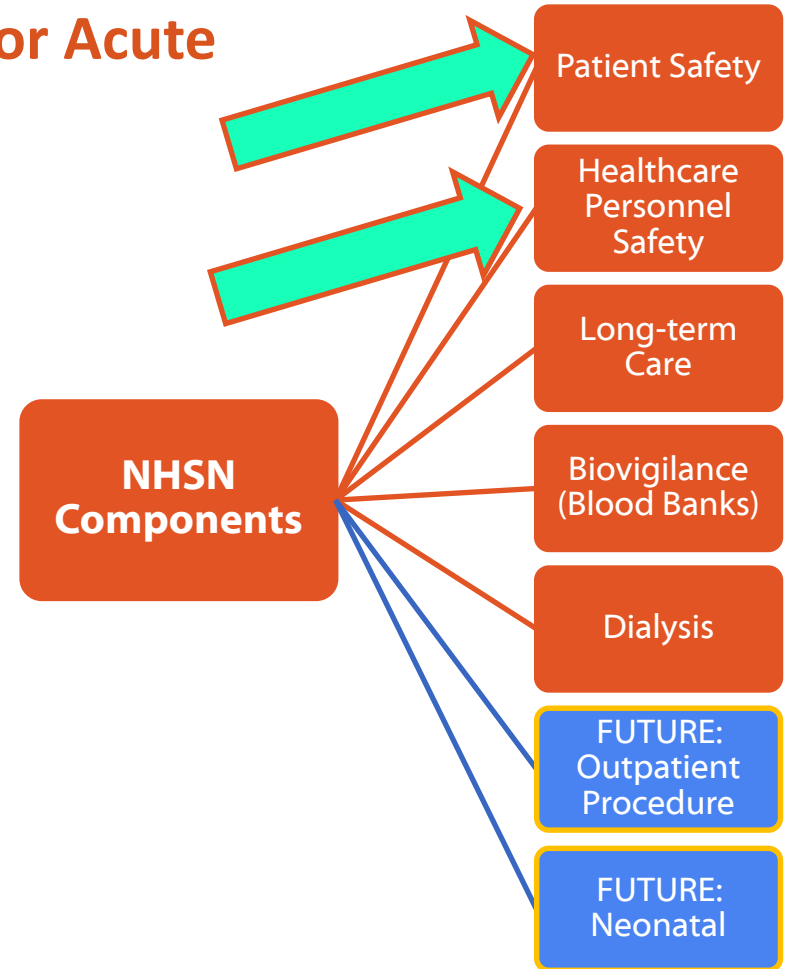


Purposes of NHSN

- Estimate the magnitude of HAIs in the USA
- Provide risk-adjusted data that can be used for inter-hospital comparisons and local quality improvement activities
 - Establish a baseline to detect new or increasing infections (e.g., outbreaks)
- Conduct and report trend analyses
- Assist hospitals in developing surveillance and analysis methods
- Conduct collaborative research studies with member hospitals
- Provide data to the Centers for Medicare & Medicaid (CMS) on behalf of participating hospitals for federal Quality Reporting Programs

Today's Focus: CMS-required HAIs for Acute Care Hospitals

- CLABSI
- CAUTI
- SSI following colon surgery or abdominal hysterectomy
- MRSA Bacteremia
- *C.difficile*
- % of healthcare workers receiving flu vaccine (HPS Component)



Accessing Data from NHSN

- State health departments may access HAI data from NHSN
 - Legislative mandate
 - State policy, project, or other voluntary data sharing initiative
 - Enter into a “Data Use Agreement” (DUA) with CDC
- Step 1: Forming a “Group” in NHSN
 - Each hospital in your jurisdiction will join your Group and provide approvals to share data with the Group
 - Most state health departments already have an established Group

Guide to creating a Group: <https://www.cdc.gov/nhsn/pdfs/groups-startup/CreateGroup-current.pdf>

What Data Will The Group Receive?

- It depends what data you ask for! (or have the legal authority to collect)
 - When forming a Group, the Group Administrator will complete a “Define Rights Template”
 - Specify the types of infections and other data elements
 - Request data from specific units (e.g., ICUs)
 - Define the time period of data you wish to receive
 - Each hospital will review & accept your template
 - In some situations, hospitals can decide to “opt out” of certain elements from the template
 - New group users are encouraged to review a copy of their template

Define Rights Template

Infections and other Events (Not specific to MDRO/CDI)
Includes Applicable Denominators and "No Events" Indicators

Plan	Month	Year	Month	Year	Event
 In ▾	January ▾	2015 ▾	To ▾	▾	BSI - Bloodstream Infection (CLA) ▾
Select in-plan, off-plan or both.		Location type: (ALL) ▾	Location: (ALL) ▾		Other Location Required: ▾
Add Row		Clear All Rows			

ALL SSI and PPP

ALL non-SSI and PPP

BSI - Bloodstream Infection (CLA)

CLIP - Central Line Insertion Practices

PNEU - Pneumonia (Vent)

PNEU - Pneumonia (Post Procedure)

SSI - Surgical Site Infection

UTI - Urinary Tract Infection (Cath)

VAE - Ventilator-Associated Event

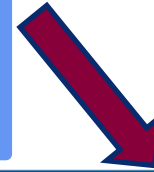
Years of data selection is optional.

You can select ALL location types and ALL locations. You can also select individual location types and locations. For individual location type/location, please add additional rows per each location type/location

Select Event types for DA individually or select ALL non-SSI and PPP to request for All DA events

Home Page of NHSN

- Your user name
- Your Group's name
- Log Out



NHSN - National Healthcare Safety Network (apt-v-nhsn-test:8001)



LINDSEY
Lindsey's test group

NHSN Home

Reporting Plan ▶

Event ▶

Procedure ▶

Summary Data ▶

Surveys ▶

Analysis ▶

Users ▶

Group ▶

Tools ▶

Logout



NHSN Patient Safety Component Home Page

Assurance of Confidentiality: The voluntarily provided information will not otherwise be disclosed or released without the consent of the

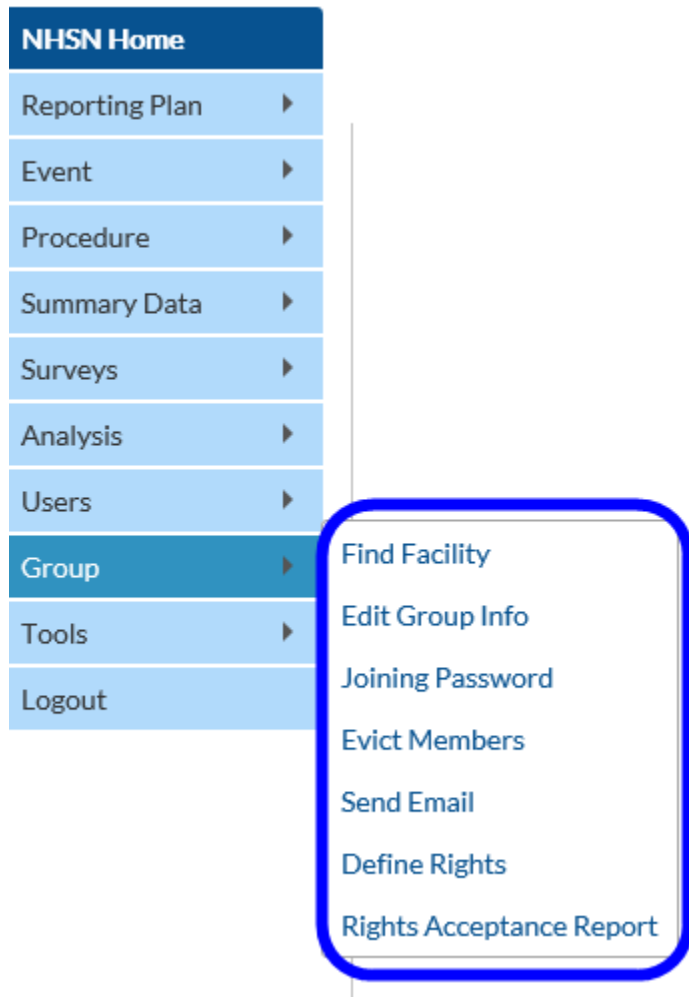


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- You are logged into the Patient Safety Component
- You will only be able to analyze PS data
- *No access to healthcare worker flu data in the PS Component*

ual or
he Put

- NHSN Navigation Menu
- May vary depending on your user rights



“Group” Menu Option

- “Send Email”: allows you to draft and send an email to your member facilities
 - Select which facilities will receive the email
- “Define Rights”: will show you the Define Rights template
- “Rights Acceptance Report”: which facilities have accepted your template, and when they accepted it

Rights Acceptance Report

- Which facilities have accepted our Rights template?
- Which facilities were invited to join our Group, but have not accepted our Rights template?
- When did a certain facility accept our Rights template?

Page 1 of 1 10 View 1 - 5 of 5				
Facility name	Facility ID	Accepted Date	Defined Date	Status
DHQP Memorial Annex	10401	Mar 19 2018 12:34PM	Mar 9 2017 10:08AM	Accepted
Rice Medical Center	10451	Dec 8 2016 10:10AM	Mar 9 2017 10:08AM	Not Accepted
Lovelace Rehabilitation Hospital	10957	Sep 19 2017 12:56PM	Mar 9 2017 10:08AM	Accepted
HURT Critical Access Hospital	11127	Apr 16 2018 7:55AM	Mar 9 2017 10:08AM	Accepted
Dana-Farber Cancer Institute	11305	Mar 26 2018 8:22AM	Mar 9 2017 10:08AM	Accepted
Page 1 of 1 10 View 1 - 5 of 5				

So Far...

- ✓ Which facilities are in our Group
- ✓ Which facilities have accepted our Rights Template
- ✓ Which infection types and data elements are available

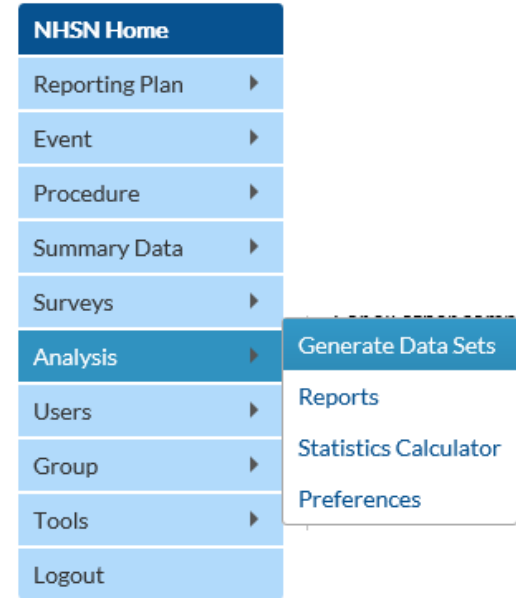
Any Questions?

Why Analyze Data?

- Facilitate data quality and accuracy checks for your facilities (especially prior to a CMS deadline)
- Inform, prioritize, and target specific infections or facilities for prevention activities
- Provide facilities with regular progress checks and/or publish state reports
- Ensuring accurate data helps ensure accuracy of national and state benchmarks
- Take ownership, let your state's data tell a story about prevention

Step 1 – Generate Analysis Datasets

- Generating datasets is the first step to performing analysis in NHSN
 - Organizes data into defined sets for analysis
 - Copies and **freezes** data from member facilities
- Each user has his/her own analysis datasets
- May take several minutes or hours to complete this process
- You may navigate or leave NHSN while datasets are generating





Generate Data Sets

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 within the parameters of rights conferred.



Generate New

Last Generated: Apr 18 2018 9:32AM

Report Types

- Various output options available for each event type:
 - Line lists
 - Frequency tables
 - Bar/Pie charts
 - Run charts – select HAIs
 - Rate tables
 - SIR and SUR tables
- Each can be modified to meet your analytic needs
- Data can also be exported for further manipulation outside of NHSN

The screenshot displays the NHSN Home interface. On the left is a vertical navigation menu with the following items: NHSN Home, Reporting Plan, Event, Procedure, Summary Data, Surveys, Analysis (highlighted), Users, Group, Tools, and Logout. The main content area shows a hierarchical tree of data modules. At the top are buttons for 'Expand All', 'Collapse All', and a 'Search' box. The tree structure is as follows:

- Device-Associated (DA) Module
 - Procedure-Associated (PA) Module
 - Device-Associated (DA) Module
 - Central Line-Associated BSI
 - Line Listing - All CLAB Events (highlighted)
 - Run Report
 - Modify Report
 - Export Data Set
 - Run Chart - CLAB Data for ICU-Other
 - Rate Table - CLAB Data for NICU
 - Run Chart - CLAB Data for NICU
 - Rate Table - CLAB Data for SCA/ONC
 - Run Chart - CLAB Data for SCA/ONC

- Navigate to the infection/facility type of interest
- Click “Run” on any report to include ALL data
- Click “Modify” to select custom parameters
- Click “Export” to view data in Excel, CSV, SAS, etc.

CLABSI Line List Example

orgID	patID	dob	gender	admitDate	eventID	eventDate	eventType	spcEvent	location
10401	020202CG	02/02/1920	M	11/06/2015	54437	11/10/2015	BSI	LCBI	3N
10401	1004	04/01/1965	F	11/01/2017	68170	11/15/2017	BSI	LCBI	ONC ICU
10401	123	04/23/1990	M	11/04/2017	68157	11/07/2017	BSI	LCBI	LEUK
10401	1234	12/12/2007	M	10/31/2017	68163	11/02/2017	BSI	LCBI	HEME
10401	124	01/01/2001	F	10/31/2017	68164	11/02/2017	BSI	LCBI	HEME
10401	6587	05/12/1908	M	01/14/2015	56713	01/19/2015	BSI	LCBI	ICU
10401	TEST9999	10/17/1974	F	09/30/2015	55378	10/02/2015	BSI	LCBI	ICU
10957	3221	07/02/1984	F	01/02/2016	61465	01/13/2016	BSI	LCBI	SDR1
11127	LA	12/15/2015	F	12/05/2016	68043	12/08/2016	BSI	LCBI	CC_N
11305	1	04/12/1999	M	03/01/2016	58071	03/15/2016	BSI	LCBI	ONC_GH
11305	TEST123	02/02/1990	M	01/03/2018	68976	01/05/2018	BSI	LCBI	ONC_GH

- Review event-level details of each CLABSI
- Use the modify screen to create separate line lists for each facility, if desired
- <https://www.cdc.gov/nhsn/ps-analysis-resources/reference-guides.html>

CLABSI Frequency Table

- Counts/percentages of events meeting different criteria
 - What percentage of CLABSIs in our state occurred in a neonatal ICU location?
 - CC_N = neonatal critical care
 - 1 event in the NICU (9.09%)
- What percentage of CLABSIs were reported from each hospital?
 - Modify the “Row” variable using the Modify Screen

Frequency Percent Row Pct Col Pct		
Table of locationType by spcEvent		
locationType	spcEvent	
	LCBI	Total
CC	3	3
	27.27	27.27
	100.00	
	27.27	
CC_N	1	1
	9.09	9.09
	100.00	
	9.09	
CC_ONC	1	1
	9.09	9.09
	100.00	
	9.09	
IRF	1	1
	9.09	9.09
	100.00	
	9.09	
WARD_ONC	5	5
	45.45	45.45
	100.00	
	45.45	
Total	11	11
	100.00	100.00

Any Questions?

Measuring HAIs

- NHSN has several metrics for measuring HAIs and/or comparing against a benchmark
 - Infection Rates
 - SIR – standardized infection ratio (incidence of all infection types)
 - SUR – standardized utilization ratio (device use)
 - SAAR – standardized antimicrobial administration ratio (AUR Module)

Rates in NHSN

$$\text{Infection rate} = \frac{\text{Observed \# of HAIs}}{\text{Exposure}}$$

$$\text{e.g.: } \frac{\text{\# of CLABSI events}}{\text{\# of Central Line Days}}$$

- Advantages of rates:
 - Adjusted for exposure – better than # of events
 - Intuitive and simple to understand - may be useful when communicating with hospital or tracking individual unit

Question: “So, what’s the problem with just using rates?”

- Facilities (and locations) have a range of **risk factors** that impact what we **expect** the rate to be
- Rates are not risk adjusted for these factors; cannot compare between facilities with different risk factors
 - It is “not fair” to use rates to compare facilities
 - Not recommended for publication or comparison between facilities

SIR: NHSN's Risk Adjusted Metric

- Standardized Infection ratio (SIR)

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

- Observed # of HAIs: the number of infections that a hospital identifies and enters into NHSN
- Predicted # of HAIs: number of infections that would be “expected” based on previous years of reported data (national baseline)
 - Calculation of the predicted # of HAIs differs depending on the measure

Example A: less events than expected

$$\text{SIR} = \frac{4}{8} = 0.50$$

50% fewer infections than expected - **this is good!**

Example B: more events than expected

$$\text{SIR} = \frac{10}{8} = 1.25$$

25% more infections than expected – **sign of issues?**

Why use the SIR?

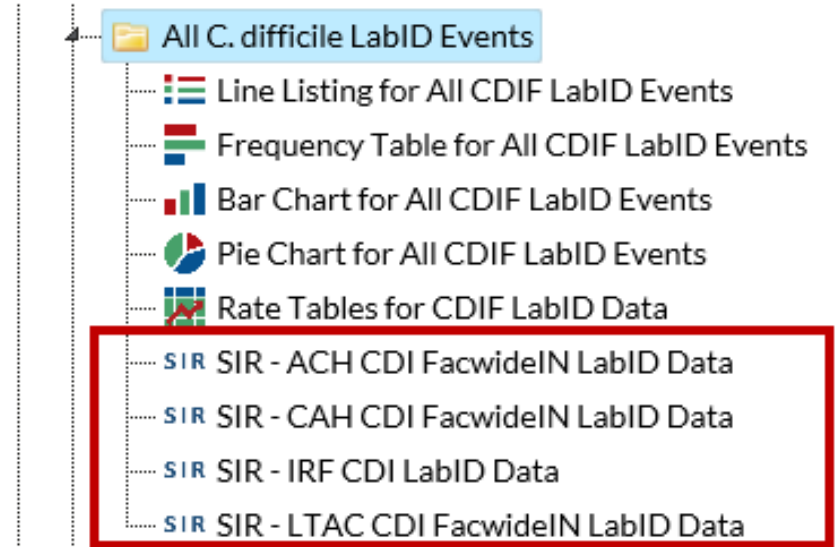
- SIR is used to track prevention progress over time
 - Prediction calibrated to a baseline that is kept constant over time to measure progress and align with federal government action plans
- Accounts for differences in incidence of HAI between facilities/groups
 - Referred to as “risk-adjustment”
- Used in public reporting by CDC (at state and national levels) and CMS (at facility level on hospital compare)
- Can be calculated at the facility level, directly in NHSN
 - Includes p-values and 95% confidence Interval to determine statistical significance
 - Can be summarized to the state, regional or national level

How we calculate predicted # of events

- Expected number of events is a prediction from a statistical model
 - All models were updated using data from 2015
 - Different models were built for each measure based on facility characteristics that explained variation in the 2015 data
- Each HAI has its own model and characteristics; e.g.:
 - CLABSI and CAUTI: Calculated by individual location; locations are pooled to get facility SIR
 - SSI: each procedure has own model
 - MRSA Bacteremia and CDI: facility-wide level hospital-onset LabID events
 - Separate models exist for types of facility (ACH, CAH, LTACH, IRF)

Different SIR Reports in NHSN, for Each Facility Type

- ACH: acute care hospitals
 - CAH: critical access hospitals
 - IRF: inpatient rehab facility
 - LTAC: long term acute care hospitals
-
- Hint! Understand which facility types are covered by your state mandate and/or are included in your NHSN Group.



SIRs, Confidence Intervals and p-values

Example
from NHSN:

orgID	summaryYQ	infCount	numPred	numclays	SIR	SIR_pval	sir95ci
10018	2015Q1	5	2.365	1850	2.114	0.1251	0.775, 4.686

P-value for SIR [SIR_pval]

- The p-value tests the null hypothesis that the SIR is not statistically significantly different from some target
 - E.g.: target value of 1 tests that the facility reported (statistically) the same number of events as was expected
 - If p-value < 0.05, usually reject null hypothesis

P-values and CIs can be obtained several ways:

1. Directly from application
2. Using NHSN calculator
3. Using SAS Macros provided by CDC

Confidence interval for SIR [sir95ci]

- 95% CI Defn: “we are 95% certain that the CI contains the true value”
 - If CI contains 1, then often indicates that p-value will not be < 0.05

Need more details, see NHSN’s SIR Guide: <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>

Where to get help with SIRs?

<https://www.cdc.gov/nhsn/ps-analysis-resources/>

Keys to Success with NHSN Data

Let's talk p-value.
As far as the SIR goes...

The p-value is a statistical measure that tells us whether the number of observed infections is statistically significantly different than the number of predicted infections (i.e., whether the SIR is significantly different from 1.0).

If the p-value ≤ 0.05 , we can conclude that the number of observed infections is statistically significantly different than the number of predicted infections.

If the p-value > 0.05 , we conclude that the number of observed infections is not statistically significantly different than the number of predicted infections.

Presenting – wait for it – the Standardized Infection Ratio (SIR)!

$$SIR = \frac{\text{Observed (O) HAIs}}{\text{Predicted (P) HAIs}}$$

If the SIR > 1.0 , then more HAIs were observed than predicted, based on the 2015 national aggregate data.

If the SIR < 1.0 , then fewer HAIs were observed than predicted, based on the 2015 national aggregate data.

If the SIR = 1.0, then the same number of HAIs were observed as predicted, based on the 2015 national aggregate data.

Analysis Reports:
Baseline Set 1 **PS** Baseline Set 2

- Device-Associated (DA) Module
- Procedure-Associated (PA) Module
- HA Antimicrobial Resistance (HA-AMR) Module
- Antibiotic Use and Resistance Module
- MDRO/CDI Module – LABID Event Reporting
- MDRO/CDI Module – Infection Surveillance
- MDRO/CDI Module – Process Measures
- MDRO/CDI Module – Outcome Measures

Remember

And how about that 95% Confidence Interval (CI)?

The 95% CI is a statistical range of values for which we have a high degree of confidence that the true SIR lies within that range.

If the CI does not include 1, then the SIR is significantly different than 1 (i.e., the number of observed infections is significantly different than the number predicted).

Example: 95% CI = (0.85, 0.92)

If the CI includes the value of 1, then the SIR is not significantly different than 1 (i.e., the number of observed infections is not significantly different than the number predicted).

Example: 95% CI = (0.85, 1.24)

If the SIR is 0.000 (i.e., the infection count is 0 and the number of predicted infections is ≥ 1), the lower bound of the 95% CI will not be calculated.

The SIR will not be calculated if the number of predicted infections is less than 1.0.

This rule was instituted to avoid the calculation and interpretation of statistically impressive SIRs, which typically have extreme values.

Name that Baseline!

Original models:
Data from December 31, 2016 and earlier

2015 Rebaseline models:
Data from January 1, 2017 and forward

*Note: both original and 2015 baseline models are available for Jan 1, 2015 – Dec 31, 2016 data

A Guide to the SIR

Updated March 2018. Please see [Page 2](#).



Centers for Disease Control and Prevention
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SEARCH



CDC A-Z INDEX ▾

National Healthcare Safety Network (NHSN)

NHSN

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Annual Reports

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Newsletters

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Data Validation Guidance

HIPAA Privacy Rule



Get Email Updates

CDC > NHSN

Patient Safety Analysis Resources



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

Analysis Resources

> Guides and Training

> NHSN Codes and Variables

> Statistical Tools

> NHSN Data

> Demo Application

Spotlight

New! NHSN HAI Reports

New! Sneak Peek at Upcoming NHSN HAI Publications [PDF - 1 MB]

This presentation provides important information on upcoming national and state HAI data reports that are scheduled to be released by the Division of Healthcare Quality Promotion in early 2018.

New! NHSN's Guide to the SUR (updated January 2018) [PDF - 1 MB]

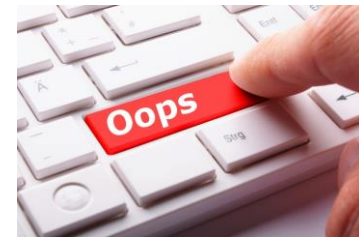
A comprehensive guide to the NHSN's SUR, including significant factors used in the SUR calculations under the 2015 baseline.

New! NHSN's Guide to the SIR (updated March 2018) [PDF - 3M]

A comprehensive guide to NHSN's SIR, including risk factors used in the SIR calculations under the

Any Questions?

Before Analyzing SIRs....



- SIRs are a useful metric to measure HAI incidence in your state, and among individual hospitals
- Be careful! We recommend assessing the quality/accuracy of data BEFORE running SIR reports
 - Inaccurate data entry by facilities will lead to inaccurate SIRs
- NHSN has identified common data entry errors that state health departments can identify & help resolve prior to analysis

Incorrect data
entry into NHSN



Inaccurate
benchmarks

Regular Data Quality Checks

- CLABSI/CAUTI:
 - Review patient days and device days for missings, zeroes, implausible values

sumyear	loccdc	bsiplan	utiplan	locbeds	numpatdays	numcldays	numucathda	noeventcl	Pdays
2017	IN:ACUTE:WARD:Y	Y	Y	16	0	0	0	Y	480
2017	IN:ACUTE:WARD:Y	Y	Y	16	0	0	0	Y	480
2017	IN:ACUTE:WARD:Y	Y	Y	16	0	0	0	Y	480
2017	IN:ACUTE:WARD:Y	Y	Y	27	0	0	0	Y	810
2017	IN:ACUTE:WARD:Y	Y	Y	27	0	0	0	Y	810
2017	IN:ACUTE:WARD:Y	Y	Y	27	0	0	0	Y	810
2017	IN:ACUTE:WARD:Y	Y	Y	11	0	0	0	Y	330
2017	IN:ACUTE:WARD:Y	Y	Y	11	0	0	0	Y	330
2017	IN:ACUTE:CC:C	Y	Y	13	0	0	0	Y	390
2017	IN:ACUTE:CC:C	Y	Y	13	0	0	0	Y	390
2017	IN:ACUTE:WARD:Y	Y	Y	23	0	0	0	Y	690
2017	IN:ACUTE:WARD:Y	Y	Y	20	0	0	0	Y	600
2017	IN:ACUTE:WARD:Y	Y	Y	12	0	0	0	Y	360
2017	IN:ACUTE:WARD:Y	Y	Y	12	0	0	0	Y	360

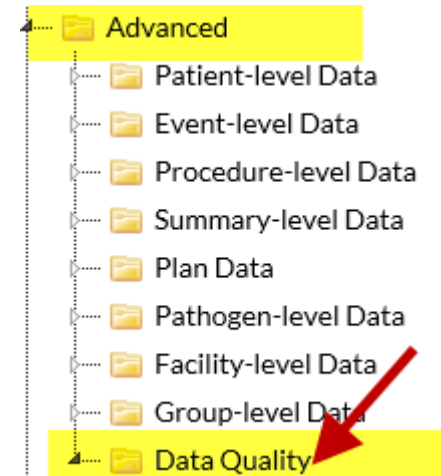
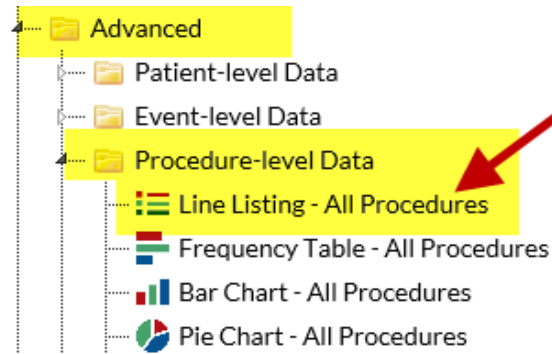
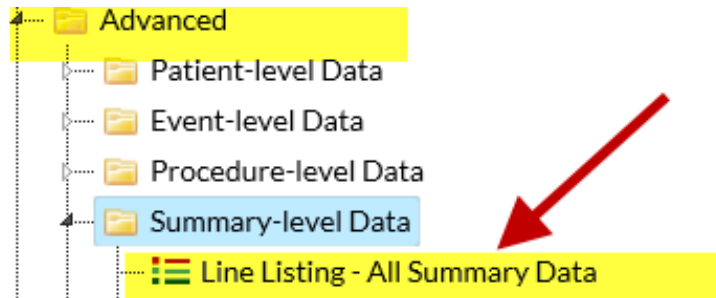
Regular Data Quality Checks

- Surgical Site Infection Data
 - Consider reviewing BMI
 - BMI is a risk factor used in the calculation of the SIR
 - NHSN found almost 11,500 records in which patient's height or weight was entered inaccurately

	Records
BMI_val less than 12	2130
Greater than 65 but less than 100	4002
Greater or equal to 100 but less than 200	1250
Greater or equal to 200 but less than 1000	2063
Greater or equal to 1000	2063

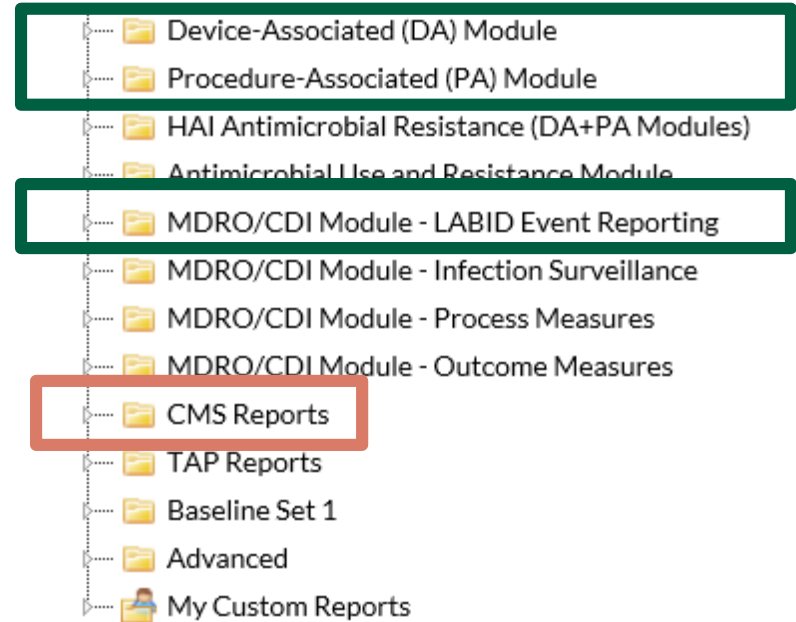
How Do I Run Data Quality Checks?

- Use the Summary (Denominator) Data Line List
- Use the Procedure Line List
- Use pre-defined reports found in the “Data Quality” folder



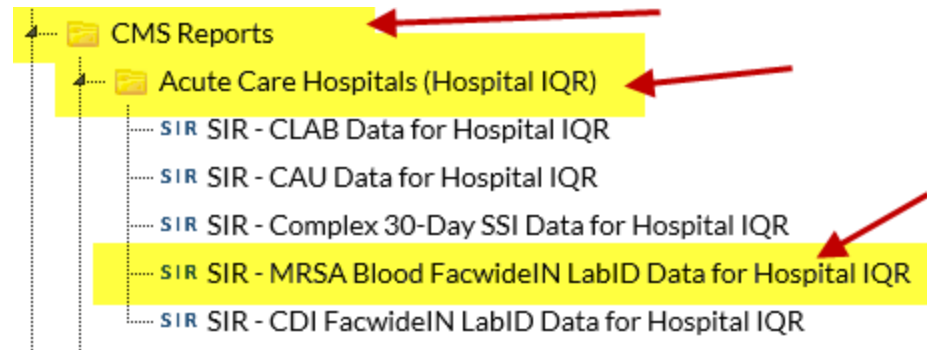
How to get SIRs from NHSN

- NHSN will calculate SIRs for you
 - Overall SIR, for the Group as a whole
 - SIRs for individual facilities
 - SIRs for individual location/procedure types, if applicable
- Decide what type of SIR reports you want to see
 - Include all data from all hospitals?
 - Review SIRs that mimic the data sent to CMS?



Example: MRSA Bacteremia SIR Report

- You are tasked with reviewing quarterly MRSA bacteremia SIRs in 2017 for hospitals in your state
 - Interested in viewing SIRs submitted to CMS
- You want to view the SIRs in Excel format, so that you can do additional manipulations before presenting these data to your colleagues



2017 MRSA SIR Report – Simplified Example

A	B	C	D	E	F	G	H	I	J	K	L	M	N
summaryYQ	MRSA bldIncCount	numPred	numpatdays	SIR pval	SIR	sir95ci	orgID	facType	medType	state	ccn	location	months
2017Q1	1	2.47243518	43660	0.3774	0.404	0.020, 1.995							
2017Q2	3	0.304364854	5278										
2017Q3	0	0.037555152	1000										
2017Q4	0	0.019528679	520										
2017Q1	0	2.283615242	42212	0.1019	0	1.312	10401	HOSP					3
2017Q2	3	0.122955566	3274				10401	HOSP-GE					2
2017Q3	0	0.037555152	1000				10401	HOSP-GEN					1
2017Q4	0	0.019528679	520				10401	HOSP-GEN					1
2017Q1	1	0.188819938	1448				11305	HOSP-ONC	M				3
2017Q2	0	0.181409289	2004				11305	HOSP-ONC	M				3

Notice orgID is missing in these rows

- One row for each quarter
- Total # of MRSA bacteremia events, in the state
- Total # predicted, in the state
- Total patient days, in the state
- State's overall SIR, p-value, and 95% CI

2017 MRSA SIR Report – Simplified Example

A	B	C	D	E	F	G	H	I	J	K	L	M	N
summaryYQ	MRSA bldIncCount	numPred	numpatdays	SIR pval	SIR	sir95ci	orgID	facType	medType	state	ccn	location	months
2017Q1	1	2.47243518	43660	0.3774	0.404	0.020, 1.995							
2017Q2	3	0.304364854	5278										
2017Q3	0	0.037555152	1000										
2017Q4	0	0.019528679	520										
2017Q1	0	2.283615242	42212	0.1019	0	1.312	10401	HOSP					
2017Q2	3	0.122955566	3274				10401	HOSP-GE					
2017Q3	0	0.037555152	1000				10401	HOSP-GEN					
2017Q4	0	0.019528679	520				10401	HOSP-GEN					
2017Q1	1	0.188819938	1448				11305	HOSP-ONC M					
2017Q2	0	0.181409289	2004				11305	HOSP-ONC M					

Notice orgID is missing in these rows

- For 2017 Q1, our state's SIR: **0.404**
 - SIR < 1; our state observed fewer MRSA bacteremia events than were predicted
- P-value: **0.3774**
 - P-value > 0.05; the # of observed MRSA bacteremia events was not significantly different than the # predicted

2017 MRSA SIR Report – Simplified Example

A	B	C	D	E	F	G	H	I	J	N
summaryYQ	MRSA bldIncCount	numPred	numpatdays	SIR_pval	SIR	sir95ci	orgID	facType	medT	months
2017Q1	1	2.47243518	43660	0.3774	0.404	0.020, 1.995				
2017Q2	3	0.304364854	5278							
2017Q3	0	0.037555152	1000							
2017Q4	0	0.019528679	520							
2017Q1	0	2.283615242	42212	0.1019	0	1.312	10401	HOSP-GEN		GA 999999 FACWIDEIN 3
2017Q2	3	0.122955566	3274				10401	HOSP-GEN		GA 999999 FACWIDEIN 2
2017Q3	0	0.037555152	1000				10401	HOSP-GEN		GA 999999 FACWIDEIN 1
2017Q4	0	0.019528679	520				10401	HOSP-GEN		GA 999999 FACWIDEIN 1
2017Q1	1	0.188819938	1448				11305	HOSP-ONC	M	MA 220162 FACWIDEIN 3
2017Q2	0	0.181409289	2004				11305	HOSP-ONC	M	MA 220162 FACWIDEIN 3

Notice orgID is populated in these rows

Notice orgID is
populated
in
these rows

- Individual, hospital-level SIR data for each hospital in your Group
- Other variables: facility type (factype), medical school affiliation (medType), state, CCN, location, number of months

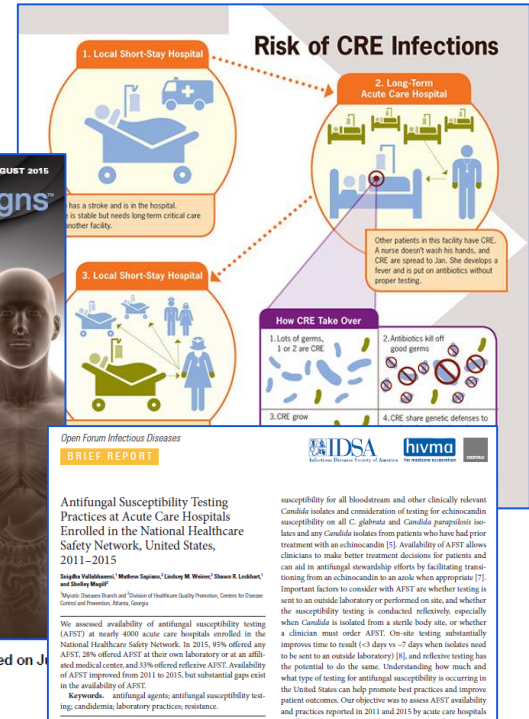
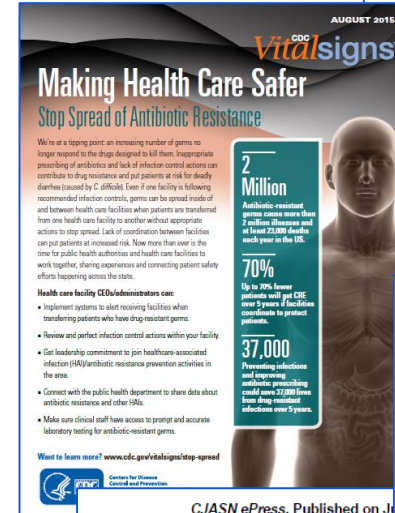
Any Questions?

Analysis of NHSN data in SAS

- Export data from the NHSN report of interest, load into SAS
 - Easy if you download data as a SAS file
 - Excel file also OK if you use proc import
 - proc import can be tricky, based on operating system etc.
- Review dataset before analyzing for the first time
 - NHSN Data Dictionary: <https://www.cdc.gov/nhsn/xls/analysis/nhsn-data-dictionary.xlsx>
- Aggregate data over facilities by pooling number of events (numerator) and expected number of events (denominator) separately
 - State/group SIR is ratio of pooled numerator and pooled denominator
 - Be careful with included/excluded data/locations/facilities

How do we use NHSN data?

- HAI data reports
 - National and state level SIRs and other metrics pooled across many facilities
 - Used to assess the nation's progress in preventing HAIs
 - Determine gaps and opportunities for prevention
 - Provide situation awareness for state health departments
 - Cannot publish hospital-level data due to confidentiality agreement
- NHSN data also used for journal articles and other CDC communication pieces



National Healthcare Safety Network (NHSN) Dialysis Event Surveillance Report for 2014

Duc B. Nguyen, Alicia Shugar, Christi Lines, Ami B. Shah, Jonathan Edwards, Daniel Pollock, Dawn Sievert, and Pats R. Patel

Abstract

Background and objectives Persons receiving outpatient hemodialysis are at risk for bloodstream and vascular access infections. The Centers for Disease Control and Prevention conducts surveillance for these infections

Division of Healthcare Quality Promotion



Data and Reports

See national and state reports using NHSN data.

Examples of CDC reports based on NHSN data

HAI data report

NATIONAL ACUTE CARE HOSPITALS Page 2 of 5

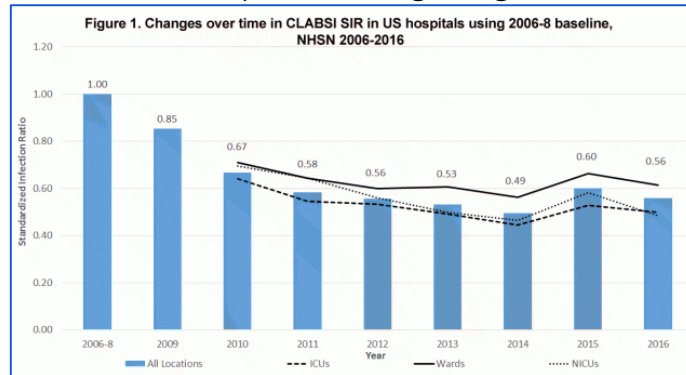
HEALTHCARE ASSOCIATED INFECTIONS 2015

Healthcare-associated infection (HAI) data give healthcare facilities and public health agencies knowledge to design, implement, and evaluate HAI prevention efforts.

HAI TYPE	#HOSPITALS REPORTING	2015 SIR DISTRIBUTION ¹			2015 NAT'L SIR
		MINIMUM	MEDIAN	MAXIMUM	
CLABSI	3,550	0.000	0.868	2.440	0.994
CAUTI	3,658	0.000	0.872	2.369	0.993
VAE	1,828	0.000	0.791	2.838	1.000
SSI, Abdominal Hysterectomy	3,029	0.000	0.777	2.656	1.003
SSI, Colon Surgery	3,140	0.000	0.823	2.631	0.999
C. difficile Events	3,634	0.000	0.928	1.842	0.993
MRSA Bacteremia	3,616	0.000	0.827	2.671	0.998

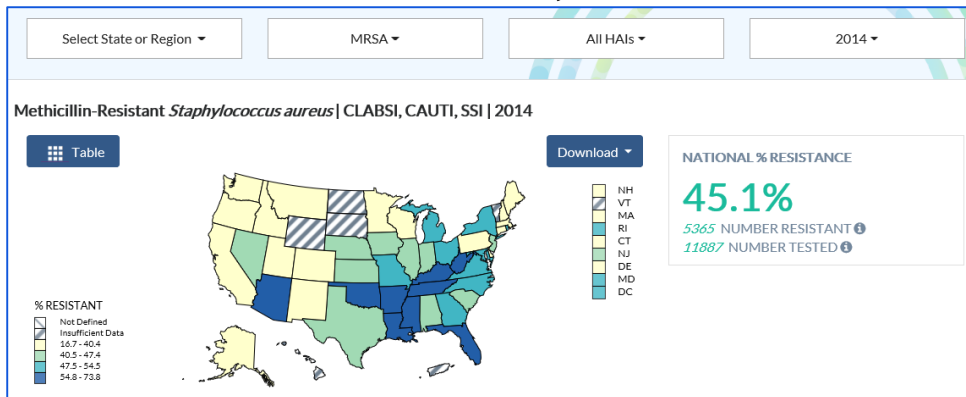
<https://www.cdc.gov/hai/surveillance/data-reports/2015-HAI-data-report.html>

Data Summary: Assessing Progress 2006-2016



<https://www.cdc.gov/hai/surveillance/data-reports/data-summary-assessing-progress.html>

Antibiotic resistance Patient Safety Atlas



<https://gis.cdc.gov/grasp/PSA/index.html>

FAQs (1)

- Q: Can CDC help me with analysis and presentation of our state's HAI data?
- A: Yes! We are happy to provide technical guidance/assistance as needed with your analyses. Please email the NHSN helpdesk: NHSN@cdc.gov
- A: Review the CSTE/CDC DAPS Toolkit for best practices with analysis and display of HAI data:
<https://www.cste.org/general/custom.asp?page=HAIToolkit>

FAQs (2)

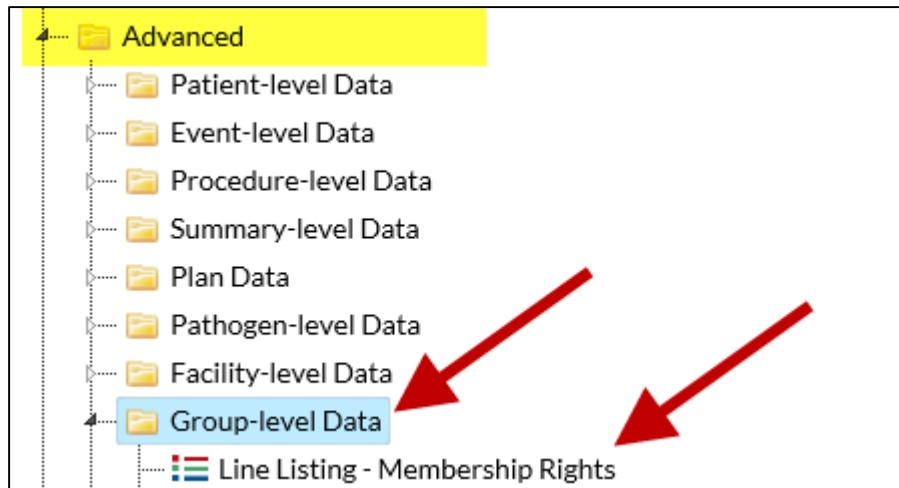
- I am missing a facility/month/location from my analysis reports.

Or

- The hospital is getting a different SIR from NHSN than what I can see in my Group.

Troubleshooting

- Ensure the facility accepted the latest version of your rights template
- Ensure both you and the facility have generated datasets at the same time
- Ensure your Group's define rights template has properly requested the specific HAI/location type of interest
- Confirm the facility has not “opted out” of sharing that specific data element with you
 - If hospital selects the “N/A” box on the rights template



- naFlag = Y
 - Facility does not have that type of unit and/or conduct that type of surveillance
 - Facility is choosing not to share data
 - Often selected by mistake

Line Listing - Group Rights

As of: June 8, 2018 at 5:42 PM
Date Range: All GROUPTRIGHTS

yearFrom	yearTo	orgID	CCN	objectname	locationType	mrsa	cdif	naFlag
-	-	10401	999999	LabID Events	IRF		Y	Y
-	-	10401	999999	LabID Events - Blood Specimen Only	IRF	Y		Y

FAQs (3)

- Q: “CDC publicly reports my state’s overall SIR. CDC’s HAI Progress Report shows that my state’s SIR is 1.5. However, when I run the SIR reports in the NHSN application, my state’s SIR is showing as 0.95. Why is there a difference?”
- A: Many possible reasons for discrepancy!
 - CDC uses data from *all* hospitals in NHSN for the state; the state HD may have access to a subset of facilities, based on their state mandate
 - Some mandates exclude Indian health services or VA hospitals
 - Hospitals may choose not to share certain data with the state HD (where applicable)
 - CDC “freezes” data for analysis (ie: take a snapshot of all data at time X to ensure stable answers)
 - Always check that you are running the correct SIR report in NHSN

Questions?
Email the NHSN Helpdesk: NHSN@cdc.gov

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

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



Appendix

Calculating the SIR

- Example: CLABSI model for Acute Care Hospital

log(# CLABSI) = -7.632 + 0.1797 + 0.2526 + 0.2625 + 0 + log(# CLdays)

Calculate facility rate by aggregated observed events over all locations and predicted events over all locations

- Expected # CLABSI for facility

$$\text{SIR for facility} = \frac{\text{Sum of Observed \# of HAIs}}{\text{Sum of Predicted \# of HAIs}}$$

$$\log(\# \text{ CLABSI}) = -7.632 + 0.1797 + 0.2526 + 0.2625 + 0 + \log(\# \text{ CLdays})$$

$$\text{Expected \# CLABSI} = \exp(-6.9372) \times \# \text{ CLdays} = 0.00097098455 \times 3969$$

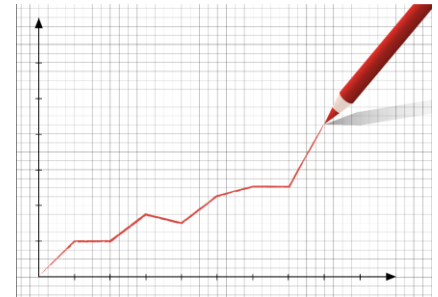
$$\text{Expected \# CLABSI} = 3.589$$

Rate for location

CLdays

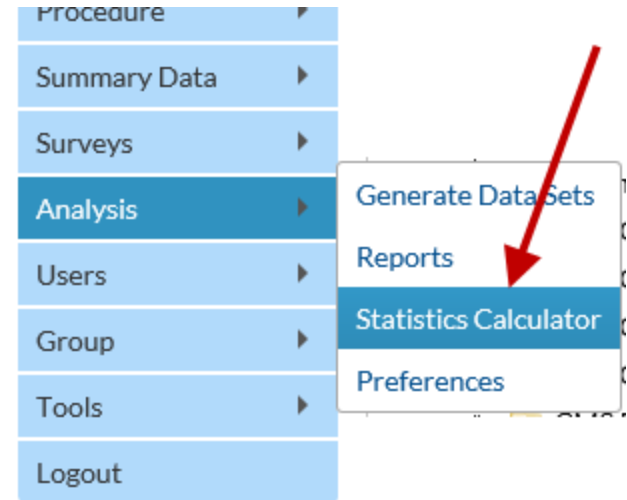
Statistics Calculator: Comparing Two SIRs

- NHSN reports will provide you with a p-value comparing a single SIR to 1
- Use the Statistics Calculator to compare 2 SIRs to each other
- May be interested in comparing SIRs across different time periods
 - Are two SIRs statistically significantly different from each other?
 - Is our state's 2017 SIR significantly different than our 2016 SIR?
 - Did facility A's SIR change significantly between Q1 and Q2?



Statistics Calculator in NHSN

- Click Analysis > Statistics Calculator
- Various options available, shown in the 2nd screen shot
- For this example, select “Compare Two SIRs”
- Manual entry of both SIRs will be required



- ▣ [Compare Two Proportions](#)
- ▣ [Compare Single SIR to 1](#)
- ▣ [Compare Two Standardized Infection Ratios](#)
- ▣ [Compare Two Incidence Density Rates](#)
- ▣ [Compare Single Proportion to a Benchmark](#)
- ▣ [Compare Single SIR to Nominal Value](#)

Complete All Fields in the Calculator

	Data Source #1	Data Source #2
Group Labels:	2016	2017
Number observed:	15	14
Number expected:	12.5	11.0
Standardized Infection Ratio:	1.200	1.273

Title: State's SIR: 2016 vs. 2017

Calculate **Back**

- Enter numerator and denominator of both SIRs in the comparison
- Enter a title if desired
- Click “Calculate”
- Pop-up window will show you the p-value

Two-tailed p-value: 0.8737