Introduction to NHSN Analysis

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2017 NHSN Annual Training

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Learning Objectives

- Understand the scope and structure of NHSN data entry and analysis functions
- Become proficient in conducting basic analyses in the application
- Gain exposure to more customized analyses available in NHSN
- Describe 5 common ways in which SIRs can be impacted by changes in NHSN
Commonly used Acronyms

- SIR – Standardized Infection Ratio
- CLABSI – Central line associated bloodstream infection
- CAUTI – Catheter associated urinary tract infection
- LabID MDRO/CDI- Laboratory-Identified *Clostridium difficile* Infection
- SSI- Surgical Site Infection
- DA – Device Associated
- VAE – Ventilator Associated Event
- MRP- Monthly Reporting Plan
- CMS– Centers for Medicare and Medicaid Services
Data Analysis Preparation
Data Entry Sources

- **Event**
  - All infection events: CLABSI, CAUTI, SSI, LABID, and more

- **Procedure**
  - Place to add all procedures, with covariates. Used for SSI

- **Summary Data**
  - Summary data forms for Device-Associated and MDRO/CDI surveillance

- **Surveys**
  - Facility level data collected once a year for previous calendar year
Accessing Data Entry Screens

3 Options: Add, Find, Incomplete

- Click ‘Add’ to enter data
- ‘Find’ is used to look for previously entered data forms.
- ‘Incomplete’ lists the forms that have been started, but all the required fields have not been completed.

The ‘Find’ and ‘Incomplete’ options are very useful for investigating data quality issues.
Annual Surveys and Data Analysis

- Every year a new survey is entered into NHSN to reflect data from the prior calendar year
- SIRS will use the most recent annual survey on file for the current SIRs
  - Right now, majority should have completed a 2016 annual survey
  - Those values will be used to calculate 2016 and 2017 SIRs
- Under the new baseline, SIRS will be risk adjusted using the corresponding annual survey from that year
- If the annual survey from that year hasn’t been completed, SIRs will be risk adjusted using the most recent available survey
NHSN User Data Entry

NHSN Analysis Functionality

Desired Reports – Rate, SIR, CMS, Custom, etc.
Monthly Reporting Plans (MRPs)

- Used by all NHSN facilities to inform CDC which patient safety modules will be used in a given month
- Participating facilities must select the modules used, if any, the events, procedures, and/or locations that will be monitored in-plan
- The MRPs signal to users what fields are required for each HAI module
- Only in-plan data are submitted to CMS in accordance with CMS’s Quality Reporting Program
  - In-plan data only used for risk adjustments and SIR reports
### Monthly Reporting Plan

**Add Monthly Reporting Plan**

Mandatory fields marked with *

- **Facility ID**: DHGP MEMORIAL HOSPITAL (ID 10018)
- **Month**: 
- **Year**: 

- **Device-Associated Module**
  
<table>
<thead>
<tr>
<th>Locations</th>
<th>CLABSI</th>
<th>VAP</th>
<th>CAUTI</th>
<th>CLIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedsurg_CC - Pedsurg_CC</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Amau - Adult Mixed Acuity Unit</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

- **Procedure-Associated Module**
  
<table>
<thead>
<tr>
<th>Procedures</th>
<th>SSI</th>
<th>Post-procedure PATHOGENIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLO - Colon surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYST - Abdominal hysterectomy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Add Row** | **Clear All Rows** | **Copy from Previous Month**

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**NHSN - National Healthcare Safety Network**

(apt-v-nhsn-test:8001)
Monthly Reporting Plan (cont.)

- Add ‘FACWIDEIN’ location for C. difficile and MRSA reporting
- Select the correct process outcome for each HAI

Be careful when choosing Infection surveillance
Alerts

- Alerts are automatic checks in NHSN that remind you of incomplete or missing in-plan data.

- Before using the analysis function, make sure to clear all (relevant) alerts.
- Found on the Home Page, or by clicking on the ‘Alerts’ tab on the sidebar.
Alerts

- When an alert category is selected, all incidents will be listed on a separate page for selection.
- Each incident will need to be resolved in order for alert category to clear.

The following are incomplete "In Plan" summary data records.

<table>
<thead>
<tr>
<th>Summary ID</th>
<th>Summary Data Type</th>
<th>Year</th>
<th>Month</th>
<th>Location Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>218</td>
<td>ICU</td>
<td>2005</td>
<td>September</td>
<td>MICU</td>
</tr>
<tr>
<td>260</td>
<td>ICU</td>
<td>2006</td>
<td>February</td>
<td>S-ICU</td>
</tr>
<tr>
<td>293</td>
<td>ICU</td>
<td>2006</td>
<td>March</td>
<td>S-ICU</td>
</tr>
<tr>
<td>4096</td>
<td>ICU</td>
<td>2013</td>
<td>February</td>
<td>INSURGCC</td>
</tr>
<tr>
<td>5576</td>
<td>ICU</td>
<td>2013</td>
<td>February</td>
<td>JOYREHAB</td>
</tr>
<tr>
<td>5902</td>
<td>ICU</td>
<td>2013</td>
<td>March</td>
<td>ICU</td>
</tr>
<tr>
<td>5903</td>
<td>ICU</td>
<td>2013</td>
<td>May</td>
<td>ICU</td>
</tr>
<tr>
<td>5904</td>
<td>ICU</td>
<td>2013</td>
<td>September</td>
<td>ICU</td>
</tr>
<tr>
<td>7964</td>
<td>ICU</td>
<td>2014</td>
<td>January</td>
<td>ICU-A</td>
</tr>
<tr>
<td>5779</td>
<td>ICU</td>
<td>2014</td>
<td>January</td>
<td>ICU/CCU</td>
</tr>
</tbody>
</table>
Resolving Alerts

- Incomplete Summary Data Form for DA
- If there are no events for a given month, check the **Report No Events** box
- If not, alerts will appear if you have completed a summary form for a unit listed in your reporting plan but have not entered events.
Generating Datasets

- After data entry is complete, the data must be first compiled into your user specific NHSN dataset
- After anything is changed in NHSN, generate datasets so that the change will be reflected in Analysis reports
- This is often the first thing we recommend when troubleshooting Analysis problems
  - NOTE: Unresolved alerts will prevent data from showing up in Rate and SIR reports, even if new datasets are generated
NHSN Data Analysis
NHSN Analysis Reports

- Click on ‘Analysis Reports’ under the Analysis tab to see all available reports in NHSN
- The highlighted reports on the right are the most commonly used and basic report types
Baseline Set 1 Reports

- Contains archived reports with the Baseline Set 1 data
- Can only be run for 2016 data and before
- Data after 2016 must be run using 2015 Rebaseline Analysis Reports
Baseline Set 1 Reports and 2015 Rebaseline Reports
NHSN Analysis Reports: CLABSI Report

- Standard list of all report types
  - Line List
  - Frequency Table
  - Bar/Pie Chart
  - Rate Table/Run Chart
  - SIR Report
- Clicking ‘Run’ will run a stock report using all CLABSI data for 2015 and forward
- Click Modify to create more specific reports
Modifying Analysis Reports: CLABSI SIR Report

- Show Descriptive Variable Names
- Analysis Data Set Source
- Type of Report
- When data set was generated
Modifying Analysis Reports: CLABSI SIR Report

- **Title/Format**
  - Used to modify the name and title of the report
  - The Title is what will appear at the top of the generated report
  - You may choose the format in which the report is displayed, such as HTML or PDF
Modifying Analysis Reports: CLABSI SIR Report

- Allows for selection of a specific time period for your report
- Select a date variable from the “Date Variable” drop down menu and specify the beginning and ending date for the desired time period
- If the “Ending” date is left blank, the results will include all data from the beginning time period and forward
Modifying Analysis Reports : CLABSI SIR Report

- Each addition of “group” and “rule” will allow you to specify values.
- After selecting a variable to filter, click in the empty box with the drop down arrow to select the operator (i.e., “equal”) then specify desired values of that variable that should be included in the report.
Modifying Analysis Reports: CLABSI SIR Report

- Add Group vs. Add Rule
- Resulting in a SIR table with data if the BSI Plan is Yes and the location type is CC or if the location type is CC_N

In this example, each Group is separated by "OR" and each rule within a group is connected by "AND". This report will select events and denominator data if the BSI Plan is Yes and the location type is CC or if the location type is CC_N.
Modifying Analysis Reports: CLABSI SIR Report

- “Display Options” tab allows you to view your report organized by a specific criteria
- Allows for the option to calculate and display results by time period – e.g., by month, year, etc.
  - Group By applicable to rates, SIRs, and SAARs
Interpreting your SIR Report

- Modified report by:
  - Time Period
    SummaryYQ: 2015Q1-2015Q4
  - Display Options
    Group By: SummaryYQ

National Healthcare Safety Network
SIR for Central Line-Associated BSI Data for Acute Care Hospitals (2015 baseline) - By OrgID
As of: March 10, 2017 at 9:58 AM
Date Range: BS2_CLAB_RATESALL summaryYr 2015 to 2015

<table>
<thead>
<tr>
<th>orgID</th>
<th>summaryYQ</th>
<th>infCount</th>
<th>numPred</th>
<th>numcldays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>sir95ci</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>2015Q1</td>
<td>4</td>
<td>1.903</td>
<td>1917</td>
<td>2.102</td>
<td>0.1701</td>
<td>0.668, 5.070</td>
</tr>
<tr>
<td>10000</td>
<td>2015Q2</td>
<td>4</td>
<td>2.310</td>
<td>2018</td>
<td>1.731</td>
<td>0.2878</td>
<td>0.550, 4.176</td>
</tr>
<tr>
<td>10000</td>
<td>2015Q3</td>
<td>0</td>
<td>0.026</td>
<td>32</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>10000</td>
<td>2015Q4</td>
<td>0</td>
<td>0.042</td>
<td>49</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
</tbody>
</table>
Interpreting your SIR Report

1. This report includes non-MBI CLABSI data from acute care hospitals for 2015 and forward.
2. The SIR is only calculated if the number predicted (numPred) is >= 1. Lower bound of 95% Confidence Interval only calculated when number of observed events > 0.
3. The number of predicted events is calculated based on national aggregate NHSN data from 2015. It is risk adjusted for CDC location, hospital beds, medical school affiliation type and facility Type.
4. If the risk factor data are missing, the record will be excluded from the SIR.

Source of aggregate data: 2015 NHSN CLABSI Data
Data contained in this report were last generated on February 23, 2017 at 12:20 PM.
Interpreting your SIR Report: The SIR

- There were 4 events identified for Q1 and Q2 for 2015
- SIR is the number of observed CLABSI (numerator) divided by the number of predicted CLABSI (denominator) (e.g. 4/1.903 = 2.102)
- This signifies that during this time period, our facility identified more CLABSI events than predicted
- SIR will only be calculated if the number of predicted infections is $\geq 1$
Interpreting your SIR Report : SIR p-value

- SIR p-value is a statistical measure that tells you if the observed number of infections is significantly different from what was predicted.
- P-value less than 0.05 indicates that the number of observed CLABSI is (statistically) significantly different (higher or lower) from the number predicted.
- In this example, the p-value for the 2015Q1 SIR is greater than 0.05 and thus there is no significant difference between the number of infections observed and the number of infections predicted.
Interpreting your SIR Report: SIR Confidence Interval

- The 95% Confidence interval is a range of values in which the true SIR is thought to lie.
- If the confidence interval includes the value of 1 (as in this example), then the SIR is not significant (the number of observed infections is not significantly different from the number predicted, using the same convenient cut point).
- 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.
Interpreting your SIR Report: SIR Confidence Interval

- Statistically significant
- NOT statistically significant
Exporting Data Sets

- **Export Analysis Data Set**
  - Appears when you select your report type
  - Exports the entire dataset from which the resulting report is generated

- **Export Output Data Set**
  - Appears at the bottom of the Modify Screen
  - Two options:
    - Exports only data used in generating the report, for the specified time period and including selection criteria
    - Exports Analysis Data Set
Data Quality – What can impact my SIRs and Rates?

- Entry, edit, or deletion of events
- Changes to numbers of patient days, device days, admissions
- Removal or addition to monthly reporting plans
- Change in admission date, previous discharge date on LABID events
- Changes to relevant factors in the annual survey (e.g., medical school affiliation, facility bedsize)
- Resolution of “Report No Events” alerts
Data Quality – Places to look

- Monthly reporting plans
  - Are the monthly reporting plans complete?
  - Are “Active” locations applicable to NHSN surveillance listed?
  - Are all appropriate procedures selected?
  - Are the appropriate lab specimens selected to collect for LABID data?

- Annual Survey
  - Are the number of beds updated from the previous survey year?
  - Has the hospital’s medical school affiliation changed?

- Alerts
  - Have the alerts been resolved for the required analysis months?

- Using NHSN Analysis
  - Are new datasets generated?
  - Were new events entered after I ran my analysis?
Advanced Folder

- Many customizable options to create and save reports
- The “How to View, Create, and Modify Dates in NHSN” document provides suggested variables to use
- Can help inform if some data is a data quality issue or accurate
NHSN Advanced Folder

- A tool to assist users with data quality efforts
- Allows users to create custom reports at various levels to check their data
  - Event Data
  - Procedure Data
  - Summary Data
  - Monthly Plan Data
  - Facility Data
  - Data Quality
Advanced Folder – Data Quality Folder

- Line lists:
  - CDI Test Method History
  - Duplicate Procedures
  - Procedures on Patient DOB
  - Procedures with 0 Duration
  - Duplicate BSI/PNEU/UTI Events
  - Duplicate SSI Events
  - SSIs on Procedure Date
  - Extremely High Incidence of SSI
  - Events Reports with 0 Device Days
Question: I am receiving January alerts that my Med unit is missing summary data, but this location was inactivated in December. Why?

- Run the Plan line list in the Advanced folder to identify what was included in your monthly reporting plan for that unit
- Check the modifyDate and ModifyUserID variables
- The reporting plan seems to be modified after December to include the CAUTI measure
Event Level Data

Question: I believe I already reported MRSA events for June 2016, but for some reason the FacWideIN summary form is showing as incomplete. Why?

- Run the Event Line List in the Advanced Folder to see if any events were reported
- The event list shows that the MRSA Events entered were all outpatient

<table>
<thead>
<tr>
<th>patID</th>
<th>eventID</th>
<th>spcOrgType</th>
<th>location</th>
<th>outpatient</th>
<th>prevPos</th>
<th>onset</th>
<th>specimenSource</th>
<th>specimenDate</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEWTEST12</td>
<td>59751</td>
<td>MRSA</td>
<td>ED</td>
<td>Y</td>
<td>N</td>
<td>CO</td>
<td>BLDSPC</td>
<td>06/01/2016</td>
</tr>
<tr>
<td>NEWTEST12</td>
<td>59753</td>
<td>MRSA</td>
<td>ED</td>
<td>Y</td>
<td>N</td>
<td>CO</td>
<td>BLDSPC</td>
<td>06/14/2016</td>
</tr>
<tr>
<td>NEWTEST22</td>
<td>59756</td>
<td>MRSA</td>
<td>2WEST</td>
<td>Y</td>
<td>N</td>
<td>CO</td>
<td>BLDSPC</td>
<td>06/01/2016</td>
</tr>
</tbody>
</table>
Question: I am running my CAUTI SIR report and my device days are not what I have recorded for October 2016. Why?

- Run the Summary Data line list in the Advanced folder to identify if there were changes to the data
- The summary data seems to be modified after November, which may be why the data has changed
Additional Resources

- Data Entry and Analysis Training
  [http://www.cdc.gov/nhsn/training/analysis/index.html](http://www.cdc.gov/nhsn/training/analysis/index.html)

- NHSN SIR Guide

- 2015 Rebaseline Page

- How to View Create & Modify Dates within NHSN

- How to Modify a Report
  [https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/howtomodifyreport.pdf](https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/howtomodifyreport.pdf)
Monday, March 20th  Afternoon Schedule Change

- 1:00-1:45 p.m. Using LabID Event Module for resistant organism (MDRO’s) surveillance and reporting
- 1:45-3:00 p.m. Using HAI Module for Urinary Tract Infection (UTI) surveillance and reporting
- 3:00-4:00 p.m. Data for Action: How can NHSN data be used to guide prevention efforts in Long-term Care Facilities?
- 4:00-4:30 p.m. Healthcare Personnel Safety in Long Term Care Settings