NHSN Analysis: Focus on Device-Associated Data

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Learning Objectives

• Review the standardized infection ratio (SIR) and its use in the interpretation of Device-associated data.

• Describe the risk-adjustment methods for Device-associated Data.

• Help you understand your data and how to analyze it.
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.
- These are YOUR data!!!!!
A Review: The Standardized Infection Ratio (SIR)

- **SIR** – A summary statistic that compares the number of healthcare-associated infections ( HAIs) that were reported to the number of HAIs that were predicted to occur, based on a calculation using data for HAI events that occurred in a given referent time period.

\[
SIR = \frac{\# \text{ observed HAIs}}{\# \text{ predicted HAIs}}
\]

*The baseline I'll be discussing today is the new 2015 baseline and risk adjustment.*
A Review: The Standardized Infection Ratio (SIR) and National SIR Baseline

- **SIR interpretation:**
  - 1 = same number of infections reported as would be predicted given the US baseline data
  - Greater than 1 = more infections reported than what would be predicted given the US baseline data
    - SIR of 1.25 = 25% more infections than predicted
  - Less than 1 = fewer infections reported than what would be predicted given the US baseline data
    - SIR of 0.50 = 50% fewer infections than predicted
Basis for Using SIRs and not Rates

- The SIR allows users to summarize data by more than a single stratum (e.g. location or procedure category), adjusting for differences in the incidence of infection among the strata.

- The SIR permits comparisons between the number of infections experienced by a facility, group, or state to the number of infections that were predicted to have occurred based on national data (i.e., baseline data).
How many of you have read the SIR Guide?

THE NHSN STANDARDIZED INFECTION RATIO (SIR)

A Guide to the SIR
Updated January 2017. Please see Page 2.
Number of Predicted Infections-Device Associated
The pooled mean is used to calculate the number of predicted events for CLABSI?

A. No
B. Yes

**Previous predicted # calculation:**
- For CLABSI and CAUTI SIRs, the predicted # is calculated for each individual location as:
  # device days *(NHSN pooled mean/1000)
- Where the pooled mean originates from a defined baseline report.

**New 2015 baseline predicted # calculation:**
General Negative Binomial Regression Model:

\[
\log(\lambda) = \alpha + \beta_1X_1 + \beta_2X_2 + \cdots + \beta_iX_i, \quad \text{where:}
\]

- \(\alpha\) = Intercept
- \(\beta_i\) = Parameter Estimate
- \(X_i\) = Value of Risk Factor (Categorical variables = 1 if present, 0 if not.)
- \(i\) = Number of Predictors
Calculating the Number of Predicted Infections

- The number of predicted infections in NHSN is calculated based on the 2015 national HAI aggregate data and adjusted for each facility using variables found to be significant predictors of HAI incidence.
- Negative binomial regression models are used to calculate the number of predicted events for CLABS, MBI-LCBI, CAUTI, VAE.

Using Models for Device-associated Infections

- General Negative Binomial Regression Model:

\[ \log(\lambda) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_i X_i, \quad \text{where:} \]

- \( \alpha = \text{Intercept} \)
- \( \beta_i = \text{Parameter Estimate} \)
- \( X_i = \text{Value of Risk Factor (Categorical variables = 1 if present, 0 if not.)} \)
- \( i = \text{Number of Predictors} \)

Factors Included in the Model: Acute Care Hospitals (ACHs)
**Factors Included in the Model: Acute Care Hospitals (ACHs) (non-NICU)**

<table>
<thead>
<tr>
<th>Factor</th>
<th>CLABSI (NICU)</th>
<th>CLABSI (NICU)</th>
<th>CAUTI</th>
<th>Total VAE</th>
<th>IVAC Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDC Location</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Facility Type</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Medical School Affiliation*</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Birthweight</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility Bed size*</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Variables taken from the Annual Survey
Methods for Calculating the Predicted Number of CLABSI Infections in Acute Care Hospital (non-NICU)

<table>
<thead>
<tr>
<th>Effect</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-7.339</td>
<td>0.0190</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CDC Location: Burn Critical Care</td>
<td>1.2874</td>
<td>0.1119</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CDC Location: Medical Critical Care</td>
<td>0.2539</td>
<td>0.0405</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Location: Other Adult ICUs and Mixed Acuity</td>
<td>0.1164</td>
<td>0.0197</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CDC Location: Pediatric Cardiothoracic Critical Care</td>
<td>0.4130</td>
<td>0.0595</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CDC Location: Trauma Critical Care</td>
<td>0.5411</td>
<td>0.0744</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Location: Adult Oncology Units (ICU and Ward)</td>
<td>0.2755</td>
<td>0.0367</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Location: Pediatric Oncology Units ICU and Ward</td>
<td>0.1960</td>
<td>0.0867</td>
<td>0.0237</td>
</tr>
<tr>
<td>Location: Adult and Pediatric Wards (ref)</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Facility Bed Size* ≥296</td>
<td>0.1686</td>
<td>0.0195</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Facility Bed Size* &lt;296</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Medical School Affiliation*: Major, Graduate, or Undergraduate Teaching Status</td>
<td>0.1958</td>
<td>0.0197</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Medical School Affiliation*: Non-Teaching Hospital</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Facility Type: Children's/Women's Hospital</td>
<td>0.1328</td>
<td>0.0643</td>
<td>0.0388</td>
</tr>
<tr>
<td>Facility Type: All Other</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Variables taken from the Annual Survey
Example: Applying Risk Model for CLABSI, NHSN 2015

\[
\text{Risk} = \exp(-7.339 + 1.2874 \times \text{Burn Critical Care} + 0.2539 \times \text{Medical Critical Care} + 0.1164 \times \text{Other Adult ICUs and Mixed Acuity} + 0.413 \times \text{Pediatric Cardiothoracic Critical Care} + 0.5411 \times \text{Trauma Critical Care} + 0.2755 \times \text{Adult Oncology Units (ICU and Ward)} + 0.196 \times \text{Pediatric Oncology Units (ICU and Ward)} + 0.1686 \times (\text{Facility Bed Size: } \geq 296 \text{ beds}) + 0.1958 \times (\text{Medical School Affiliation: Major, Graduate, or Undergraduate Teaching Status}) + 0.1328 \times (\text{Facility Type: Children's/Women's Hospital Children's Hospital, Women's Hospital, Women's/Children's Hospital})) \times \text{numCLDays}
\]

* For these risk factors, if present = 1; if not = 0
Example: Applying Risk Model for CLABSI, NHSN 2015

- Facility Profile: Monthly (February 2015)
  - 135-beds
  - General Acute Care Hospital
  - Major teaching affiliation
  - Reporting for:
    - Mixed Age Mixed Acuity Unit
    - Neurologic Critical Care
    - Medical/Surgical Critical Care
  - With 238 central line days and 1 CLABSI event reported for the month of February
Example: Applying Risk Model for CLABSI, NHSN 2015

New model for calculation the number of predicted CLABSI events:

\[ = \exp(-7.339 + 1.2874 \times 0 + 0.2539 \times 0 + 0.1164 \times 1 + 0.413 \times 0 + 0.5411 \times 0 + 0.2755 \times 0 + 0.196 \times 0 + 0.1686 \times 0 + 0.1958 \times 1 + 0.1328 \times 0) \times 238 \]

\[ = 0.211 \text{ predicted CLABSI events for the month of February} \]
Example: Applying Risk Model for CLABSI, NHSN 2015

New model for calculation the number of predicted CLABSI events:

\[ = \exp(-7.339 + 1.2874*(0) + 0.2539*(0) + 0.1164*(1) + 0.413*(0) + 0.5411*(0) + 0.2755*(0) + 0.196*(0) + 0.1686*(0) + 0.1958*(1) + 0.1328*(0)) \times 238 \]

\[ = 0.211 \text{ predicted CLABSI events for the month of February} \]
Your hospital has been measuring CLABSI using SIRs under the previous, 2006-2008 baseline. Should you compare these SIRs with those calculated under the 2015 baseline?

A. No  
B. Yes

- SIRs under the original baseline cannot be directly compared to any SIRs calculated under the new baseline, because of the different risk adjustment, different baseline population.
- When comparing SIRs from two time periods, both SIRs must have been calculated under the same baseline, for example:
  - 2014 vs. 2015 SIRs: original baseline
  - 2015 vs. 2016 SIRs: use either the new baseline or original baseline for both SIRs in the comparison
  - 2016 vs. 2017 SIRs: new baseline
Standardized Infection Ratio (SIR) Table

- The following example:
  - shows how to calculate and interpret the SIR for device-associated infections
  - is for CLABSI, but the CAUTI SIR is calculated and interpreted in a similar manner
Standardized Infection Ratio (SIR) Table

<table>
<thead>
<tr>
<th>Analysis Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expand All</strong></td>
</tr>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>SIR</strong></td>
</tr>
<tr>
<td><strong>SIR</strong></td>
</tr>
<tr>
<td><strong>SIR</strong></td>
</tr>
<tr>
<td><strong>SIR</strong></td>
</tr>
</tbody>
</table>
Standardized Infection Ratio (SIR) Table

- **Report Modification**: For the purpose of this example, the modifications that have been made are: *summaryYr was set to 2015*, filtered by Critical Care (CC) locationType, and the report grouped by summaryYH.
Standardized Infection Ratio (SIR) Table

- **Report Modification**: For the purpose of this example, the modifications that have been made are: summaryYr was set to 2015, filtered by Critical Care (CC) locationType, and the report grouped by summaryYH.
Standardized Infection Ratio (SIR) Table

- **Report Modification:** For the purpose of this example, the modifications that have been made are: summaryYr was set to 2015, filtered by Critical Care (CC) locationType, and the report grouped by summaryYH.
## Standardized Infection Ratio (SIR) Table

### Output/Results

<table>
<thead>
<tr>
<th>orgID</th>
<th>summaryYH</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>2015H1</td>
<td>4</td>
<td>1.504</td>
<td>1249</td>
<td>2.660</td>
<td>0.0849</td>
<td>0.845, 6.416</td>
</tr>
<tr>
<td>10000</td>
<td>2015H2</td>
<td>0</td>
<td>0.011</td>
<td>12</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

1. This report includes non-MBI CLABSII 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 NHDownload 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.
This facility reported 4 central line-associated BSI (infCount) in critical care locations (locationType="CC") during the first half of 2015. This is the observed number of CLABSIs.

The overall SIR for this facility during this time period is 2.660, indicating that this facility observed approximately 166% more infections than predicted. The number of CLABSIs predicted to occur for the first half of 2015 is 1.504 and 0.011 for the second half.

An SIR will only be calculated if the number of predicted infections is \( \geq 1 \).
Interpretation:

- In this example, the p-value for the first half of 2015 is greater than 0.05 and thus there is no significant difference between the number of infections observed and the number of infections predicted.
- If the confidence interval includes the value of 1, 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).
- The statistical evidence should be interpreted as insufficient to conclude that the SIR is different than 1.
The Re-baseline: Will my SIRs change?

- In short...Yes.
- In addition to different risk models being used, the rebaselined SIRs will be using data with different incidence than the first baseline.
The Re-baseline: Will my hospital’s SIRs change?

Annual, Facility-level CAUTI data from a Critical Access Hospital with an undergraduate medical school affiliation

Baseline 1 (2009 NHSN Data):

<table>
<thead>
<tr>
<th>orgid</th>
<th>summaryYr</th>
<th>infCount</th>
<th>numExp</th>
<th>numucathdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>SIR95CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>2015</td>
<td>3</td>
<td>1.576</td>
<td>985</td>
<td>1.904</td>
<td>0.2860</td>
<td>0.484, 5.181</td>
</tr>
</tbody>
</table>

Baseline 2 (2015 NHSN Data):

<table>
<thead>
<tr>
<th>orgid</th>
<th>summaryYr</th>
<th>infCount</th>
<th>numPred</th>
<th>numucathdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>SIR95CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>2015</td>
<td>3</td>
<td>2.406</td>
<td>985</td>
<td>1.247</td>
<td>0.6544</td>
<td>0.317, 3.393</td>
</tr>
</tbody>
</table>

Fictitious data. Example provided for illustrative purposes only.
The Re-baseline: What to Expect with New Models

- **CLABSI:**
  - Separate models for each setting (e.g., ACHs, LTACHs)
  - **MBIs will be excluded from the 2015 baseline**
  - Risk models will be used to assess predicted # of infections and will incorporate a level of categorization by CDC location (for ACHs), and relevant, significant facility-level factors
  - Previously-excluded inpatient locations (e.g. Telemetry Ward, Mixed Acuity Ward) will be included under the 2015 baseline.
Real World Case

- I need your assistance with a missing CLABSI for 2016 since the recent upgrade.
  - The CLABSI was captured on reports I ran prior to the upgrade.
  - Missing is 1 CLABSI for my Hematology/Oncology Ward that appears on our line list but not on the SIR reports.

Can you tell me why I’m missing this event?
The reason why this CLABSI is being excluded from the calculations is because this is MBI-LCBI event.

With the re-baseline, MBI-LCBI events have been removed from the CLABSI numerator.

Later on this year, we will be introducing MBI-LCBI rate and SIR tables in the NHSN application.
Checking for MBI-LCBI

- Run the CLABSI Frequency Table and include the variable mbi_lcbi
- Based on our results, 1 CLABSI would be excluded when our data will be calculated using the 2015 baseline:

National Healthcare Safety Network
Frequency Table for All Central Line-Associated BSI Events
As of: January 28, 2016 at 2:38 PM
Date Range: CLAB_EVENT evntDate YQ 2015Q3 to 2015Q3

https://www.cdc.gov/nhsn/PS-Analysis-resources/PDF/MBIAnalysis.pdf
The Re-baseline: What to Expect with New Models

- **CAUTI:**
  - Separate models for each setting (e.g., ACHs, LTACHs).
  - Urinary catheter days will continue to be used in the SIR calculation.
  - Risk models will be used to assess predicted # of infections and will incorporate a level of categorization by CDC location (for ACHs), and relevant, significant facility-level factors.
  - Previously-excluded inpatient locations (e.g. Telemetry Ward, Mixed Acuity Ward) will be included under the 2015 baseline.
CAUTI (and CLABSI) SIR Reports in NHSN
CAUTI (and CLABSI) SIR Reports in NHSN

- SIR Outputs will include 5 tables:
  1. Overall SIR for the facility
  2. SIR by location type
  3. SIR by CDC location
  4. SIR by individual locations
  5. Data Not Included in the SIR
CAUTI (and CLABSI) SIR Output- Table 1

- This table will include all the units for which your hospital reported data during that time period.
- For this example we use the cumulative group by function

National Healthcare Safety Network
SIR for Catheter-Associated UTI Data for Acute Care Hospitals (2015 baseline) - By OrgID

As of: March 9, 2017 at 8:16 AM
Date Range: BS2_CAU_RATE SICU_SCA summaryYr 2015 to 2016

<table>
<thead>
<tr>
<th>orgID</th>
<th>infCount</th>
<th>numPred</th>
<th>numucathdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>sir95ci</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>4</td>
<td>1.167</td>
<td>1107</td>
<td>3.429</td>
<td>0.0379</td>
<td>1.089, 8.270</td>
</tr>
</tbody>
</table>
CAUTI (and CLABSI) SIR Output- Table 2

- This table produces an SIR for each Location Type (eg. ICUs, WARDs)

### National Healthcare Safety Network

**SIR for Catheter-Associated UTI Data for Acute Care Hospitals (2015 baseline) - By OrgID/Location Type**

As of: March 9, 2017 at 8:16 AM

Date Range: BS2_CAU_RATE SICU_SCA summaryYr 2015 to 2016

orgID=10000 CCN=32M22222 medType=M

<table>
<thead>
<tr>
<th>orgID</th>
<th>locationType</th>
<th>infCount</th>
<th>numPred</th>
<th>num_ucathdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>sir95ci</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>CC</td>
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<tr>
<td>10000</td>
<td>CC_ONC</td>
<td>1</td>
<td>0.498</td>
<td>531</td>
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<td></td>
</tr>
<tr>
<td>10000</td>
<td>OTHER</td>
<td>0</td>
<td>0.042</td>
<td>39</td>
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</tr>
<tr>
<td>10000</td>
<td>WARD</td>
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<td>0.431</td>
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<tr>
<td>10000</td>
<td>WARD_ONC</td>
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<td>0.014</td>
<td>10</td>
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<td></td>
</tr>
</tbody>
</table>
CAUTI (and CLABSI) SIR Output- Table 3

- This table produces an SIR for each CDC location type that has CAUTI data entered in the facility.

### National Healthcare Safety Network
**SIR for Catheter-Associated UTI Data for Acute Care Hospitals (2015 baseline) - By OrgID/CDC Location Code**

As of: March 9, 2017 at 8:16 AM
Date Range: BSZ_CAU_RATE SICU_SCA summaryYr 2015 to 2016

<table>
<thead>
<tr>
<th>orgID</th>
<th>loccdc</th>
<th>infCount</th>
<th>numPred</th>
<th>numucathdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>sir95ci</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>IN:ACUTE:CC:MS</td>
<td>0</td>
<td>0.115</td>
<td>104</td>
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<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:CC:N</td>
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<td>0.066</td>
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</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:CC:ONC_MS</td>
<td>1</td>
<td>0.498</td>
<td>531</td>
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<td>.</td>
<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:MIXED:ALL_ADULT</td>
<td>0</td>
<td>0.042</td>
<td>39</td>
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<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:WARD:LD</td>
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<td>0.008</td>
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<tr>
<td>10000</td>
<td>IN:ACUTE:WARD:M</td>
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</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:WARD:MS</td>
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<td>0.025</td>
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<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:WARD:ONC_HONC</td>
<td>0</td>
<td>0.014</td>
<td>10</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>IN:ACUTE:WARD:S</td>
<td>0</td>
<td>0.011</td>
<td>11</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>
This table produces an SIR for each individual location that has CAUTI data entered in the facility.

<table>
<thead>
<tr>
<th>orgid</th>
<th>location</th>
<th>infcount</th>
<th>numPred</th>
<th>numucathdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>SIR95CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
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<td>311</td>
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<tr>
<td>10000</td>
<td>5 WEST</td>
<td>0</td>
<td>0.011</td>
<td>11</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>9 WEST</td>
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<td>1</td>
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</tr>
<tr>
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<td>9NORTH</td>
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<td>0.008</td>
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<td>10000</td>
<td>CV-ICU</td>
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<td>0.041</td>
<td>38</td>
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<td>.</td>
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<td>HEMONC</td>
<td>0</td>
<td>0.014</td>
<td>10</td>
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<td>.</td>
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<tr>
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<td>MSICU</td>
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<td>104</td>
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<td>.</td>
</tr>
<tr>
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<td>NEURO ICU</td>
<td>0</td>
<td>0.066</td>
<td>22</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>10000</td>
<td>ONC MS</td>
<td>1</td>
<td>0.498</td>
<td>531</td>
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<td>.</td>
</tr>
</tbody>
</table>
CAUTI (and CLABSI) SIR Output - Table 5

- This table produces a list of the locations that are not included in the SIR (e.g., missing data or outpatient locations)

<table>
<thead>
<tr>
<th>orgID</th>
<th>locationType</th>
<th>locccdc</th>
<th>location</th>
<th>infcount</th>
<th>numucathdays</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>WARD</td>
<td>OUT:ACUTE:WARD</td>
<td>12</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>10000</td>
<td>OTHER</td>
<td>IN:ACUTE:OR_STEP</td>
<td>PACU</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>10000</td>
<td>OTHER</td>
<td>OUT:NONACUTE:DIAG:GI</td>
<td>XYZ</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>
The Re-baseline: What to Expect with New Models

- **VAE:**
  - Separate models for each setting (e.g., ACHs, LTACHs)
  - Will be calculated for “Total VAE” as well as “IVAC Plus”
  - Risk models will be used to assess predicted # of events and will incorporate a level of categorization by CDC location (for ACHs), and relevant, significant facility-level factors
  - There are no VAE models and thus, no SIRs for: IRF (no Total VAE or IVAC Plus model), CAH (no IVAC Plus model)
VAE SIR-Outputs

- Separate models for each setting (e.g., ACHs, LTACHs)
VAE SIR-Outputs

- Will be calculated for “Total VAE”
### VAE SIR-Outputs

- As well as “IVAC Plus”

**National Healthcare Safety Network**

**SIR for Ventilator-Associated Event Data for Acute Care Hospitals (2015 Baseline) - By OrgID**

As of: March 9, 2017 at 8:35 AM  
Date Range: All BS2_VAE_RATE SICU SCA

vaecategory = IVAC Plus orgid = 10000 CCN = 32M22222 medType = M

<table>
<thead>
<tr>
<th>orgid</th>
<th>infCount</th>
<th>numPred</th>
<th>numventdays</th>
<th>SIR</th>
<th>SIR_pval</th>
<th>SIR95CI</th>
<th>vaecategory</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>1</td>
<td>1.462</td>
<td>860</td>
<td>0.684</td>
<td>0.8022</td>
<td>0.034, 3.373</td>
<td>IVAC Plus</td>
</tr>
</tbody>
</table>
If your facility had a Predicted Number of infections equal to 0.896 for 2015Q2, will the SIR be calculated for that quarter?

A. Yes
B. No
C. Maybe, it will depend on the number of events for that quarter

- When the predicted number of infections is <1, it is considered too low to calculate a precise SIR and comparative statistics.
- When this occurs, you may wish to group your SIRs by a longer time period, such as calendar year (summaryYr).
- Run the TAP Reports to review the CAD (cumulative attributable difference, which is the difference between the # observed and # predicted).
Device Utilization Ratios

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

- Calculated as:

  \[
  \frac{\text{# of device days}}{\text{# of patient days}}
  \]
Pooled Means (National Benchmark Rates)

- 2014 was the last year NHSN published device-associated national pooled means
  - Infection rate and device utilization ratio (DUR)
  - Moving forward, benchmarks will be published annually as SIRs

- Typically, rate tables provided the facility’s rate and DUR, with a comparison to national pooled means
Rate Tables

- Pooled means will **no longer appear** in the default device-associated rate tables for 2015 data and forward

### National Healthcare Safety Network

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

As of: March 10, 2017 at 7:57 AM
Date Range: BS2_CAU_RATE SICU_SCA summaryYr 2015 to 2016

<table>
<thead>
<tr>
<th>location</th>
<th>months</th>
<th>caucount</th>
<th>numucathdays</th>
<th>CAURate</th>
<th>numpatdays</th>
<th>CathDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 CENTRAL</td>
<td>3</td>
<td>2</td>
<td>43</td>
<td>46.512</td>
<td>83</td>
<td>0.518</td>
</tr>
<tr>
<td>4F</td>
<td>2</td>
<td>1</td>
<td>311</td>
<td>3.215</td>
<td>511</td>
<td>0.609</td>
</tr>
</tbody>
</table>
Rate Tables in “Baseline Set 1” Folder

- Review the comparison between your facility’s rates and the 2014 national pooled mean rates in the “Baseline Set 1” folder
  - 2015 + 2016 device-associated rates will be compared to 2014 national pooled mean rates

- Reminder: 2014 is the last pooled mean in the “Baseline Set 1” rate tables
- 2015 national pooled means will be available in the Rate Calculator
Rate Calculator

- *New* online tool launching this year
- Public website outside of the NHSN application
- User will enter risk factors as they apply to the facility/HAI of interest
  - e.g., bed size, medical school affiliation
- Calculator will produce a national pooled mean rate for the facility based on 2015 national data
  - No annual updates
- All HAI types (including SSI, MRSA & *C. difficile* LabID, etc.)
Rate Calculator- Preview

HAI Type: CLABSI

Facility Type: Acute Care Hospital (ACH)

CDC Location Code Group: Burn Critical Care

Facility Bed Size:
- ≥ 296 beds
- < 296 beds

Medical School Affiliation:
- Teaching
- Non-Teaching

Facility Type:
- Children’s/Women’s Hospital
- All Others

Result:
The rate is 3.18 CLABSI per 1000 central line days.

Calculate Rate

Default multiplier setting is suggested to produce rates that are comparable to national measures of specific HAI's.
Exercise - CLABSI

- Your administration has asked you to provide a summary statistic describing the CLABSI experience in your Acute Care Hospital for the first half of 2015.
- You will need to be able to interpret the statistic and its associated tests of statistical significance for the administrators.
- To be able to answer this question you will need to run the “SIR – Acute Care Hospital CLAB Data” report.
Exercise - CLABSI

- The SIR for the first half of 2015 is 2.326
How can this overall CLABSI SIR of 2.326 be interpreted?

A. This facility observed more infections than predicted.
B. This facility observed the same number of infections predicted.
C. This facility observed less infections than predicted.
D. None of the above

The overall SIR for this facility during this time period is 2.326, indicating that this facility observed approximately 133% more infections than predicted.
What changes can potentially impact my SIRs?

- Entry or deletion of events
- Changes to number of patient days, device days, admissions
- Removal or addition to monthly reporting plans
- Changes to relevant factors in the annual survey (e.g., medical school affiliation, facility bedsize)
- Resolution of “Report No Events” alerts
Take-Home Points

- Updated risk adjustment will be applied across various HAI types and healthcare settings
- SIRs produced under the new 2015 baseline will not be comparable to SIRs calculated under the original baselines
- The 2015 baseline is a new “starting/referent point” from which to measure future progress –therefore, we expect that hospital SIRs will shift closer to 1, particularly for the 2015 SIRs calculated with the 2015 baseline
Device Associated Analysis Resources

- Hospital Compare Data Verification: https://www.cdc.gov/nhsn/PS-Analysis-resources/PDF/MBIAnalysis.pdf

Help with any analysis outputs: email nhsn@cdc.gov
Thank You!

nhsn@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)

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.