Patient Safety Component
Use of NHSN Annual Survey Data: Involvement in HAI SIR Models

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NHSN Acute Care Analytics Team
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Disclosures

- Nothing to disclose
Objectives

- Locate the annual survey variables involved in the HAI SIR calculations
- Determine which annual survey year is included in HAI SIR calculations
Outline

- Annual survey and SIR overview
- Annual survey facility characteristics
- Relationship between annual survey year and SIR year
Overview

Annual Survey and SIR
Annual Survey

- New facility survey must be completed to reflect data from prior calendar year
- Completed by March 1st each year
- Separate surveys by facility type
  - ‘Hospital’ - Acute Care Hospital (general acute care, critical access, oncology, orthopedic, pediatric, women’s, women’s and children’s, military, psychiatric, and Veterans Affairs)
  - ‘LTAC’ - Long-term Acute Care (LTAC) Hospital
  - ‘REHAB’ - Free-standing rehabilitation facilities and CMS-certified inpatient rehabilitation units

https://www.cdc.gov/nhsn/psc/locations.html
Standardized Infection Ratio (SIR)

- Track HAIs, compares the number of observed infections to the number of predicted infections
  - CMS Quality Reporting for select HAI and facility types
  - State health departments
  - Other organizations or groups
  - CDC in national surveillance reports

- Risk adjusted
  - HAI-specific risk factors
  - Facility characteristic risk factors
Facility Characteristics
Facility Characteristics

- Collected on each annual survey, differs by survey type
- Required questions
- Select facility characteristics as risk adjustment factors for select SIR models*

# Facility Characteristics – Hospital Survey

**Facility Characteristics (completed by Infection Preventionist)**

*Ownership (check one):*
- [ ] For profit
- [ ] Not for profit, including church
- [ ] Government
- [ ] Military
- [ ] Veterans Affairs
- [ ] Physician owned

**If facility is a Hospital:**
- *Number of patient days: _________
- *Number of admissions: _________

**For any Hospital:**
- *Is your hospital a teaching hospital for physicians and/or physicians-in-training?*
  - [ ] Yes
  - [ ] No
  - If Yes, what type:  
    - [ ] Major
    - [ ] Graduate
    - [ ] Undergraduate

*Number of beds set up and staffed in the following location types (as defined by NHSN):*
- a. ICU (including adult, pediatric, and neonatal levels II/III and III): __________________________
- b. All other inpatient locations: __________________________
Facility Characteristics – LTAC Survey

In the previous calendar year, indicate:

* Number of patient days: ________________________
* Number of admissions: ________________________
* Average daily census: ________________________

* Numbers of LTAC beds in the following categories (categories should equal total):
  a. Intensive care unit (ICU) or critical care beds: __________
  b. High observation/special care/high acuity beds (not ICU): __________
  c. General LTAC beds: __________

* Total number of LTAC beds (licensed capacity): __________

* Number of single occupancy rooms: __________

Total number of admissions with one of the following conditions identified on admission (present on admission, not developing during LTAC stay): (Note: These categories are not mutually exclusive. If helpful for your facility in identifying these conditions on admission, please review a list of ICD-10 and DRG codes commonly associated with these conditions found here: http://www.cdc.gov/nhsn/xls/DRGs-ICD-9s-NHSN-LTAC-Survey.xlsx)

  a. Ventilator dependence: __________
  b. Hemodialysis: __________
Facility Characteristics – REHAB Survey

In the previous calendar year, indicate the following counts for the Rehabilitation Facility:

* Total number of rehab beds: 

* Average daily census: 

* Number of patient days: 

* Average length of stay: 

* Indicate the number of admissions with the primary diagnosis for each of the following rehabilitation categories (must sum to the total number of admissions listed below)

  a. Traumatic spinal cord dysfunction: 
  b. Non-traumatic spinal cord dysfunction: 
  c. Stroke: 
  d. Brain dysfunction (non-traumatic or traumatic): 
  e. Other neurologic conditions (e.g., multiple sclerosis, Parkinson’s disease, etc.): 
  f. Orthopedic conditions (incl. fracture, joint replacement, other): 
  g. All other admissions: 

* Total number of admissions: 

* Number of admissions on a ventilator: 

* Number of pediatric (≤ 18 years old) admissions:
Annual Survey Line Listing

- Annual survey analysis report for year(s) of interest
- Reports > Advanced > Facility-level Data
  - Line Listing - Survey
### Annual Survey HAI SIR-involved Variable Names

<table>
<thead>
<tr>
<th>Hospital (HospSurvey)</th>
<th>LTAC (LTACSurvey)</th>
<th>REHAB (IRFSurvey)</th>
</tr>
</thead>
<tbody>
<tr>
<td>numBeds</td>
<td>numBeds</td>
<td>numAdmits</td>
</tr>
<tr>
<td>numPatDays</td>
<td>numPatDays</td>
<td>numNonTraSCDysAdm</td>
</tr>
<tr>
<td>numAdmits</td>
<td>numAdmits</td>
<td>numTraSCDysAdm</td>
</tr>
<tr>
<td>numICUbeds</td>
<td>numAdmVent</td>
<td>numStrokeAdm</td>
</tr>
<tr>
<td></td>
<td>numAdmHemo</td>
<td>numOrthoAdm</td>
</tr>
<tr>
<td></td>
<td>numSingOccRm</td>
<td>numOtherAdm</td>
</tr>
</tbody>
</table>

#### National Healthcare Safety Network

**Line Listing - Long-term Acute Care Facility Survey (2021 and later)**

<table>
<thead>
<tr>
<th>orgID</th>
<th>surveyYear</th>
<th>numBeds</th>
<th>numPatDays</th>
<th>numAdmits</th>
<th>numAdmVent</th>
<th>numAdmHemo</th>
<th>numSingOccRm</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>2020</td>
<td>138</td>
<td>1256</td>
<td>665</td>
<td>15</td>
<td>12</td>
<td>59</td>
</tr>
</tbody>
</table>
Survey Year and SIR Year Relationship
Survey Year and SIR Year

- Survey year and surveillance year possible difference
  - To calculate SIR for current reporting year (for example, 2022)
  - SIR will use survey year for most recent completed calendar year (for example, 2021)
  - Example
    • The 2021 annual survey responses are used for the 2022 SIRs
- Survey year and SIR year may not always be the same
Survey Year and SIR Year: CMS deadline

- Assume
  - Facility completed 2020 survey
  - Facility completed 2021 survey in January 2022

<table>
<thead>
<tr>
<th>CMS deadline month</th>
<th>CMS submission / NHSN data</th>
<th>Survey year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 2021</td>
<td>2021 Q1 (Jan–Mar)</td>
<td>2020</td>
</tr>
<tr>
<td>Nov 2021</td>
<td>2021 Q2 (Apr–Jun)</td>
<td>2020</td>
</tr>
<tr>
<td>Feb 2022</td>
<td>2021 Q3 (Jul–Sep)</td>
<td>2021</td>
</tr>
<tr>
<td>May 2022</td>
<td>2021 Q4 (Oct–Dec)</td>
<td>2021</td>
</tr>
</tbody>
</table>
My 2021 number predicted changed, but why?

- My 2021 SIR report, and the number of predicted events has changed!
- I ran an SIR report in December 2021 and again at the end of February 2022. No events or summary data changed, but my number predicted is different. Can you explain this?
My 2021 number predicted changed, but why? – Answer

- Assuming no reporting changes (monthly reporting plans, events, summary data), the most likely cause is number predicted calculation used different survey year at the time the reports were prepared.

- To confirm annual survey is the cause:
  - Review SIR Guide for HAI of interest to observe HAI SIR risk factors.
  - Review survey variables of interest using survey line list and include completed date (completeddate) to see when survey was submitted.
  - If MRSA or CDI
    - Risk Adjustment Factors included in SIR report.
  - Confirm change in risk adjustment parameter estimate.
Example - My 2021 number predicted changed, but why?

SIR for MRSA Blood FacwideIN LabID Data in Acute Care Hospital (2015 baseline)

- Assume no reporting changes (monthly reporting plans, events, summary data were unchanged) during 2021Q3
- Compare SIR reports: December 2021 vs. February 2022
  - 2021Q3 numPred prepared in December 2021 = 0.995
  - 2021Q3 numPred prepared in February 2022 = 0.828

*Fictitious data used for illustrative purposes only.*
## Compare SIR reports

### Dec 2021 Report

National Healthcare Safety Network  
SIR for MRSA BloodFacwideIN LabID Data in Acute Care Hospital (2015 baseline)  
As of: December 10, 2021 at 4:48 pm

<table>
<thead>
<tr>
<th>orgID</th>
<th>location</th>
<th>summaryYQ</th>
<th>months</th>
<th>MRSA_bldIncCount</th>
<th>numPred</th>
<th>numpatdays</th>
<th>SIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>FACWIDEIN</td>
<td>2021Q3</td>
<td>3</td>
<td>2</td>
<td>0.995</td>
<td>10150</td>
<td>.</td>
</tr>
</tbody>
</table>

Data contained in this report were last generated on December 10, 2021 at 3:14 PM to include data beginning January 2005.

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### Feb 2022 Report

National Healthcare Safety Network  
SIR for MRSA BloodFacwideIN LabID Data in Acute Care Hospital (2015 baseline)  
As of: February 12, 2022 at 12:48 pm

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Review SIR Guide to determine annual survey variables

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average length of stay**: ≥ 5.1 days</td>
<td>0.2787</td>
<td>0.0343</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Average length of stay**: 4.3-5.0 days</td>
<td>0.0955</td>
<td>0.0341</td>
<td>0.0050</td>
</tr>
<tr>
<td>Average length of stay**: 0-4.2 days</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Medical school affiliation‡: Major</td>
<td>0.2585</td>
<td>0.0334</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Medical school affiliation‡: Graduate/undergraduate</td>
<td>0.1166</td>
<td>0.0345</td>
<td>0.0007</td>
</tr>
<tr>
<td>Medical school affiliation‡: Non-teaching</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Number of ICU beds‡: ≥ 45</td>
<td>0.5650</td>
<td>0.0898</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Number of ICU beds‡: 21-44</td>
<td>0.4599</td>
<td>0.0899</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Number of ICU beds‡: 11-20</td>
<td>0.3394</td>
<td>0.0922</td>
<td>0.0002</td>
</tr>
<tr>
<td>Number of ICU beds‡: 7-10</td>
<td>0.4720</td>
<td>0.0993</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Number of ICU beds‡: 0-6</td>
<td>REFERENT</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

** Average length of stay is taken from the Annual Hospital Survey. It is calculated as: total # of annual patient days / total # of annual admissions.

‡ Medical school affiliation and number of ICU beds are taken from the Annual Hospital Survey.
Review annual survey line list

National Healthcare Safety Network
Line Listing - Hospital Survey (2018-2020)
As of: December 10, 2021 at 4:40 pm

<table>
<thead>
<tr>
<th>orgID</th>
<th>surveyYear</th>
<th>name</th>
<th>medAff</th>
<th>medTypeDesc</th>
<th>numICUBeds</th>
<th>numPatDays</th>
<th>numAdmits</th>
<th>completeddate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>2020</td>
<td>ABC Hospital</td>
<td>Y</td>
<td>M - Major</td>
<td>35</td>
<td>39990</td>
<td>7690</td>
<td>02/25/2021</td>
</tr>
</tbody>
</table>

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National Healthcare Safety Network
Line Listing - Hospital Survey (2021 and later)
As of: February 12, 2022 at 12:48 pm

<table>
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<tr>
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<th>surveyYear</th>
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</thead>
<tbody>
<tr>
<td>10000</td>
<td>2021</td>
<td>ABC Hospital</td>
<td>Y</td>
<td>M - Major</td>
<td>35</td>
<td>38930</td>
<td>8694</td>
<td>01/12/2022</td>
</tr>
</tbody>
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Review annual survey line list

### Data used in Dec 2021

**SIR Report**

<table>
<thead>
<tr>
<th>orgID</th>
<th>surveyYear</th>
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<td>02/25/2021</td>
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### Data used in Feb 2022

**SIR Report**

<table>
<thead>
<tr>
<th>orgID</th>
<th>surveyYear</th>
<th>name</th>
<th>medAff</th>
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Confirm risk adjustment parameter estimate change

average length of stay (LOS) = \( \frac{\text{numPatDays}}{\text{numAdmits}} \)

- December 2021 report used 2020 survey, LOS = 5.2
- February 2022 report used 2021 survey, LOS = 4.5
- Change in LOS explains change in numPred

Fictitious data used for illustrative purposes only
### Review Risk Adjustment Factors (MRSA and CDI only)

**National Healthcare Safety Network**

**Risk Adjustment Factors for FacwideIN MRSA Bacteremia SIR**

As of: December 10, 2021 at 4:48 pm

orgID=10000 medType=M

<table>
<thead>
<tr>
<th>summaryYQ</th>
<th>MRSA_admPrevBldRate</th>
<th>MRSA_EDObsPrevRate</th>
<th>LOS</th>
<th>medType</th>
<th>facType</th>
<th>numICUBeds</th>
<th>numpatdays</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021Q3</td>
<td>0.045</td>
<td>0.055</td>
<td>5.2</td>
<td>M</td>
<td>HOSP-GEN</td>
<td>35</td>
<td>10150</td>
</tr>
</tbody>
</table>

The table above displays the values that are included in the calculation of your acute care hospital's MRSA Bacteremia Lab ID Event SIR.

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**National Healthcare Safety Network**

**Risk Adjustment Factors for FacwideIN MRSA Bacteremia SIR**

As of: February 12, 2022 at 12:48 pm

orgID=10000 medType=M

<table>
<thead>
<tr>
<th>summaryYQ</th>
<th>MRSA_admPrevBldRate</th>
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<th>LOS</th>
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The table above displays the values that are included in the calculation of your acute care hospital's MRSA Bacteremia Lab ID Event SIR.

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Recommendation

- Save SIR reports for each HAI ahead of the CMS deadline or other facility-specific deadline
- Also save annual survey line list
Resources

- https://www.cdc.gov/nhsn/psc/locations.html
For any questions or concerns, contact the NHSN Helpdesk at nhsn@cdc.gov

For more information please contact Centers for Disease Control and Prevention
1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov   Web: 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.