VI. Considerations for Facilities without an NHSN-calculated SIR

The NHSN Standardized Infection Ratio: A Guide to the SIR states: “In order to enforce a minimum precision criterion, SIRs are currently not calculated when the number of predicted infections is less than 1.0. This rule was instituted to avoid the calculation and interpretation of statistically imprecise SIRs, which typically have extreme values.”

Consistent with CDC, the workgroup does not recommend calculating the SIR for any facility, procedure, or unit that does not have a large enough exposure volume to have at least one predicted infection. However, hospitals in this situation are left without a performance metric for that infection type. As a result, hospitals with no infections may not be acknowledged or recognized for that accomplishment and hospitals that are doing worse than predicted may not be identified. Small units within hospitals or hospitals that perform a low number of procedures can also fall into this category. In addition, hospitals may view not having a performance metric as inequitable since their data are reported to NHSN, and having a “no conclusion” performance statement may not explain the context clearly to all audiences. The DAPS workgroup has discussed potential solutions and alternative ways to display and communicate HAI data in these scenarios.

At this time, the workgroup does not recommend one approach over another; instead, it recognizes the need for organizations to continue to learn from each other as different methods are implemented or changed over time. The toolkit is anticipated to evolve with future iterations.

The following table summarizes several approaches to presenting data for these facilities, along with associated advantages and disadvantages. Some of these approaches are not recommended for public reporting and are better suited for internal data quality checks. It is also possible to use the raw data for action; for example, consider highlighting hospitals or units in which the number of observed infections is greater than the number of predicted infections, or in which the number of observed infections is greater than a predetermined number such as 1 or 2. Each of these methods is described in more detail below the table, including an explanation of methodology, interpretation and consideration for data display, recommended language, and other considerations. The workgroup recommends that the following table be considered by a multidisciplinary group to determine which metrics are most appropriate for the organization. Additionally, regardless of which method is chosen, it is always important to, at a minimum, conduct a data quality check prior to analyzing the data (e.g., check for missing months of data, missing or mislabeled units, and other errors). General considerations for analyzing or interpreting the SIR can be found on pages 11-15 of the Methods Chapter.
**Table X. Summary of alternatives for presentation of data for facilities without an NHSN-calculated SIR**

<table>
<thead>
<tr>
<th>Method</th>
<th>Report zero observed infections</th>
<th>Provide SIR when number of predicted infections falls between 0.2/0.5 and 1.0</th>
<th>Present number of months since last infection</th>
<th>Aggregate data over a longer period of time</th>
<th>Present an infection rate</th>
</tr>
</thead>
</table>
| **Summary** | • Highlight hospitals with zero infections with a special symbol, regardless of their number of predicted events  
• Explicitly specify time period (start and stop date)  
• Recommend using neutral symbol | • Calculate SIR for facilities when the number of predicted infections is ≥0.20 or ≥0.50  
• Add note of caution for interpretation  
• Consider the impact of lowering threshold on the number of facilities with an SIR for a given infection category  
• Can be applied only to HAI categories for which NHSN has established a national baseline (i.e., not VRE or CRE LabID Events)  
• Not suitable for publication in a consumer report | • Present number of months since last infection  
• Explicitly specify time period (start and stop date)  
• Important to include catch-all category to capture >X months (e.g., 36+ months to never)  
• Present this value to facilities for their eyes only; not suitable for public reporting | • Extend the reporting period to analyze more data beyond a calendar year  
• Explicitly specify time period (start and stop date)  
• Additional data should increase the number of predicted infections  
• Utilizes all the same SIR terminology (interpretation and symbols) | • Provides information about the number of infections occurring in a specific population at risk for an infection type  
• Reporting should be stratified across similar populations  
• Consider stratifying rates by all variables used in the SIR models, or as many variables as possible  
• Not suitable for publication in a consumer report |
| **Pros** | • Clear and simple interpretation  
• No calculation required  
• Provides facilities with a practical benchmark  
• Gives facility recognition/credit | • SIR allows facilities to compare themselves to the national baseline  
• Confidence intervals (CI) provide information about the precision of data used for the calculation | • Provides facilities with an internal benchmark  
• This metric can be calculated regardless of the number of predicted infections  
• Could provide comparison (if hospitals are appropriately stratified)  
• Variety of display options  
• Clear and simple interpretation | • More data may mean fewer facilities with predicted number of infections <1  
• Aggregate data yield more precise results  
• Larger sample size will yield result closer to the true SIR  
• Facilities will be able to compare themselves to the national baseline | • Provides a standardized measure of occurrence  
• Precision of the rate can be displayed by 95% CI  
• Allows for stratified comparison within population risk group  
• Patients are able to see their risk of SSI from certain procedure types |
| **Cons** | • May not be current (e.g., with annual reports)  
• Notation is misleading (i.e., no risk adjustment)  
• Very small hospitals (e.g., only conduct surveillance on 1 unit) have a much easier time getting 0 infections | • May take substantial time and effort to calculate outside of NHSN  
• Due to small sample sizes, SIRs in these cases are rarely statistically significantly different than national baseline  
• Unclear if audience will understand different interpretations for facilities with less than one predicted infection  
• This SIR will be inconsistent with data presented in NHSN and on Hospital Compare | • Requires prompt and frequent reporting to be meaningful (more than annual)  
• May not be as beneficial to larger hospitals  
• Does not reflect infections since end of time period  
• May mask risk of infection over the time period  
• Does not account for risk adjustment | • Data may not be as timely or useful to facilities (reporting will be delayed)  
• No national SIR would be calculated for same time period (12 vs 18 or 24 months)  
• Limits the opportunity to measure annual changes over time  
• Need to consider protocol changes in NHSN within the time period for analysis  
• Does not guarantee predicted number of infections ≥1 | • Not risk-adjusted  
• Should only be compared within appropriate strata, leads to additional data tables  
• Likely too complicated of an interpretation for consumer report  
• Requires a sufficient patient time at risk (i.e., denominator-days) for accuracy  
• Can be computationally intensive, especially if varying multiplier  
• National rates no longer published |
A. Report zero observed infections

I. Introduction/overview
   Provide an additional symbol for hospitals with zero infections, regardless of SIR calculation, to highlight attaining zero infections. Some states have done this and received positive feedback from facilities.

II. Methodology
   No calculations are necessary; authors need to determine which facilities have zero observed infections in the SIR numerator.

III. Interpretation and consideration for data display
   a. Consumer Report
      This metric is ideal for a consumer audience, as it offers a clear and simple interpretation. Consider including a disclaimer in methods section:
      
      This metric may favor smaller hospitals as well as hospitals serving patients with comparatively low risk of developing infections, as it may be difficult for larger hospitals that perform more procedures or have more patients with invasive devices to observe zero infections.

   b. Technical Report
      This approach may be used in a technical report but should be accompanied with a similar disclaimer. Consider adding verbiage regarding risk adjustment not being accounted for in this metric.

IV. Recommended language/tables/other considerations
   The workgroup recommends that a consumer-friendly description and symbol be used to denote zero infections, but different from the symbols used to compare the SIR to the national experience. Additionally, clearly specify the time period for observation. Examples include:

   1. Normal footnote symbols (*, †, ‡, etc.)
   2. Culturally appropriate or state specific symbol (e.g. Hawaii uses a hibiscus 🌺)
   3. Slashed zero (∅)

   Consider incorporating interpretive language:

   If a hospital has zero observed infections, it does not mean that the hospital failed to report infections. When evaluating the performance of a hospital with zero observed infections, it may be important to consider the size of the hospital, the total number of procedures performed, device days or patient days, and the number of infections that were predicted (shown in the data tables).

V. Conclusion
   This approach provides facilities with recognition and a target to achieve if an SIR cannot be calculated. It is also clear and easy to interpret. However, the notation can be misleading since there is no risk adjustment and a facility’s risk of having an infection is not the same across all facility types.
B. Provide SIR when the number of predicted infections falls between 0.2/0.5 and 1.0

I. Introduction/overview

Presenting SIRs for hospitals with a low number of predicted infections (e.g., 0.20-0.99 predicted infections) enables stakeholders to view infection-specific SIRs for hospitals that may not have a large volume of patients or procedures performed.

When deciding whether to calculate SIRs for hospitals with less than one predicted infection, consider the impact of presenting an SIR for these hospitals, and whether the lowered threshold should be 0.2, 0.5, or another cutoff value. If the threshold for the number of predicted infections is lowered from 1.0 to 0.5, consider what proportion of hospitals would now have an SIR that previously would not.

Beginning in 2014, the California Department of Public Health (CDPH) began to calculate SIRs for hospitals with less than one predicted infection. In 2014, this was limited to specific SSI data in hospitals performing at least 100 procedures, but in the 2015 Annual HAI Report was expanded to include all infection types where the predicted number of infections was above 0.2.

The decision to calculate SIRs for hospitals with at least 0.2 predicted infections was partly based on the fact that substantially more hospitals would have an SIR they could use to compare to the national baseline or to themselves over time. For example, when CDPH lowered their threshold to 0.2 in 2015, only 1% of acute care hospitals had no *C. difficile* infection (CDI) SIR published, compared to 8% the previous year.

II. Methodology

When calculating an SIR for a facility with less than one predicted infection, technical reports should:

a) Use NHSN calculated values for number of observed and predicted infections to obtain a state-calculated SIR

b) Calculate 95% confidence intervals to include a measure of uncertainty

c) Provide symbols or interpretive criteria to indicate whether the facility SIR is significantly different than the national baseline

NHSN has SAS macros publicly available that can be used to calculate 95% confidence intervals around an SIR. The SIRcomp SAS macro uses the exact mid-p confidence intervals when observed and predicted numbers of events are less than or equal to 100. If more than 100 events are observed or predicted, use the Byar approximation method to calculate confidence intervals.¹ The NHSN helpdesk is available to answer any questions related to this methodology.

Note: This macro instructs the user to set confidence intervals to missing when less than one infection is predicted; this would need to be altered when performing this calculation for facilities with less than one predicted infection.

III. Interpretation and consideration for data display

a. Consumer Report

Presenting SIRs when the number of predicted infections is less than 1 will lead to inconsistent results between a state’s HAI report and the SIRs presented on Hospital Compare. For this reason, we do not

b. Technical Report

Organizations should add language and a symbol for each infection with an SIR -- either Better, Worse, or the Same as the national baseline. This symbol and interpretative language accompanies each SIR. If the number of predicted infections is less than the cutoff (e.g., 0.2, 0.5), the report should state “No Conclusion.”

Consider adding an asterisk (*) or another notation to tables when calculating SIRs for facilities with less than one predicted infection. Also consider including language that clarifies the purpose of the notation and that these measures should be regarded as less precise and accurate than the SIRs calculated by NHSN in which the predicted number of infections is at least one. Make it clear which SIRs are based on less than one predicted infection and list the numerator, denominator, resulting SIR, 95% confidence interval, and interpretation. In addition, consider using a separate data table to display all facility data in which the facility had less than 1 predicted infection but in which an SIR was calculated. See the example below of a CLABSI report when less than one infection was predicted.

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Unit Type</th>
<th>Device Days</th>
<th>Number of Infections</th>
<th>SIR and 95% Confidence Interval (CI)</th>
<th>SIR Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Memorial</td>
<td>ICUs</td>
<td>1,523</td>
<td>1</td>
<td>0.80</td>
<td>1.25* (0.06, 6.17)</td>
</tr>
<tr>
<td></td>
<td>NICUs</td>
<td>803</td>
<td>1</td>
<td>0.79</td>
<td>1.27* (0.06, 6.24)</td>
</tr>
<tr>
<td></td>
<td>Wards</td>
<td>986</td>
<td>3</td>
<td>0.65</td>
<td>4.62* (1.17, 12.56)</td>
</tr>
</tbody>
</table>

The SIR is not calculated when the number of predicted infections is less than [0.50].

*The number of predicted infections is less than one. Caution should be used when interpreting the SIRs based on less than one predicted infection, since a single observed infection can greatly influence the SIR. SIRs calculated based on less than one predicted infection have wider confidence intervals and are less reliable than SIRs based on more than one predicted infection.*
on at least one predicted infections. NHSN only calculates SIRs when the number of predicted infections is at least one; however, the <state health dept> has chosen to display an SIR for facilities with at least <xx> number of predicted infections in order to provide a comparison for these facilities to the national baseline. The SIRs shown in this table will not be inconsistent with those presented in NHSN or on Hospital Compare. Refer to the Methods section for a discussion of these calculations.

Additional footnote for consideration:
For facilities whose SIR is not calculated under this methodology (e.g., number of predicted infections < 0.5), an alternative interpretation of their data is offered below: Based on the data reported, when the number of predicted infections for a given year and infection type is less than 0.5, then we expect this facility will not have a single infection in a two-year time period. For ease of interpretation, this suggests that zero events are predicted to occur during a single year. This notion may be easily understood by a variety of audiences, and can be considered for inclusion as a separate footnote for applicable facilities in this table.

IV. Recommended language/tables/other considerations

Regardless of the number of predicted infections, it is important to include language that clarifies the role of confidence intervals and other measures of uncertainty. Add language that explicitly states the benefits of this method, but also cautions against interpreting these estimates:

*By calculating an SIR when the predicted number of infections is less than one, more hospitals can compare their infection incidence to the national experience and across time. However, caution should be used in interpreting these estimates based on very small number of predicted infections, where a single infection can greatly influence the SIR. SIRs calculated based on less than one predicted infection have wider confidence intervals and are less precise than SIRs based on predicted infections equal to or greater than one.*

V. Conclusion

For facilities that do not have enough data to have at least one predicted infection in a given infection category, presenting an SIR has several potential benefits and drawbacks. By providing these facilities with an SIR to compare to the national baseline, facilities with small volumes can compare themselves to the national baseline and to themselves over time. Using confidence intervals can restrict unfair interpretations by making it clear when an SIR is not significantly different than the national baseline. In most cases, the SIR will not be significantly different than the national baseline. Jurisdictions using this approach should state the purpose of calculating SIRs with less than one predicted infection, consider including confidence intervals, and clearly illustrate how the SIR should be interpreted (i.e., whether it is significantly different than the national baseline).

However, this process can be time and resource intensive, and the interpretation may be unclear to consumer audiences. Including SIRs for this group may not add substantial value to a report if the resulting SIRs feature large confidence intervals and imprecise estimates (i.e., an extremely low or high SIR with a wide confidence interval that includes 1.0).
C. **Present approximate number of months since last infection**

I. Introduction/overview

Providing the amount of time since the last infection for hospitals with less than one predicted infection can highlight hospitals that have gone a long period of time without an infection, as well as hospitals with less than one predicted infection that have a recent infection. If this metric is used, it is important to communicate how it was calculated and that it reflects a specific point in time, which should be clearly indicated in the report. This metric is not recommended for use in a public report but is appropriate for internal quality improvement reports.

II. Methodology

To calculate this value, select an appropriate unit of time; this workgroup would suggest measuring time in months (preferred over days or years). Determine appropriate start and end dates and clearly indicate these in the report. List the amount of time that the facility has reported data into NHSN without reporting an HAI. Consider stratifying these data by HAI type and ignoring any SIR exclusion rules that would typically have resulted in an event not being counted in the SIR.

When selecting the starting point, consider how many months/years of data are available and potentially identify a threshold after which the specific number of months would not be displayed (i.e., catchall category for >36 months). If a hospital never reported an infection based on the available data, consider displaying “>x months.”

Formula for calculating months since last infection:

\[
\text{Time (months) since last infection} = \frac{\text{Last day included in report} - \text{Date of last infection}}{30}
\]

III. Interpretation and consideration for data display

This metric is not recommended for use in a public report to discourage comparisons between hospitals. Therefore data display examples for consumer and technical audiences are not provided.

IV. Recommended language/tables/other considerations

There are a few options to consider when utilizing this metric. For example, Minnesota produces an anonymized dot plot (example 1) that displays a statewide distribution of time since last infection for facilities with less than one predicted infection. Additionally, a jurisdiction can produce a table displaying the same data (example 2) for a specific HAI. Finally, jurisdictions can produce a table featuring a facility snapshot of all HAIs reported (example 3). When selecting a display option, considerations should be given to time/effort needed to generate the plots or tables and desired effects (e.g., peer comparison vs. facility snapshot).

Regardless of which display option is selected ensure that a disclaimer or footnote is included (e.g., *Note: Data contained in this table were last generated on [Date]. These data are intended for internal facility use...*
only). If using this metric for SSI data, include the caveat of different surveillance periods for different procedures.

Example 1: Statewide Facility Dot Plot

**Statewide distribution of time since last CLABSI among hospitals with less than one predicted infection (n=42)**

![Statewide distribution of time since last CLABSI among hospitals with less than one predicted infection](image)

Example 2: Statewide Facility Table

**Approximate time since last CLABSI among hospitals with less than one predicted infection**

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Approximate Months since Last Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital A</td>
<td>3</td>
</tr>
<tr>
<td>Hospital B</td>
<td>3</td>
</tr>
<tr>
<td>Hospital C</td>
<td>15</td>
</tr>
<tr>
<td>Hospital D</td>
<td>&gt;36 or never</td>
</tr>
</tbody>
</table>

Example 3: Specific Facility Snapshot

**Time since last HAI for [Hospital Name]**

<table>
<thead>
<tr>
<th>HAI Type</th>
<th>Approximate months since Last Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI</td>
<td>3</td>
</tr>
<tr>
<td>CAUTI</td>
<td>3</td>
</tr>
<tr>
<td>CDI</td>
<td>15</td>
</tr>
<tr>
<td>MRSA bacteremia</td>
<td>&gt;36 or never</td>
</tr>
</tbody>
</table>
V. Conclusion

Time since last infection can be a helpful alternative when the SIR cannot be calculated, especially for smaller, lower volume hospitals. It is easy to understand; a long period of time without an infection is clearly good. However, this metric does not account for the risk of infection over the time period in the calculation. For example, a hospital with 0.9 predicted infections over a one-year period that had an infection 3 months ago would look the same as a hospital with 0.2 predicted infections that had an infection 3 months ago. This metric should be accompanied with technical details and methods. In addition, the metric reflects a static point in time and does not capture infections reported since the end of the time period included in the report. Finally, this metric is not an appropriate metric for public reporting.
D. **Aggregate data over a longer period of time**

I. **Introduction/overview**

A key component to calculating the SIR is to clearly define the start and end points. Typically, state reports will calculate an SIR for an entire calendar year. However, the time period can be modified for those hospitals with no SIR reported. One benefit of extending the length of the reporting time period is the accumulation of additional data to increase the predicted number of infections such that an SIR can be calculated.

The length of time chosen should be as long as needed (e.g., 18 or 24 months) to achieve a number of predicted infections greater than one (within reason). This section of analysis should consider all the facilities or units where the number of predicted infections is less than one. Generally, the longer the time period, the more likely it is to achieve at least one predicted infection.

II. **Methodology**

- For a comprehensive overview of the SIR calculation, please see the Methods Chapter.
- An SIR calculated by aggregating data over a longer period of time will continue to have all the same properties as the SIR presented in the main body of the report; the defining difference is the time period for which the data are derived.
- The easiest approach to generating the SIR is to modify the report within NHSN. When modifying the report, follow the directions for modifying the time period presented.
- Basic analytic considerations for the SIR when aggregating data over a longer period of time:
  - If data from NHSN are used, analyses should only include data that facilities have included in their monthly reporting plans.
  - Note that the Laboratory-identified SIR measures (MRSA bacteremia and *C. difficile*) for acute care hospitals are only calculated on a quarterly-level or higher. Therefore, the extended time period used to calculate SIRs should contain complete quarters, and the ending time period should not be in the middle of a quarter.
  - A report that presents hospital-level HAI metrics may carry with it the implication that all facilities contributed the same number of months of data included in the report. It should be qualified by an explanatory footnote if data contributions differ among hospitals.
  - As the time since the baseline period increases, consideration should be given to comparing a facility’s serial SIRs from one reporting period to the next (e.g., 2016-2017 CLABSI SIR vs. 2018-2019 CLABSI SIR). This will provide a more real-time measure of facility performance compared to changes from the baseline period. SAS code to perform this comparison is available on the NHSN website. These comparisons may be better suited for a technical report audience for the reasons described in the “Other Considerations” chapter.

\[ \text{SIR} = \frac{\text{Number of observed infections}}{\text{Number of predicted infections}} \]
• Include any information about analytic decisions when data are excluded.

III. Interpretation and consideration for data display

Interpretation of the SIR remains the same. The important consideration is to clearly define the time period and explain why this is different from the standard report. This should be done within all tables, figures, and for any written text of the SIR results. Please see the Methods chapter of the toolkit for a more detailed explanation of interpreting the SIR.

Additionally, present SIRs as they are presented in the main report (i.e., by infection type, facility, unit designation, etc.). It is recommended that all facilities or locations in which an extended time period was used to calculate the SIR be grouped separately from the main report in a designated section.

a. Consumer Report

The DAPS template for a consumer audience does not show a calculated SIR value, however, an interpretation of the SIR may be provided. A plain language approach is a suitable strategy for explaining the SIR to a consumer audience. See Chapter 8 – Consumer Data Tables for language intended for the consumer audience. Be sure to clearly define the time period and explain why these results are separate from the main report.

b. Technical Report

The workgroup recommends using similar language for interpreting SIRs using aggregated data from a longer time period as the main SIR report. In a technical report, consider using interpretive language geared towards clinicians and others more experienced with HAI reporting. See Chapter 9 – Technical Tables for language intended for the technical audience. Be sure to clearly define the time period and explain why these results are separate from the main report.

IV. Recommended language/tables/other considerations

Example Data Tables:

**Sample Consumer Title: Central Line-Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR) Report by Facility and Unit Type, Acute Care Hospitals, [STATE], [AGGREGATED TIME PERIOD]**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Infection Type</th>
<th>Unit Type</th>
<th>Time Period</th>
<th>Number of Infections</th>
<th>Facility comparison to national experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital A</td>
<td>CLABSI</td>
<td>ICUs</td>
<td>2014-2015</td>
<td>1</td>
<td>★ Better</td>
</tr>
<tr>
<td>Hospital B</td>
<td>CLABSI</td>
<td>Wards</td>
<td>2014-2015</td>
<td>0</td>
<td>★ Better</td>
</tr>
</tbody>
</table>

**Sample Technical Title: Central Line-Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR) Report by Facility and/or Unit Type, Acute Care Hospitals, [STATE], [AGGREGATED TIME PERIOD]**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Infection Type</th>
<th>Time Period</th>
<th>Number of Infections</th>
<th>SIR and 95% Confidence Interval (CI)†</th>
<th>SIR Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital A</td>
<td>CLABSI</td>
<td>2014-2015</td>
<td>1</td>
<td>2.8</td>
<td>★ Better</td>
</tr>
<tr>
<td>Hospital B</td>
<td>CLABSI</td>
<td>2014-2015</td>
<td>0</td>
<td>1.8</td>
<td>★ Better</td>
</tr>
<tr>
<td>Hospital</td>
<td>Type</td>
<td>Time Period</td>
<td>Observed Infections</td>
<td>Predicted Infections</td>
<td>SIR</td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>-------------</td>
<td>---------------------</td>
<td>----------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Hospital A</td>
<td>CLABSI</td>
<td>2014-2015</td>
<td>1</td>
<td>2.8</td>
<td>0.36</td>
</tr>
<tr>
<td>Hospital B</td>
<td>CLABSI</td>
<td>2014-2015</td>
<td>0</td>
<td>1.8</td>
<td>0</td>
</tr>
</tbody>
</table>

† When the SIR is 0, the lower bound of the 95% confidence interval cannot be calculated. However, for ease of interpretation, it can be considered 0.

V. Conclusion

There are several benefits and limitations to this approach. First, it is beneficial that more data may mean fewer facilities with predicted number of infections less than one. This can allow for more facilities to be analyzed using the SIR. Additionally, aggregated data across a longer time period can yield more precise results.

However, aggregating data will not always be useful for facilities with less than one predicted infections. For example, data may not be as timely or useful to facilities (i.e., reporting will be delayed). Additionally, there is no national SIR value for the same time period. This approach also limits the ability to measure annual changes over time. It is important to consider any changes to NHSN protocols when pooling data over multiple years.

Lastly, this approach does not guarantee that the number of predicted infections will be equal to or greater than one. Therefore, there is currently no recommendation for aggregated time period length (e.g., 18 months, or 24 months).
E. **Present an infection rate**

I. **Introduction/overview**

Infection rates can provide valuable information about the HAI experience in a hospital. When a risk-adjusted measure is not available, (e.g., in situations when the number of predicted infections is less than one), infection rates can be considered as an alternate metric for tracking HAI.

II. **Methodology**

Refer to pages 10-11 of the *Methods Chapter* for a thorough discussion of the use of infection rates. A high-level summary is provided below:

a. Limit the publication of NHSN data to “in-plan” data only.

b. Ensure the facility has sufficient exposure volume in order to calculate a meaningful rate. As a recommendation:
   i. Device-associated rates should be stratified by type of unit and only calculated for locations with at least 50 device days.
   ii. SSI rates should be stratified by procedure type and only calculated for facilities that perform at least 20 surgical procedures of that type.
   iii. LabID rates should be presented facility-wide (FACWIDEIN) and only calculated for those facilities with at least 50 patient days.

c. Consider using the NHSN default multiplier when calculating rates; however, if the resulting rates are too small or large for a meaningful interpretation, adjust the multiplier as needed.

d. Rates should be stratified based on the known risk factors that are significantly associated with that HAI’s incidence (refer to SIR models as listed in *NHSN Guide to the SIR*).

<table>
<thead>
<tr>
<th>HAI Type</th>
<th>NHSN Default Multiplier</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device-associated Events (CLABSI, CAUTI, VAE)</td>
<td>1,000 device days</td>
<td># of infections per 1,000 device days</td>
</tr>
<tr>
<td>Surgical Site Infections</td>
<td>100 procedures</td>
<td># of infections per 100 procedures</td>
</tr>
<tr>
<td>MRSA bacteremia Laboratory-identified (LabID) Events</td>
<td>1,000 patient days</td>
<td># of events per 1,000 patient days</td>
</tr>
<tr>
<td>C. difficile LabID Events</td>
<td>10,000 patient days*</td>
<td># of events per 10,000 patient days</td>
</tr>
</tbody>
</table>

* When the MDRO/CDI module was developed, NHSN decided to use 10,000 patient days as the multiplier when calculating CDI Rates for LabID event surveillance, thinking that incidence would be fairly low. Therefore, this was done in NHSN simply for ease of interpretation. Multipliers only impact how you interpret the rate (per 1,000 patient days, per 10,000 patient days, etc.) and do not change the actual raw value/calculation of the rate itself.

Example Rate Calculation: CLABSI in medical ICUs during 2017

\[
CLABSI \text{ Rate} = \frac{\# \text{ CLABSI}\text{s}}{\# \text{ of central line days}} \times 1,000
\]

**Example:** 5 CLABSI\text{s} / 4,500 central line days * 1,000 = 1.11 CLABSI\text{s} per 1,000 central line days

III. **Interpretation and consideration for data display**
a. Considerations for Consumer Report
Due to the careful interpretation required when reviewing infection rates, displaying rates in a consumer report is not recommended.

b. Considerations for Technical Report
It should be noted in the report that many factors can influence an infection rate in a facility and that infection rates for one facility should not be compared to infection rates for another facility. To help prevent readers from making unfair comparisons and to provide a more meaningful interpretation, rates should be stratified whenever possible using the variables included in NHSN SIR risk adjustment models for that infection type. For example, some types of patient care areas within a hospital experience higher rates of device-associated infections than others and each patient undergoing a surgical procedure has different patient- and procedure-level risk factors. A single facility-wide rate does not take these various risk factors into consideration.

In a technical report, include the values for the 95% confidence interval around the rate. A SAS macro is available to perform this calculation.

c. Display of rates
We recommend that all facilities for which rates are being calculated be displayed together in a designated section of the report, separate from facilities with an SIR.

Rates should be stratified based on the major factors included in the SIR risk-adjusted model, and a rationale for the stratification should be included in the methods section (e.g., to align with NHSN published rates or to account for differences in infection risk among patient care area types or patients undergoing surgical procedures).

Sufficient explanation about the use of rates should be provided in a methods section. We recommend listing all factors included in the SIR risk adjustment model for that facility/infection type as possible influencers of the facility’s rate (e.g., “CLABSI infection rates are known to be impacted by the size of the facility, the type of facility, medical school affiliation, and type of unit”).

IV. Recommended language/tables/other considerations

a. Use of benchmarks
For most infection types, national rates are no longer available or published from NHSN.

- In the future, a facility’s rate could be compared to this national 2015 rate if following the same level of stratifications.
- The predicted rate calculator will not be updated on an annual basis. The 2015 national data will be the only data available in this calculator – therefore, this national comparison will eventually become outdated.

If NOT using the rate calculator: These facilities cannot be compared to a national benchmark. Therefore, facilities for which rates are being calculated should be compared to themselves over time to assess changes in HAI incidence in the facility.
b. Other considerations
Readers should be cautioned when interpreting rates, as this is not a risk-adjusted metric and therefore should not be compared to any other facility.

V. Conclusion

Infection rates can be used to track HAI incidence in a specific facility/unit/procedure over time, especially when the SIR cannot be calculated. Rates provide an obtainable metric for the facility to use in tracking their HAIs which can be helpful for prevention efforts. However, caution should be used when interpreting rates. Rates are not risk-adjusted, and therefore are easily influenced by changing factors within a facility, such as changes in patient population or laboratory testing practices. Rates should be stratified by the significant risk factors when available, which may require substantial analytic work outside of NHSN. The layout, organization, and text around the displayed rate tables should clearly discourage comparison of rates between facilities. Due to the nuances and careful interpretation needed when reviewing rates, this metric may not be suitable for a consumer audience. Furthermore, national rates are currently not available from NHSN. Therefore, benchmarking can be performed only by comparing the facility to itself over time.