# Healthcare-Associated Infection Data Analysis and Presentation Standardization Toolkit

CSTE
COUNCIL OF STATE AND TERRITORIAL EPIDEMIOLOGISTS

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# Healthcare-Associated Infection (HAI) Data Analysis and Presentation Standardization (DAPS) Toolkit

## *Overview and Table of Contents*

The CSTE/CDC Healthcare-Associated Infection (HAI) Data Analysis and Presentation Standardization (DAPS) Workgroup (hereafter referred to as "the workgroup") is charged with identifying and recommending specific methods for analyzing and reporting HAI data when those data are publicly disclosed. The workgroup's discussions and decisions are guided by a common understanding that publicly reported HAI data at a minimum should meet the needs of two key audiences: healthcare consumers (e.g., patients and their families) and healthcare/public health professionals. Further, as guiding principles, the same HAI data can serve multiple purposes, and differences in data uses and user groups should inform decisions about how best to analyze and present the data. Fundamental differences in user group expectations include the granularity of results, extent of technical information, and type of explanatory notes they seek from public reports of HAI data. In operational terms, the workgroup translated these guiding principles into an overarching recommendation: State HAI programs and other organizations publishing HAI measures and data analyses should produce distinct reports for healthcare consumers and healthcare/public health professionals. More specific recommendations for methods and data presentation styles tailored to each audience are outlined below:

**(1) A consumer-friendly HAI report** that presents data in a high-level summary form and uses plain language to reduce the cognitive burden of consuming HAI information that would otherwise poses challenges to individuals without a clinical or public health background. The healthcare consumer audience includes members of the general public, the media, legislators, and others with limited or no prior knowledge of HAI data. The purpose of this consumer report is to provide sufficient HAI information in an understandable way that will enable consumers to view facility-specific HAI performance and make informed decisions about selecting healthcare from the available options. Overall state HAI performance also will be of interest to legislators, policy researchers, media personnel, and others. Consumers who are more "data savvy" or wish to have more information should be directed to the technical HAI report.

**(2) A technical report tailored to healthcare providers** and those with HAI subject matter expertise and/or epidemiologic methods. This audience may also include clinicians, administrators, public health professionals, biostatisticians, and others. This report can include more advanced statistics and data presentation strategies as compared to the consumer-friendly report. The purpose of the technical report is to provide sufficient HAI information in an understandable way to enable healthcare providers and public health professionals to view facility-specific HAI performance, evaluate interventions to drive change within a facility, understand the entire state's HAI performance as a whole, and/or to compare a facility's HAI experience to that of the rest of the country.

The workgroup recognizes that some states have legal requirements for how they must analyze and/or present HAI data. This toolkit should serve as recommended best practices in the display and communication of HAI data analyses, for both consumers and providers, to be implemented by a state health department or other organizations that publicly report HAI data, to the extent possible. Establishing and maintaining standards across states and organizations that report these data will improve the consistency and usability of this information.

HAI report authors are encouraged to review each toolkit component listed below for specific examples of how (and why) to tailor the report to its intended audience, and to view sample templates of HAI data display for both a consumer and healthcare provider audience.

## *Toolkit Table of Contents*

The following sections of this toolkit outline the recommendations of the CSTE/CDC HAI Data Analysis and Presentation Standardization Workgroup.

- ***Toolkit Introduction:*** Includes a history and a description of the process for creating this toolkit. Also includes a summary of relevant literature, prior research in the area of public reporting of hospital quality data, and examples of recent state efforts to address the needs of a consumer and technical audiences.

- ***Methods for Composing HAI Reports*:** Provides sample text and descriptive elements to include in a methods section of an HAI public report. Also provides guidance on the recommended methods for analyzing HAI data.

- ***Template Report for Consumers*:** Provides example explanatory text and educational materials for an HAI report tailored to healthcare consumers.

- ***Template Report for Providers*:** Provides example text and educational materials for an HAI report tailored to a technical audience (e.g., healthcare providers and other public health professionals).

- ***Other Considerations:*** Provides background on the toolkit workgroup's decision-making processes, additional display and analytic considerations, and an overview of the Maryland focus groups that helped offer a consumer perspective during the toolkit creation process.

- ***Data Tables****:* Provides template tables for displaying HAI or healthcare worker influenza vaccination summary data as well as infection-specific HAI tables tailored to a consumer or technical audience.

  The infection tables display HAI data from two device-associated HAIs (central line-associated bloodstream infections and catheter-associated urinary tract infections), one procedure-associated HAI (surgical site infections), and two

laboratory-identified (LabID) event measures (methicillin-resistant *Staphylococcus aureus* bacteremia and *Clostridium difficile*). These sample template reports will present HAI data using standardized infection ratios (SIRs), comparing the facility's observed number of infections to the predicted number based on the NHSN national baselines (however, please note that guidance is provided in the "Methods for Composing HAI Reports" chapter of the toolkit for the analysis of HAI infection rates).

  - **Infection Summary Table**
  - **Infection Tables for Consumer Report**
  - **Infection Tables for Technical Report**
  - **Summary Data Table for Hospital Process Measures**
  - **Healthcare Worker Influenza Vaccination Summary Table**

- ***Technical Resources:*** Includes example SAS code, image files, and other materials needed to implement the recommendations in the toolkit.
  - **SAS code**
    - Infection Summary Table
    - Consumer Report
    - Technical Report
    - Healthcare Worker Influenza Vaccination Summary Table and Summary Data Table for Hospital Process Measures
  - **Sample output from SAS code**
    - Infection Summary Table
    - Consumer Report
    - Technical Report
    - Summary Data Table for Hospital Process Measures
    - Healthcare Worker Influenza Vaccination Summary Table
  - **Image files**
    - Catheter-associated urinary tract infection (**PNG image**) (**PNG image with text**) (**scalable Adobe Illustrator file with text**)
    - Central line-associated bloodstream infection (**PNG image**) (**PNG image with text**) (**scalable Adobe Illustrator file with text**)
    - Surgical site infection (**PNG image**)

- ***Report Dissemination Strategies*:** Includes suggestions on methods to publicize HAI reports and things to consider when working with the media on report releases.

- ***Toolkit Conclusions*:** Describes concluding thoughts on toolkit implementation and needs for future research in the field.

- ***Toolkit Evaluation***

- ***Workgroup Members and Acknowledgments***

- ***CSTE Position Statement: Data Analysis and Presentation Standardization Toolkit (13-ID-02)***

- ***References***

# Toolkit Introduction

## *Executive Summary*

The National Healthcare Safety Network (NHSN) is a secure, internet-based surveillance system managed and maintained by the Centers for Disease Control and Prevention (CDC). As the leading national surveillance system for healthcare-associated infections (HAIs), NHSN now serves more than 15,000 medical facilities tracking HAIs and other patient safety indicators, including bloodstream infections, surgical site infections, and healthcare personnel influenza vaccination rates, among others. Current participants reporting data to NHSN include acute care hospitals, long-term acute care hospitals, psychiatric hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and nursing homes, with hospitals and dialysis facilities representing the majority of facilities reporting data. The data submitted by those healthcare facilities are used to improve patient safety at the local, state, and national levels. The CDC analyzes and publishes the surveillance data to estimate and characterize the national burden of HAIs. At the local and state level, participating facility and group users (such as state health departments) can access the data to generate reports and graphs that compare facility-level or state-level HAI metrics to national aggregate data. These reports and graphs may be published online on a website or made available to the public via an interactive web portal or hospital report card.

Currently, multiple organizations and stakeholder groups publish NHSN data using various methods, time periods, and presentation strategies. These differences in data analysis and presentation techniques can lead to conflicting results and consumer confusion regarding the HAI experience in an individual facility. Although individual states may have legislative or regulatory stipulations on how HAI data are to be displayed and shared, development of a standardized approach to data presentation can fill a gap in the current practice of HAI public reporting. As participation in NHSN increases and the availability of HAI data extends to a variety of governmental and non-governmental organizations, it is imperative to outline some distinct parameters for appropriate analysis and presentation of HAI data.

To that end, in June 2013, the Council of State and Territorial Epidemiologists (CSTE) passed a policy position statement (13-ID-02) that called for the establishment of a multidisciplinary workgroup chaired by CSTE and CDC to develop a toolkit of best practices and recommended methods of presenting and analyzing HAI measures.

The HAI Data Analysis and Presentation Standardization toolkit was developed as a result of the workgroup's activities and is designed to inform states and organizations that analyze and present HAI data. This toolkit additionally provides recommendations on how to effectively share and communicate HAI metrics targeted to the public report's audience.

HAI report authors are advised to review the analysis and display recommendations in the toolkit and implement the strategies, to the extent possible, in consultation with internal and external stakeholders.

Evaluation on the toolkit is encouraged, and continued research in the field is necessary to learn more about how to make HAI information most useful to the report audience, especially to healthcare consumers. Please see the "Evaluation" chapter of the toolkit to provide the workgroup with any feedback as you begin to implement the toolkit.

## *Background*

Over the past decade, states have passed legislation and/or regulation to collect and report HAI data to public health or patient safety authorities.

According to Edmond and Bearman (2007), theoretically, there are four ways that public reporting can improve healthcare quality:

(1) remediation (hospitals make a concerted effort to improve quality)
(2) restriction (licensing and accreditation organizations use the data to restrict provision of care by poor performers)
(3) removal (poor performers discontinue providing services)
(4) competition (between providers on the basis of improving quality to improve market share)

However, to drive performance and improve healthcare quality, the data must be presented in a way that is meaningful and understandable by the intended audience(s).

Federal agencies such as the CDC and the Centers for Medicare and Medicaid Services (CMS) as well as consumer groups (e.g., Consumers Union, the Leapfrog Group) publicly report HAI data for a variety of purposes, including informing policy development, evaluating progress toward infection reduction targets, and aiding consumers in making decisions about healthcare. Although multiple stakeholder groups use the same data source (NHSN), their varying methods, time periods, populations, and presentation strategies can lead to conflicting results and different conclusions. This can cause confusion for consumers who are trying to use the information to make educated decisions, and for healthcare providers and public health researchers who view and analyze the reported data from multiple publications.

CSTE position statements from 2010-2012 (10-ID-28, 10-SI-05, 11-SI-03, 12-ID-06) made efforts toward standardizing HAI surveillance methods and promoting the complete and accurate reporting of HAIs, but did not specifically address data presentation methods. As HAI reporting requirements and mandates have matured and grown within states, so too have the individual approaches to the presentation of HAI statistics and measures in published reports and online data dashboards. Although consensus groups like the Healthcare Infection Control Practices Advisory Committee (HICPAC) have published standards on essential elements of an HAI reporting system and on HAI surveillance (McKibben et al., 2005; Talbot et al., 2013), most of the focus

to date has been on the specific measures that are collected and reported, and not on the manner in which the data are displayed. For example, the most recent HICPAC guidelines address the public reporting of HAI surveillance data and outline some of the limitations and unintended consequences of using HAI surveillance data for inter-facility comparisons (Talbot et al., 2013). In light of this absence of standardization of NHSN HAI data presentation strategies, CSTE passed a policy position statement in June 2013 (13-ID-02) calling for the establishment of a multidisciplinary workgroup chaired by CSTE and CDC to develop a toolkit of best practices and recommended methods of presenting HAI measures and statistical information, including analytic standards, to a variety of audiences. A list of workgroup members is provided in the "Workgroup Members and Acknowledgments" chapter of the toolkit.

One objective of an HAI public report is to inform and empower the consumers' choice of healthcare provider. Despite this goal, there is evidence to suggest that very few consumers are actually using healthcare quality data when making healthcare decisions. A 2008 poll by the Kaiser Family Foundation found that 30% of Americans said they had seen healthcare quality data used in comparisons of hospitals, physicians, or insurance plans, but only 14% of Americans had used this information to make healthcare-related decisions (The Henry J. Kaiser Family Foundation, 2008). McGuckin and colleagues (2014) note that "the foundation of consumer awareness is engagement" and suggest that to increase consumers' awareness of HAI public reports, consumers should be involved in the development of the information. Further, McGuckin notes that consumers should receive detailed instructions on how to access and use the information provided. In response to this evidence, consumers and advocacy groups were involved in the design and testing of this toolkit and its HAI report templates.

Policymakers and healthcare providers also are key stakeholders that use and interpret publicly reported HAI data. For this particular audience, it is important that the analytic methods and data caveats are clearly delineated in the report to aid in transparency and trust of the reported data. In 2005, only 30% of physicians surveyed believed that the healthcare quality measures displayed in a public report were generated from accurate data (Jones, 2012).

There are several obstacles to the development and implementation of HAI display standards. A variety of process and outcome measures exist for assessing facility performance (in regards to HAI prevention), and many of them have complex underpinnings. At-risk populations and denominator calculations vary between infection types (e.g., urinary catheter days for catheter-associated urinary tract infections, surgical procedures for surgical site infections, patient days for *Clostridium difficile* infections). Some measures are risk-adjusted and are compared to a reference population, such as the standardized infection ratio (SIR), a measure that compares the observed number of infections in a facility or state to a predicted number based on national, historical baseline data. Others, like infection rates, may be crude, stratified, or risk-adjusted, and may or may not be compared to another population. Another challenge influencing the establishment of data presentation standards is the fact that different states may have regulations or legislation that prescribe how and when data are to be published and in what format.

HAI data analyses are complex, and need to be displayed in ways that are accessible to different audiences with varied levels of mathematical sophistication and knowledge of HAIs. As the science and practice of public reporting of HAI measures has progressed, some states and regions have involved consumer and stakeholder input to identify the data elements and presentation strategies that are of greatest interest to different groups and that maximize comprehension of the data.

Some examples from state HAI programs include:

- **Maryland**: Prior to creating web-based public reports of HAI data, two focus groups were conducted; one of consumers and one of healthcare professionals. After identifying differences in the audiences' ability to understand and interpret the presentation options presented, two websites were produced, each with a report tailored to the intended audience. The consumer site presents the number of observed and predicted infections and an SIR symbol noting a comparison between the facility and the baseline national experience. Alternatively, the report for healthcare professionals contains more data and is available at a more granular level.

- **New Mexico**: As part of a regional collaborative on HAI website design, four focus groups were held with members of the general public to gather information on their interest in and current familiarity with HAI data, preferences for information on an HAI website, and to get feedback on several possible displays of HAI data. Despite preferring a visualization that was thought to be simple, consumers still did not demonstrate understanding of the data they were viewing and did not use the data that were reported.

- **Virginia**: Numerous stakeholder groups including infection preventionists, members of the multidisciplinary statewide HAI Advisory Committee, and a patient/consumer advocacy group were engaged to gather input when the state health department was developing a new central line-associated bloodstream infection report for healthcare providers and the general public. The patients/consumers were interested in highlighting the hospitals that achieved zero infections during the time period. Advisory Committee members and health department epidemiologists stressed the importance of including confidence intervals with the reported data to show statistical significance. Infection preventionists favored a color scheme in which facilities that were statistically similar to the national experience were in blue, while consumers preferred the "stoplight" colors of red, yellow, and green (where red indicated that a hospital had statistically more infections than predicted and green indicated the hospital observed statistically fewer infections than predicted).

- **Washington:** HAI program staff have been engaged in a variety of studies, collaborations, and research projects to examine the evidence behind public reporting of hospital performance data. A paper published by Birnbaum et al. (2010) explains an approach to improving the usage and impact of hospital comparison websites that involved developing prototype reports based on design principles to address issues related to poor usage and impact, and conducting focus group evaluations to test the prototypes. Research by Amini and colleagues (2013) examines the credibility and user-friendliness of state websites that publicly report hospital infection rates.

Other organizations and research groups have studied the issue of effective presentation of health data, including quality and patient safety information. For example, in 2010, Aligning Forces for Quality (AF4Q), a Robert Wood Johnson Foundation initiative, sponsored a guide describing how to display comparative quality information that consumers can understand and use (American Institutes for Research, 2010). According to this document, there are three goals of a good display of comparative information:

(1) Make it easy to identify and understand patterns.
(2) Help users focus on topics or providers of interest.
(3) Reduce the amount of information for users.

In addition, reports should strive to combat two common problems: "data overload" (too much information to process and use), and "bewilderment" (users can't find the information they want or can't understand what they have).

The AF4Q guide includes a checklist of nine criteria that identifies ways to improve the effectiveness of quality data display. The criteria address domains such as:

- Use plain language
- Distinguish clearly between high and low performers
- Be concise (i.e., allowing users to pay attention to what matters to them most)
- Use a consistent display manner throughout the report
- Show the performance of multiple facilities (or providers) at the same time
- Show how local or state performance compares to national performance (i.e., identify the level of quality across the facilities/providers in a community)
- Target the information needs of the audience
- Highlight areas in which different facilities (or providers) perform well and not so well
- Bring different pieces of information together to choose the provider that is best for the user

## *Impact*

Improving the analysis and presentation of HAI data has several potential public health impacts. In addition to improving the ability for public health to meaningfully monitor trends in the HAI data, these best practices aim to improve stakeholders' capacity to understand and use HAI data. Following best practices in an HAI report can ensure that

all recipients of HAI data are provided with adequate information about the importance, meaning, and interpretation of specific measures and are given guidance and support in using the information. This will help avoid common pitfalls that lead to misinterpretation of the data.

Using a consistent data presentation framework can increase healthcare providers' and consumers' trust in the data. If providers understand and trust the data, it may encourage them to more actively use the information to improve the quality of care in their facility. By removing some of the confusion and conflicting results that exist currently, consumers' understanding of HAI measures and statistical information can be deepened. Further, consistency of reporting and improved understanding may engage and motivate consumers to explore and use reports when making healthcare decisions. If consumers use the information to make informed choices, it may be likely that they will obtain high-quality healthcare for themselves and their family members. Collectively, many consumers making informed choices may stimulate quality improvement among providers and help healthcare facilities continue to work toward patient safety and infection prevention goals.

# Methods for Composing HAI Reports and Key Concepts for Analyzing HAI Data

Contents:



The purposes served by HAI data and analyses vary by the perspective of the audience, and perhaps the most notable and important differences are between the lay public (healthcare consumers) and other audiences comprised of individuals who may be more familiar with HAIs and their epidemiology (including clinicians, quality improvement professionals, and public health professionals). The workgroup recommends creating separate HAI public reports for these two audiences.

Differences in purposes and between key user groups of HAI reports underscore the importance of including a methods section in any public report of HAI data that is clearly stated and targets the intended audience. The consumer-friendly report may include a subset of key methodological points, while the more technically-oriented report may contain a detailed explanation of the techniques used to calculate the HAI summary statistics presented, along with an explanation of their underlying data elements.

In this section of the toolkit, a series of best practices that can be used when analyzing and publishing HAI data is presented. State legislative mandates and other internal reporting requirements may necessitate variation from these best practices in some cases.

## *I. Metrics*

Public reports of HAI outcome data generally use one of two metrics – infection rates or standardized infection ratios (SIRs) that compare the number of reported infections to a predicted number of infections calculated from a given baseline period and reference population. Both metrics are useful in measuring and communicating HAI incidence.

Infection rates can provide valuable information about the HAI experience in different patient care areas of a hospital. An assessment of the need for risk adjustment should

precede publication of aggregated infection rates and should take into account known differences in risks of infection because of various patient- and hospital-specific factors. For example, some types of patient care areas within a hospital experience higher rates of device-associated infections than others (Dudeck, Weiner, Allen-Bridson et al., 2013), each patient undergoing a surgical procedure has different patient- and procedure-level infection risk factors (Mu, Edwards, Horan, Berrios-Torres, Friedkin, 2011) and facilities may experience a higher incidence of methicillin-resistant *Staphylococcus aureus* or *Clostridium difficile* infections due to the prevalence of these infection types in the community, and other facility-level factors (Dudeck, Weiner, Malpiedi et al., 2013). A single facility-wide rate may not take these various risk factors into consideration.

The SIR is a risk-adjusted metric that uses location-specific rates or individual patient, facility, and surgical factors to control for differences in infection risk. SIRs can be calculated at the individual location or procedure level as well as the aggregate facility-wide or statewide level.

Healthcare worker influenza vaccination data should be presented as a vaccination percentage. Please refer to Appendix 1 for detailed recommendations about the calculations and display of these data.

## *II. Basic Elements to Include in the Methods Section of an HAI Report*

*IIA: All Audiences*
Regardless of the report's audience and metric(s) included, any public report of HAI data should include the following key elements in a methodology section:

- **Data source** – describe the system used to obtain the HAI data (e.g., CDC's NHSN, state reporting system, claims data)
- **Type of HAI** – summarize and define the infections that are reported, and consider providing separate tables or graphs for each infection type unless a composite metric is used. If a composite metric is used, describe the component measures and how they contribute to the composite score. When discussing the type of infection, include information about any surveillance definition changes or considerations that apply to the reporting time period's data.
- **Place** – clearly describe the jurisdiction that the report covers – the nation, a region, a whole state, part of a state, or a select group of hospitals or other healthcare facility types within a state or across different states. If infections are reported from distinct location types within a hospital, this should be noted as well.
- **Time** – indicate the time period during which the events occurred. Be sure to note the difference between when the events occurred and when the report is published so report users are aware of how "real-time" the data are (e.g., data from HAI events occurring in 2013; published in 2015).

- **Freeze date** - the date on which the HAI data were pulled from the surveillance system and frozen for analysis should be included in the public report.
- **Facility types** – different facility types care for different types of patients and therefore may have different infection experiences. Be sure to indicate which healthcare facility types are included in the report and consider placing HAI data from different types of facilities [e.g., long-term acute care hospitals (LTACHs) or inpatient rehabilitation facilities (IRFs)] in separate tables or graphs.
- **Validation** – a robust data validation program may result in the identification of additional infections or corrections being made to denominator data. Details should be provided on any validation activities performed, including data quality assessment of oddities or outliers and/or medical record review to audit case ascertainment. References to any published validation protocols used should be provided. If no validation has been done on the data used to create the report, it is important to mention that as well.
- **Description of metrics included (e.g., rate, SIR)** – define the infection metrics used in the report.

    - **Sample introductory language defining the SIR** (if used in the report)**:**
      The SIR is a summary measure that can be used to track HAIs over time and can be calculated on a variety of levels, including unit, facility, state, and nation. It adjusts for differences between healthcare facilities such as types of patients and procedures, as well as other factors such as the facility's size and whether it is affiliated with a medical school (please refer to section/page number {include link to other material in the report} for more information about risk adjustment). It compares the number of infections reported in a given time period to the number of infections that were predicted using data from a baseline time period, which varies for different infection types. Lower SIRs indicate better performance.

$$\text{SIR} = \frac{\text{Number of observed infections}}{\text{Number of predicted infections}}$$

    - **Sample language defining an infection rate:** An infection rate provides information about the number of infections that occurred in a particular population at risk for an infection. For example, a central line-associated bloodstream infection (CLABSI) rate calculates the number of CLABSIs that occur for every 1,000 days that patients have at least one central line in place. Lower rates indicate better performance.

$$\text{CLABSI rate} = \frac{\text{Number of CLABSIs}}{\text{Number of central line days}} \times 1000$$

- **Comparison group** – a comparison group should be cited if reporting infection rates and performing comparisons to national or state data. For SIRs, cite the baseline time period and describe the reference population used for each type of infection.
    - ❖ **Sample language to describe the national baseline and how the predicted number of infections is calculated**:
      The national experience (or "national baseline") is aggregated (summary) data reported to NHSN by all facilities during a baseline period. These data are used to "predict" the number of infections expected to occur in a hospital or state. Infection types presented have different baseline years for comparison. In this report, the number of predicted infections is an estimate based on infections reported to NHSN during the following time periods:
        - 2006 to 2008: Central line-associated bloodstream infection (CLABSI) and surgical site infection (SSI) for acute care hospitals (ACHs)
        - 2009: Catheter-associated urinary tract infections (CAUTI) (ACHs)
        - 2010 to 2011: Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and *C. difficile* laboratory-identified events (ACHs)
        - 2013: CLABSI [long-term acute care hospitals (LTACHs)] and CAUTI [LTACHs and inpatient rehabilitation facilities (IRFs)]

      Once CDC updates the national baselines, [state] will be able to publish SIRs and compare infections to a more recent time period.

*IIB: Additional Material for the Technical Report*
The methods section in the technical report should include additional information about the methodology used to produce the HAI summary data and any statistical conclusions, including:

- **Risk adjustment** – if reporting infection rates, indicate the rationale for the level of stratification used (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). If reporting SIRs, describe the risk adjustment methodology (e.g., risk adjustment using a reference population's infection experience or applying a series of risk models to a reference population). NHSN produces SSI SIRs using several different risk models, with each one including a different subset of infections and surgical procedures. The risk model used (and

any modifications done to the risk model outside of NHSN) should be explicitly stated.

- **Sample language defining the factors used in the SIR risk adjustment produced by CDC** (*modify as needed to specify the risk adjustment performed by the state and/or the SIR model used in the report*):
  The SIRs are risk adjusted by taking into account risk factors, such as type of patient care location, bed size of the hospital, patient age, and other factors, that vary among hospitals and that may underlie differences in the number of reported infections. The SIR is adjusted differently depending on the type of infection measured.

  The SIRs for CLABSIs and CAUTIs are adjusted for:
  - Type of patient care location
  - Hospital affiliation with a medical school (for some units)
  - Bed size of the patient care location (for some units)

  The SIRs for hospital-onset *C. difficile* and MRSA bloodstream LabID events are adjusted using slightly different risk factors:
  - Facility bed size
  - Hospital affiliation with a medical school
  - The number of patients admitted to the hospital who already have a *C. difficile* or an MRSA bloodstream LabID event ("community-onset" cases)
  - For hospital-onset *C. difficile*, the SIR also adjusts for the type of test the hospital laboratory uses to identify *C. difficile* from patient specimens

  The SSI SIRs are presented using CDC's Complex Admission/Readmission (A/R) model, which takes into account patient differences and procedure-related risk factors within each type of surgery. These risk factors include:
  - Duration of surgery
  - Surgical wound class
  - Use of endoscopes
  - Re-operation status for orthopedic surgeries (e.g., knee replacement, hip replacement)
  - Patient age
  - Patient assessment at time of anesthesiology

- **Data exclusions** – include information about analytic decisions such as types of surgical site infections that are excluded or outlier data that are excluded.
  - **Sample language defining the use of the Complex A/R model for SSI SIRs**:
    To capture those infections most likely to be reported consistently across facilities, only deep incisional and organ/space infections detected during the same admission as the surgical procedure or upon readmission to the

same hospital that performed the surgical procedure are included in the reported SIRs. Superficial incisional SSIs and those identified on post-discharge surveillance are excluded. More details on the Complex A/R model, as well as definitions for the different types of surgical site infections, can be found in the NHSN SSI Protocol: http://www.cdc.gov/nhsn/acute-care-hospital/ssi/index.html

- **Statistical comparisons or tests** – information about statistical significance tests used to produce confidence intervals or p-values should be included only in a technical report. If confidence intervals are presented and there are facilities or units for which the lower bound of the confidence interval cannot be calculated, an explanation of the interpretation of the lower bound may be included in the data table. Note that the NHSN application uses a mid-P exact test when calculating p-values and 95% confidence intervals.

  - ❖ **Sample language defining the p-value and 95% confidence interval:**
    *(Note: The sample language below is designed for a technical audience only and can be incorporated into a technical HAI report. The workgroup does not recommend displaying statistical measures for a consumer audience. While the toolkit recommends displaying the 95% confidence intervals in the HAI data tables, sample language for the p-value is also provided below.)*

    HAIs:
    The p-value and 95% confidence intervals are statistical measures that describe the likelihood that a numerical estimate, i.e., what was observed, was due to random chance. These measures tell us whether or not a facility's SIR is significantly different from 1 (the value we would expect if the facility performed exactly the same as what was predicted based on the national data). If the p-value is less than or equal to 0.05, we can conclude that the number of observed infections is *significantly different* than the number of predicted infections (i.e., the facility's SIR is significantly different from 1). If the p-value is greater than 0.05, we can conclude that the number of observed infections in a facility *is not significantly different* than the number predicted (i.e., the facility's SIR is no different than 1).

    The 95% confidence interval is a range of values. We have a high degree of confidence (in this case, 95%) that the true SIR lies within this range. The upper and lower limits are used to determine the significance and precision of the SIR. If the confidence interval includes the value of 1, then the SIR is *not significant* (i.e., the number of observed events is not significantly different than the number predicted). If the confidence interval does not include the value of 1, then the SIR *is significant* (i.e., the number of observed events is significantly different than the number predicted). 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.

Influenza Vaccination:
The p-value is used to compare the observed vaccination percentage to the chosen benchmark. If the p-value is less than or equal to 0.05, we can conclude that the facility's vaccination percentage is *significantly different* than the benchmark. If the p-value is greater than 0.05, we can conclude that the facility's vaccination percentage is *not statistically different* than the benchmark.

## *III. Best Practices for Analysis of HAI Data*

When analyzing data to be used in an HAI public report, consider the best practices that are outlined below. State-specific reporting requirements (legislative or otherwise codified) may constrain use of a specific practice.

**Basic analytic considerations for infection rates:**

- If data from NHSN are used, analyses limited to data that facilities have included in their monthly reporting plans are preferable to analyses that do not take reporting plans into account. Data that are included in a facility's monthly plan must be collected and entered into NHSN according to standardized CDC protocols. Data that are not in a facility's monthly plan may not have been collected according to NHSN requirements and may not contain all data elements. Some states require the use of "off-plan" reporting for some infections.
- If reporting requirements allow, ensure that a facility has enough exposure volume to create a minimally precise infection rate. Many states have set minimum thresholds for including a facility's infection rate in their public report. As a recommendation, device-associated infection rates should only be calculated for locations with at least 50 device days, and SSI rates should only be calculated for facilities that perform at least 20 surgical procedures. States may wish to use higher denominator thresholds when calculating rates.
- Serial comparisons of stratified rates can be performed to measure the facility's experience from one reporting period to the next. SAS code to perform this comparison is available on the NHSN website at http://www.cdc.gov/nhsn/PS-Analysis-resources/index.html

Device-Associated Infections

- If the public report will compare facility device-associated infection rates to national rates, the best practice is to align the format and stratification of patient care areas that are published in a state's report with those used in nationally published data. CDC produces national device-associated infection rates for all patient care area types reporting sufficient data to NHSN each year. Due to differences in risk, it is recommended that rates be presented by unit type and not aggregated to higher levels, such as the healthcare facility as a whole or the

entire state. However, the workgroup acknowledges that some states are required by legislation or regulation to publish crude rates.

- When comparing facility performance to the national experience using infection rates, prioritize the location types with the greatest exposure volume. Medical, surgical, and combined medical/surgical intensive care units tend to have more data reported than respiratory intensive care units, for example. Some states are required to compare all patient care areas, regardless of patient volume within the state or in the national data. If a national comparison rate is not available for a given patient care area, those rates may be withheld from public reporting, published with no comparison, or published with a comparison to a state-level rate.

Procedure-Associated Infections

- If possible, procedure-associated infection rates should be presented separately for each procedure type included in the report. Due to advances in risk adjustment of inpatient surgical site infection data, crude inpatient SSI rates or rates adjusted using the legacy National Nosocomial Infection Surveillance System (NNIS) three-level basic risk index should be avoided or explicitly labeled as "non-risk adjusted" or "calculated with limited risk adjustment." Current NHSN inpatient SSI data should be presented as SIRs using the existing risk models that adjust for more than the three core NNIS risk factors. Some states are required to publish crude rates.
- Operational and methodological constraints limit the use of the SIR for outpatient procedures, including outpatient procedures reported from ambulatory surgery centers (ASCs). Many of the SSI risk models require facility-level factors that are not relevant to or collected by ASCs. This includes medical school affiliation and facility bed size. In addition, the ASA score – a risk factor included in the majority of SSI risk models – is not a required data element when reporting outpatient procedures to NHSN. Given these limitations, states may not be able to present SIRs for ASCs depending on the procedure categories reported. States encountering these limitations may wish to consider the use of SSI rates for outpatient procedures.

MRSA Bacteremia and *C. difficile* LabID Events

- CDC does not publish national infection rates for MRSA or *C. difficile* LabID events, as the SIR offers an enhanced risk adjustment for acute care hospital data. MRSA and *C. difficile* LabID event data for acute care hospitals should ideally be presented as SIRs.
    - Until national baseline data are available, MRSA and *C. difficile* LabID event data from long-term acute care hospitals (LTACHs) and inpatient rehabilitation facilities (IRFs) are recommended to be presented as rates.

**Basic analytic considerations for SIRs:**

- If data from NHSN are used, analyses should only include data that facilities have included in their monthly reporting plans. Data that are included in a facility's monthly plan must be collected and entered into NHSN according to standardized CDC protocols. Data that are not in a facility's monthly plan may

not have been collected according to NHSN requirements and may not contain all data elements. Some states require the use of "off-plan" reporting for some infections.

- If state requirements allow, only produce an SIR for facilities that use enough invasive devices, have enough patient days, or perform enough surgical procedures to do so. In an effort to set a minimum level of precision, the NHSN reporting application's analysis tool will only produce an SIR when there is at least one predicted infection. Calculating an SIR for a facility with less than one predicted infection can result in a very large SIR value if the facility reported even one infection, which may be misleading. Some states are required to produce SIRs for all facilities, regardless of exposure volume.
- For facilities that report no infections for a time period, an upper limit of the SIR's 95% confidence interval should be calculated, but a lower limit should not. When interpreting this 95% confidence interval, the lower bound can be assumed to be zero.
- 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, and should be qualified by an explanatory footnote if data contributions differ among hospitals. If some facilities reported fewer months than the maximum included in the report, or if some months or quarters are excluded from the SIR calculation (e.g., quarters with an outlier *C. difficile* or MRSA community-onset prevalence rate are excluded from the SIR), a footnote should be provided for those facilities to indicate that less than the maximum number of months are included in the calculation.
- As the time since the baseline period has increased over the past several years, consideration should be given to comparing a facility's serial SIRs from one reporting period to the next (e.g., 2013 CLABSI SIR vs. 2014 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 at http://www.cdc.gov/nhsn/PS-Analysis-resources/index.html. These comparisons may be better suited for a technical report audience for the reasons described in the "Other Considerations" chapter.
- After the updated SIR baselines are established using 2015 data, discussions will occur between CDC and state health departments in order to provide recommendations on how best to analyze and interpret the new SIRs.

## *IV. Interpreting the SIR*

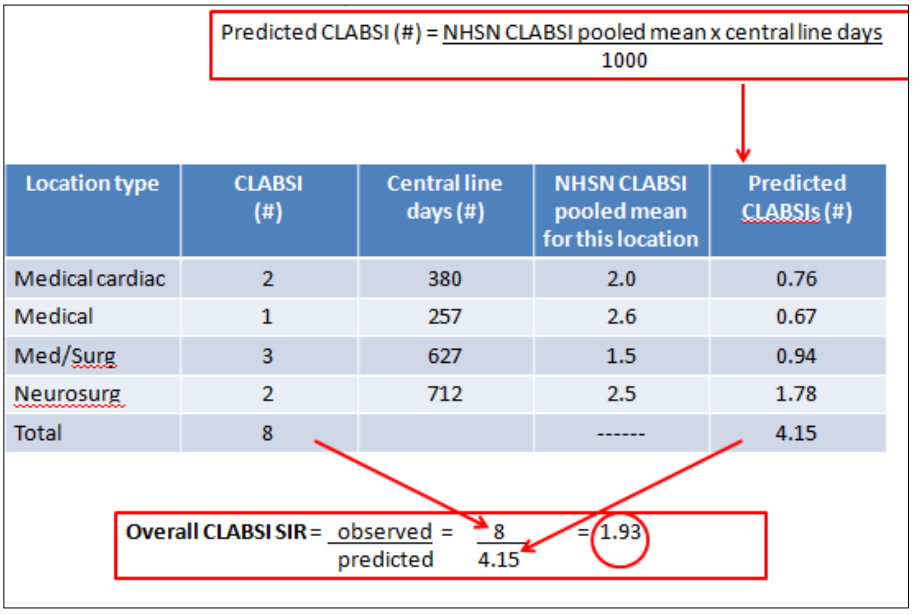
**Summary information about the SIR and its interpretation:**
An advantage of the SIR is its ability to summarize a large amount of HAI data from a single facility, a state, or some other group of facilities into a single summary statistic. However, it can be difficult to communicate the meaning of the SIR, even as a single statistic that compares "observed" and "predicted" (or "expected") numbers of infections.

Describing the numerator of the SIR is straightforward – it is the number of infections that were identified and reported during the surveillance period. The denominator is more challenging to describe to a lay audience, which may include individuals who are unfamiliar with comparisons to a baseline period. By comparison, clinical audiences are likely to be more familiar with observed to expected ratios, which are commonly used in quality improvement efforts. However, an important communication consideration for HAI reporting is the use of the word "expected" in the denominator. No one "expects" to be infected when entering the healthcare system; the expectation is to be protected from HAIs. When describing the denominator of the SIR, the term "predicted infections" should be used instead of "expected infections." That denominator can be described more fully as the number of infections that would be predicted during the surveillance period if the underlying HAI experience of the reference population has not changed from the baseline period.

When the SIR is calculated, there are three possible results:

- The SIR is less than 1.0 – this indicates that there were fewer infections reported during the surveillance period than would have been predicted given the baseline data.
- The SIR is equal to 1.0 – as in any ratio, the nominal value of 1 indicates that the numerator and denominator are equal. In this case, the number of infections reported during the surveillance period is the same as the number of infections predicted given the baseline data.
- The SIR is greater than 1.0 – this indicates that there were more infections reported during the surveillance period than would have been predicted given the baseline data.

Example of how to calculate a CLABSI SIR from a facility with multiple critical care locations:



Interpretation: During this time period, facility X reported 93% more CLABSIs than were predicted.

Reporting the results of SIR statistical significance testing, when the SIR is used to summarize the facility's performance, poses a communications challenge. The workgroup recommends the following interpretation language to be used in a **technical report** data table geared towards clinicians and others more experienced in the HAI reporting arena:

- Significantly fewer infections (**better**) observed than predicted, based on the national baseline
- No significant difference (**same**) between the number of observed and predicted infections, based on the national baseline
- Significantly more infections (**worse**) observed than predicted, based on the national baseline

A plain language approach is a suitable strategy for explaining SIR results to a consumer audience. The workgroup recommends the following interpretation be used in a data table for a **consumer audience**:

- Fewer infections (**better**) than predicted based on the national experience
- About the **same** number of infections as predicted based on the national experience
- More infections (**worse**) than predicted based on the national experience

## *V. Other Metrics and Considerations*

The "Other Considerations" chapter includes recommendations on several topics that may be of interest to an agency preparing an HAI report:

- How to incorporate the Targeted Assessment for Prevention (TAP) strategy into an HAI report
- Considerations for comparing a facility's HAI performance to the overall state or national experience
- Comparing the state SIR to the national SIR
- Presenting trend data
- Rationales for the recommended colors and symbols
- And more!

Please see "Other Considerations" for more information.

# *VI. Considerations for Small Hospitals*

*The suggestions below assume that data are presented as a single SIR per HAI and hospital location-type. If your state reports individual unit-specific data, the guidance below may not apply. The workgroup recommends considering alternative analysis/display techniques only when the SIR cannot be calculated for a facility at all levels of stratification included in the data table (i.e., for all location types shown in the CLABSI and CAUTI table).*

When hospitals do not have a large enough denominator to have even one predicted infection, the workgroup recommends **not** calculating the SIR for that facility to ensure precision and interpretability of the metric. However, hospitals in this situation are left without a performance metric for that infection type. As a result, hospitals with no infections may not get credit for that accomplishment and hospitals that are doing worse than predicted may not be identified. Small units within hospitals can also fall into this category. Hospitals may view not having a performance metric as unfair since data are reported and having a "no conclusion" performance does not explain the context clearly. The following suggestions have been made on how to handle these situations:

**Highlight Hospitals with Zero Infections:**

- Provide number of months since last infection for those hospitals with zero infections. Points to be considered if using this metric:
    - How often would this metric be updated?
    - How could the state track this metric to ensure it is accurate?
    - This measure shows only a point in time and is not updated in real time. Conveying that message to the public may be difficult. For example, a hospital could be showing 6 months since the last infection (at the time of report publication) when in reality they have had an infection in the past month.
- Provide an additional symbol for hospitals with zero infections, regardless of SIR calculation, to highlight this achievement. Some states have done this and received positive feedback from facilities. A point to consider is that this may favor smaller hospitals as well as hospitals with lower risk patients, as it may be increasingly difficult for larger hospitals that perform more procedures or have patients with more invasive devices to have zero infections.

**Provide a Different Metric for Small Hospitals:**

- Aggregate data over a longer period of time to calculate a SIR. Points to consider if using this metric would be:
    - The data will not be comparable to other hospitals since the time period is not the same.
    - Would the data be meaningful since it covers a longer period of time?
    - How should a consumer interpret the data?
- Use an extended explanation for the SIR interpretation when an SIR is not calculated. For example, Hawaii's HAI Program uses the following explanation: "ICU patients had too few central line days (procedures, etc.) to

calculate a reliable SIR. When an SIR cannot be calculated, a comparison to national data is not possible".

- On the consumer report, show an infection rate instead of the SIR. Of note, rates do not offer the same level of risk adjustment as the SIR. If used, rates should be stratified. Further details and recommendations concerning the use of rates are outlined in earlier parts of this document.

At this time, the workgroup does not recommend one approach over another to address the issue of small hospitals reporting a low volume of data. The workgroup recognizes the need to continue to learn from states as different methods are implemented or changed over time. The toolkit is anticipated to evolve with future iterations.

## *VII. Next Steps: Using these Recommendations*

The "Consumer Report Template" and "Technical Report Template" sections of the toolkit that follow provide examples of how these best practices can be used to display facility-level HAI data. These templates also include information on how to describe data limitations and intended uses, as well as the SIR's interpretation, to the report's intended audience. Sample data tables for HAIs and influenza vaccination are provided in the "Data Tables" section of the toolkit.

In addition to a methods section, public reports of HAI data should also include a description of any limitations of the data or data analysis. An example of how a limitations section might be formatted is included in the Consumer Report and Technical Report Templates.

# Appendix 1: Healthcare Worker Influenza Vaccination Summary Data

## *Introduction*

The Advisory Committee on Immunization Practices (ACIP) recommends that all healthcare workers and persons in training for healthcare professions should be vaccinated annually against influenza (CDC, 2009). Persons who are infected with influenza virus can transmit the virus to others, particularly those who are at a high risk for complications from influenza (e.g., elderly, immunocompromised, etc.). Vaccination of healthcare workers has been associated with reduced work absenteeism and with fewer deaths among nursing home patients and elderly hospitalized patients. The Healthy People 2020 goal for healthcare worker influenza vaccination in the United States is 90% (Healthy People 2020 Topics and Objectives: Immunization and Infectious Diseases) (i.e., 90% of healthcare workers in every facility receive the influenza vaccine).

The workgroup recommends that state health departments include healthcare worker (also known as healthcare personnel) influenza vaccination summary data in state HAI reports if these data are available. Data from the most recent influenza season should be displayed, after the influenza season has ended and all summary data for that season have been entered (i.e., after May 15th).

As with HAI outcome measures, showing facility-specific healthcare worker influenza vaccination percentages may influence performance and encourage facilities with lower vaccination percentages to improve their vaccination efforts.

## *Part 1: Calculation*

Healthcare worker influenza vaccination data are presented as a percentage of healthcare workers vaccinated. The percentage of healthcare workers vaccinated is calculated as:

$$\frac{\text{Total number of healthcare workers vaccinated}}{\text{Total number of healthcare workers in the facility}} \times 100\ \%$$

Denominator**:** Healthcare workers who were physically present in the healthcare facility for at least 1 working day between October 1 and March 31 (i.e., the measure reporting period) of the following year. This includes all facility employees, licensed independent practitioners, adult students/trainees, and volunteers regardless of full-time/part-time status or patient contact.

(*Optional denominator category, as of 2015 NHSN protocol*): Other contract personnel who provide care, treatment, or services at the facility through a contract but do not fall into any of the other worker categories may also be reported.

Numerator**:** Number of healthcare workers from the denominator population who received the influenza vaccine during the time from when the vaccine became available (e.g., August or September) through March 31 of the following year.

This calculation is performed within NHSN for each of the three (or four, if other contract personnel data are reported) employment groups; however, the workgroup's recommendation is to present an overall vaccination percentage by healthcare facility (e.g., total vaccination percentage inclusive of all employment categories) in both the consumer and technical HAI report. Refer to part 2 of this document for more details on the display recommendations.

### *1a: Recommended Comparison Group*

The Department of Health and Human Services (HHS) Healthy People 2020 goal for healthcare worker influenza vaccination percentage is 90% for the entire facility. The workgroup recommends using this metric as the standard against which facilities' vaccination percentages should be compared. Benefits to this approach are that the benchmark stays standard from year to year and that a state's facilities can show progress toward a goal that is shared among all states in the nation.

### *1b: Other Comparison Groups for Consideration*

A state may choose to benchmark healthcare facilities' healthcare worker influenza vaccination percentages against other comparison groups. Options include:

- Three categories around the **state pooled mean** for that year.
  - A benefit to this approach is that the facilities are compared to other facilities within the state. This comparison can also potentially show more variation among facilities if the majority or minority of facilities are close to meeting the Healthy People 2020 goal.
  - A drawback to this approach is that the state pooled mean varies from year to year and healthcare facilities with vaccination rates above 90% may fall into the "significantly lower" category if the state pooled mean is significantly higher than 90%.
  - The calculation of the state benchmark has been performed in various ways. Hospital Compare and other national publications calculate a pooled mean by summing the numerator counts across all facilities and dividing this by the sum of denominator counts from all facilities in the state (and multiply the result by 100). While this method may result in some double-counting of healthcare workers, the effect of this on the overall state percentage is assumed to be minimal. Other states have

calculated a raw mean (state average) by summing all facilities' vaccination percentages and dividing by the total number of facilities. If the state pooled mean or state average is used, it is recommended that the methods used to calculate the state benchmark and limitations are clearly explained in the report and a footnote is added to the data tables.

- ❖ Three categories around the **national pooled mean** for that year.
  - One drawback to this approach is that the national pooled mean is published on Hospital Compare and may not be available in a timeline that corresponds with the state's desired deadline for publishing the HAI report. Like the state pooled mean, the national pooled mean also varies from year to year.

***1c. Statistical Comparisons***

The workgroup recommends using a statistical test to assess whether the facility's vaccination percentage is significantly different from the benchmark. Recommended methods are below:

Use the macro posted on the NHSN website titled "SAS Macro for a Single Proportion" to perform a mid-P Exact test comparing each facility's influenza vaccination percentage to the chosen benchmark. Use the p-value to determine whether the facility's percentage is significantly higher, lower, or not significantly different from the benchmark. The macro is available at http://www.cdc.gov/nhsn/PS-Analysis-Resources/index.html

- ★ Better or ✕ Worse: If the p-value is less than or equal to 0.05, the facility's vaccination percentage is significantly different than the benchmark. Review both values to determine direction of the comparison.

- = Same: If the p-value is greater than 0.05, the facility's vaccination percentage is not significantly different than the benchmark.

## *Part 2: Display*

An overall vaccination percentage by healthcare facility (e.g., total vaccination percentage inclusive of all employment categories) should be presented in both the consumer and technical HAI report. If states are interested in stratifying influenza vaccination percentages by employment category, the workgroup suggests that this is only done in the technical report. Some states may also want to present data by medical contraindication, declination, and unknown vaccination status in the technical report. The workgroup recommends that facility-specific percentages are shown without displaying actual numerator and denominator data. Raw numbers can be misleading and could potentially lead the audience to perform an incorrect calculation of the state's total number of vaccinated personnel or overall vaccination percentage. However, if raw numbers are presented, the workgroup recommends aggregating data by facility, (i.e., not stratifying by employment status) and including a footnote beneath the data table to

caution the audience against calculating the state's total number of vaccinated personnel.

Example footnote language: Caution should be used when interpreting the overall number of healthcare workers vaccinated in the state. In some instances, a single healthcare worker may be counted in multiple hospitals, and therefore the total number of vaccinated personnel in the state as shown in this table may be inflated.

The workgroup recommends that facility-specific influenza vaccination percentages be categorized into four performance categories, each with a corresponding symbol, based on the results of statistical testing (i.e., see details above). The below language assumes the Healthy People 2020 Goal is used as the benchmark:

A) Vaccination is higher (**better**) than the Healthy People 2020 Goal: ★ better
B) Vaccination is **similar** to the Healthy People 2020 Goal: = **same**
C) Vaccination is lower (**worse**) than the Healthy People 2020 Goal: ✖ worse
D) Data were not reported from this facility: **not reported** (no affiliated symbol)

The actual facility-specific influenza vaccination percentage, along with the corresponding symbol, should be displayed in a data table specific to influenza vaccination. In addition, the workgroup recommends displaying the results of statistical testing (e.g., p-value) to a technical audience only (please review the example Healthcare Worker Influenza Vaccination Summary Table in the "Data Tables" chapter of the toolkit).

Some states may want to show an additional comparison in the data table; a comparison between the facility's vaccination percentage and the state pooled mean. This would allow multiple points of comparison (HP 2020 goal and the state benchmark) around each facility's vaccination performance. However, adding this column complicates the data table, as an additional p-value column would also be warranted. If the state chooses this approach, the workgroup recommends including those extra columns only in the technical report.

If the HAI report will include other process measures such as central line insertion practices or compliance with infection prevention bundles or checklists, the state may consider including the corresponding healthcare worker influenza vaccination symbol for each facility (★ better /= **same** /✖ worse / **not reported**) in a summary table dedicated to HAI process measures. Please see the "Data Tables" toolkit section for a sample Summary Data Table for Hospital Process Measures.

## *Vaccination Survey*

Some states have asked healthcare facilities if mandatory policies are in place through the use of a survey tool or as an add-on question to an existing hospital survey. Examples of surveys recently used by state health departments for this purpose are provided on the next few pages. Feel free to adopt some or all of the questions presented. If states are able to obtain information related to the below survey questions, we suggest including aggregated results of the survey responses in the HAI report, as it can influence other healthcare facilities to enact such policies.

As part of the Healthcare Personnel Safety Component of NHSN, CDC provides hospitals with an optional survey for seasonal influenza vaccination. This survey can be found here: http://www.cdc.gov/nhsn/forms/57-215-Seasonal-Survey-form.pdf

## *Hospital Survey on HCW Vaccination Policy: Example A*

1. Does your facility have a seasonal influenza vaccination policy? Such a policy means that the facility requires all or some portion of HCW working at that facility to receive a seasonal influenza vaccine.

   a. Yes, there is a policy currently in place
   b. No, but we are considering a policy
   c. No, and we are not considering a policy
   d. Other (please specify): _____

2. If your facility has a seasonal influenza vaccination policy, what reasons for exemption are acceptable? Check all that apply.

   a. Medical
   b. Religious
   c. Personal/philosophical
   d. Any reason
   e. Other (please specify): _____

3. If your facility has a seasonal influenza vaccination policy, what do you require of unvaccinated HCW with an acceptable reason for exemption? Check all that apply.

   a. Wear a mask
   b. Receive verbal and/or written education
   c. Other (please specify): _____

4. If your facility has a seasonal influenza vaccination policy, what are the potential consequences for unvaccinated HCW without an acceptable reason for exemption? Check all that apply.

   a. Wear a mask
   b. Progressive discipline, potentially including termination
   c. Other (please specify): _____

5. Does your facility offer the high-dose influenza vaccine? (Y/N)

## *Hospital Survey on HCW Vaccination Policy: Example B*

1. Does your hospital have a mandatory influenza vaccination policy in place for healthcare workers? (Y/N)

2. What strategies does your hospital employ to facilitate employee access to influenza vaccination? (Check all that apply)
   a. Provide vaccinations on-site in wards, clinics, or other common areas
   b. Provide vaccinations on-site through use of mobile vaccination carts
   c. Provide vaccination services during all work shifts
   d. Provide off-hours vaccination clinic
   e. Provide vaccination at staff and departmental meetings
   f. Other (please specify): _____

3. Does your hospital currently provide influenza vaccination free or reduced cost to the following people:

| | Free | Reduced cost | Not provided |
|---|---|---|---|
| Full-time employees | ☐ | ☐ | ☐ |
| Part-time employees | ☐ | ☐ | ☐ |
| Unpaid workers (e.g., students, volunteers) | ☐ | ☐ | ☐ |
| Community | ☐ | ☐ | ☐ |

4. Are employees required to provide proof of off-site vaccination AND/OR medical contraindication? (Check all that apply)

   <u>Off-site vaccination</u>
   a. Printed document from other site
   b. Documentation not required
   c. Other(please specify): _____

   <u>Medical Contraindication</u>
   a. Physician documentation of contraindication
   b. Signed declination
   c. Documentation not required
   d. Other(please specify): _____

5. Is documentation maintained by the hospital to confirm employee vaccination? (Check all that apply)
   a. Documentation is maintained on employees who are vaccinated on-site
   b. Documentation is maintained on employees who are vaccinated off-site
   c. Documentation is maintained on employees who declined vaccination
   d. No documentation
   e. Other (please specify): _____

6. If your hospital has a <u>mandatory</u> influenza vaccination policy, how does your hospital enforce compliance for employees who decline the vaccination? (Check all that apply)

   a. Termination of employment (if employee declines for reasons other than medical contraindication)
   b. Required to wear a face mask
   c. Restricted to certain areas of the hospital
   d. Suspension of privileges
   e. Impose monetary penalty
   f. No mandatory policy
   g. Other (please specify): _____

7. If your hospital has a <u>mandatory</u> policy, how many people were terminated, suspended, resigned, or had to stop working in your hospital as a result of refusing the flu vaccine?

   a) Employees: _____
   b) Employed physicians/providers: _____
   c) Non-employed physicians/providers: _____

## Template Report: HAI Data for Consumers

### Key Concepts for Displaying HAI Data to a Consumer Audience: Information for HAI Report Authors

In this section of the toolkit, we will describe the characteristics of a standard report template for a consumer audience. An example of an HAI report introduction, methods section, and supporting reference/educational materials are also provided, all of which have been tailored to a consumer-friendly audience.

"Notes" in italic font are provided throughout the template to assist the HAI report authors in understanding the workgroup's rationale for certain decisions or to provide other instructions/clarifications. The "Other Considerations" chapter of the toolkit contains additional details on the workgroup's rationale and decision-making process.

Many of the decisions in this chapter of the toolkit were based on feedback from multiple consumer focus groups. Information about these focus groups can be found at the end of the "Other Considerations" chapter.

The working group acknowledges that individual state mandates and/or available resources may not allow for complete adoption of the standard data elements and template provided; therefore some alternatives are also presented, with caveats to consider.

## *Explanation of Standard Report Elements to Include in Data Tables*

Below is a list of standard data elements that are recommended for display in a public HAI data report for consumers.

- **Title**: The title should clearly state the geographic location (your state's name), the HAI type, time period, location or procedure type if applicable, and facility type(s) included in the table.

- **Facility Name:** This should be the "doing business as" name that is recognized by the general public. Facilities with multiple campuses should have each campus identified separately in a clear and understandable way.

- **Procedure Type:** This is the specific type of procedure (surgery) that procedure-associated infections are being presented for (e.g., colon surgery, abdominal hysterectomy).

> *<u>NOTE</u>**:** The workgroup recommends producing a separate data table for each procedure type, in which case the full procedure name (e.g., Colon Surgery, Abdominal Hysterectomy) should be included in the title, and report authors can consider removing this column from the tables. Additional considerations are found in the "Other Considerations" chapter.*

- **Unit/Unit Type:** This is the specific unit in the facility that device-associated infections are attributed to. It can be unit-specific (e.g., Medical/Surgical ICU, Cardiac ICU) or unit type-specific (e.g., Adult/Pediatric ICUs, Neonatal ICUs, Inpatient Wards).

> *NOTE: The workgroup recommends that the consumer data report display the most granular level of data possible while maintaining data integrity. For additional considerations, see the "Other Considerations" chapter.*

- **Number of Procedures:** For surgical site infection (SSI) data, this is the total number of procedures (surgeries) performed by a facility during the time frame of interest.

> *NOTE: The workgroup concluded that device and patient days may be too complicated to describe to a consumer audience. For additional considerations and sample language if your state chooses to present device and/or patient days, see the "Other Considerations" chapter.*

- **Observed Infections (or Observed Events):** This is the number of infections (or events, for LabID measures) that were reported by the facility for a given time period and unit type or procedure. This number is the numerator in the SIR calculation and should be displayed for all HAI types.

- **Predicted Infections (or Predicted Events):** This is a calculated value that reflects the number of infections (or events, for LabID measures) that were "predicted" to have occurred in the facility, based on the national baseline data. This is the denominator in the SIR calculation and should be displayed for all HAI types. Refer to the "Methods for Composing HAI Reports" chapter of the toolkit for an explanation of using the term "predicted" instead of "expected." This number should be rounded to 1 decimal place (e.g., 1.2) when being presented in the consumer data tables. If the number of predicted infections is less than 1 before any rounding is performed, the number of predicted infections should state "less than 1.0" in the data tables. This will prevent any confusion in the case when a facility has a predicted number of infections that is less than 1.0, but after rounding would appear to be 1.0 and thus warrant an SIR interpretation.

> *NOTE: Through focus group testing, the workgroup determined that it may not be necessary to present the actual SIR value on the consumer report. For additional considerations and sample language if your state chooses to present the SIR value, see the "Other Considerations" chapter.*

- **"How Does This Facility Compare to the National Experience?"**

  The information in this column represents the SIR's statistical significance using consumer-friendly language and symbols. For additional considerations and workgroup rationale, see the "Other Considerations" chapter.

  The workgroup recommends using three main categories for the SIR, with an additional category that indicates when an SIR is not calculated. For each of these categories, the workgroup recommends the following symbol and accompanying words:

  A) SIR is significantly < 1 : ★better
  B) SIR is not statistically different from 1 : = same
  C) SIR significantly > 1 : ✖worse
  D) # of predicted infections < 1 : **"No Conclusion"** (no affiliated symbol)

| |
|---|
| *NOTE: The workgroup offers a second choice for symbol considerations. See the "Other Considerations" chapter for more information about these chosen symbols and accompanying language.* |

- **Legend:** The workgroup recommends displaying a legend at the top of each page of data tables. The legend should include lengthier explanations for each of the SIR categories, as well as information about the year of the national experience (data from the national baseline). The language in a legend for the consumer report differs from that in the technical report because consumers may not be familiar with the concept of statistical significance. Note the change in terminology in the legend used for LabID events, which references "events" instead of "infections."

  **Lengthier Explanations and Corresponding Image for each SIR Category:**

  A) "Fewer infections (**better**) than predicted, based on the national experience":
  ★

  B) "About the **same** number of infections as predicted, based on the national experience": =

  C) "More infections (**worse**) than predicted, based on the national experience":
  ✖

  D) "When the number of predicted infections is less than 1, no conclusion can be made": "**NO CONCLUSION**"

A blanket statement addressing the years of the national baseline can be listed at the bottom of legend:

**The national experience contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA bacteremia and C. difficile Laboratory-Identified Events.*

## Sample State HAI Report for Healthcare Consumers

The following pages contain an example HAI report template compiled by the Data Analysis and Presentation Standardization Workgroup that has been specifically tailored to a healthcare **consumer** audience.

Supporting educational materials and images are also provided to aid in consumer understanding, and these may be copied and/or modified for your report. Along with the materials below, please review the "Data Tables" chapter of the toolkit for standard data display templates using the best practices outlined in the "Methods for Composing HAI Reports" chapter to present HAI data to a consumer audience. The "Technical Resources" chapter of the toolkit provides the image files used in the consumer educational materials, as well as SAS code that can be used to create each data table.

**NOTE:** Edit the highlighted sections as needed to ensure this text accurately represents the data you are presenting in your report. The *italicized* text provides instruction to the toolkit reader (i.e., HAI report authors) while developing a report from this template.

# [STATE DEPARTMENT OF HEALTH]
# HEALTHCARE-ASSOCIATED INFECTIONS REPORT FOR A HEALTHCARE CONSUMER AUDIENCE
# [TIME PERIOD]

## *Table of Contents*

An HAI report should include a Table of Contents listing the main sections of the report. If appropriate for your state, providing internal hyperlinks connecting the Table of Contents to the particular sections may be helpful for some audiences.

## *Introduction*

Consider including a brief introduction to the report and its contents. This part of the report should explain to consumers why this information is important and how to use the information.

This section is meant to be short so that readers are not discouraged by the report's length. Some report authors may choose to include an executive summary that highlights the major findings and conclusions of the state's HAI experience, but caution is given to keep the summary brief.

***Note to Authors:*** *The workgroup has created and compiled specific information that can be helpful for consumers reading an HAI report. This includes how to read and interpret the data, an explanation of the variables, and HAI educational materials. Feel free to adopt all or part of the language presented below in the report's introduction.*

### WHAT IS THE PURPOSE OF THE REPORT?

This report is meant to help patients who need inpatient medical treatment decide whether they should be concerned about healthcare-associated infections (HAIs) at the hospital they may choose. HAIs are infections patients can get while receiving medical treatment in a healthcare facility. Patients should know that these infections are unintended. Ideally, HAIs should never happen, but sometimes they do.

Hospitals track and report HAIs for many reasons. In some cases they are required to do so—either by state public health authorities or by federal health agencies. In most cases, hospitals report numbers (data) about certain HAIs because they want to know how well they are doing in preventing them, and how they compare with other hospitals of similar size and with similar kinds of patients.

It is important for the patients and their family members or advocates to use this information to ask healthcare providers questions before seeking and while receiving medical treatment. Asking the right questions can help patients and family members learn what they can do to prevent infections.

**Click here to learn about the methods we used to put together this report.**

This report looks at <five> HAIs:

1. Central line-associated bloodstream infections (CLABSI)
2. Catheter-associated urinary tract infections (CAUTI)
3. Surgical site infections (SSI) following <types of surgeries>
4. Positive laboratory results with methicillin-resistant *Staphylococcus aureus* (MRSA) bacteria found in the bloodstream
5. Positive laboratory results with *Clostridium difficile* (*C. difficile*) bacteria found in stool (feces)

**Click here for "Fast Facts" about central lines, urinary catheters, and the HAIs discussed in this report.**

The report also shares information on healthcare worker vaccination for influenza (or the "flu"). The Centers for Disease Control and Prevention (CDC) <and the State Health Department> recommend that all personnel who work in a healthcare setting receive the flu vaccine each year to help prevent the spread of flu.

**Click here for a guide to understanding healthcare worker flu vaccination.**

Hospitals are <required by law> to report these <five> HAIs to the <State Health Department>. More information about <State's> mandatory reporting can be found here: <insert link>.

These measures do not represent all possible infections, but were selected because they give a good overview of how a hospital is doing in preventing healthcare-associated infections. These infections are largely preventable when healthcare providers use infection prevention steps recommended by the CDC. The information in this report can help you to think about whether a particular hospital is the best place for you to receive care. However, there are other things to consider when making a decision about where to get your care. You should use this information as a starting point to ask your healthcare provider questions, and use the answers in your decision making.

**Click here for more things to think about when it comes to choosing a hospital.**

**Click here for things patients can do to prevent infections.**

## *Methods and How to Use the Information in the Report*

### HOW DO I READ THE REPORT?

***Note to Authors**: If presenting **SIRs,** use the following text to explain to consumers how they should read and interpret SIR data:*

This report looks at how hospitals in this state performed in terms of infection prevention by displaying how many HAIs they reported during <time period>. It shows whether a hospital had more HAIs, fewer HAIs, or about the same number of HAIs compared to the national baseline (national experience) based on previous years of reported data. This comparison takes into account differences between hospitals such as types of patients and procedures, as well as other factors such as the hospital's size and whether it is affiliated with a medical school.

**Click here for a reading guide that explains each element in the infection data tables.**

This report also looks at the percentage of all healthcare workers in each hospital who received the flu vaccine. Higher percentages are better, because this indicates that a greater number of healthcare workers are protected against the flu and less likely to spread it to patients. The report shows whether a hospital had a higher percentage, lower percentage, or similar percentage of vaccinated healthcare workers compared to the Department of Health and Human Services (HHS) Healthy People 2020 goal (90%).

**Click here for a reading guide that explains each element in the healthcare worker flu vaccination data table.**

***Note to Authors**: If presenting infection **rates,** use the following text to explain to consumers how they should read and interpret rate data:*

This report looks at how hospitals in this state performed in terms of infection prevention by displaying how many HAIs they reported during <TIME FRAME>. The data tables that follow show an infection rate for each hospital/location type and each HAI. An infection rate measures the number of new infections seen in a hospital during a given time frame for those patients at risk for infection. It gives you information about how often infections are occurring in a particular location within the hospital, and can identify the types of surgical procedures that may pose the highest risk for infection.

A rate is calculated for each infection type (CLABSI, CAUTI, MRSA, *C. difficile*) as the total number of infections or events reported during <TIME FRAME>, divided by the

total number of days that patients were in the hospital/location and at risk for that infection or event.

A rate for surgical site infections (SSI) is calculated as the total number of infections reported for surgical procedures during <TIME FRAME>, divided by the total number of procedures that were performed of that type.

## WHAT DO THE NUMBERS MEAN?

It's important to understand that numbers alone won't show how well a hospital is doing in preventing HAIs. This report shows how hospitals performed during a single year (2014), and compares each hospital's performance to the national baseline. It does not track the hospital's performance over time.

Larger hospitals that see more patients or do more surgeries may have more infections compared to smaller hospitals. Therefore, it is important not only to consider the "interpretation" for each hospital, but to also look at the total number of procedures performed and the total number of infections observed (or identified) in that time period.

### If a Hospital Has Zero (0) Infections, What Does That Mean?

The total number of infections listed in the data tables represents a count of the number of infections reported by this hospital. If the number of infections is zero (0), this means that the hospital saw no infections of this type during <time period>. It does NOT mean that the hospital failed to report all of their infections. If a hospital reported zero infections, it may be important to consider the size of the hospital and to look at the total number of procedures performed and the total number of infections that were predicted (also shown in the data tables).

**Click here *<add hyperlink to Methods section of the Technical Report>* to learn more about how we calculated the numbers.**

## WHERE DO THE NUMBERS COME FROM?

***Note to Authors**: The template assumes data are abstracted from NHSN. Please modify as needed to provide details of the surveillance system that collects the data you present.*

Hospitals self-report their HAI data to the CDC and the [state] using a free, web-based software system called the National Healthcare Safety Network (NHSN). CDC and [state

HAI program] provide training to hospital staff on the appropriate use of this system and provide guidance on how to track infections in a standard way.

More information about NHSN can be found here: http://www.cdc.gov/nhsn/

## THINGS TO CONSIDER WHEN LOOKING AT THE REPORT

A complete list of data considerations and limitations can be found in the [technical report], available here: <link>

These reports cover data from [TIME PERIOD], and the data were downloaded from the National Healthcare Safety Network (NHSN) on [DATE]; any changes made to the data after this date are not reflected in this report. Before reviewing this report, a few clarifications about the data need to be made:

1. **The data within this report are preliminary.** Although efforts were made by hospitals and the [state HAI Program] to ensure that the data were accurate and complete, the data are self-reported and have not been formally "double-checked," or validated. Until data validation is completed, numbers should be interpreted with caution.

   **OR**

   **These data have been formally double-checked** using [xxxxxx] validation protocol. Validation is a process where information is thoroughly reviewed. Reported and unreported infections are compared to a standard definition to see if the infections were classified correctly. [State HAI Program] has also reviewed the quality of the data to identify any potential errors or data entry mistakes. Data that have been thoroughly reviewed by [State HAI Program] may find additional infections or lead to corrections to the data. Please refer to the Methods section of the technical report for more information about validation.

2. **There may be differences in reporting practices among hospitals.** Hospitals with more infection control personnel and resources may be able to identify and report more infections compared to a hospital with fewer infection control resources.

   ***Note to Authors**: The workgroup feels that it is important for an HAI report to provide its audience with a rationale for possible discrepancies between the state's data and data published by other organizations (Hospital Compare, Consumer Reports, etc.). A detailed explanation on this can be found in the "Other Considerations" chapter.*

3. **There may be differences between results published by the [State HAI Program] and results published elsewhere** (e.g., CMS - Centers for Medicare and Medicaid Services Hospital Compare website). Results may differ due to using

data from different time periods, different facility types, different patient populations, and/or different methods of analysis.

***Note to Authors**: If presenting infection rates and applying thresholds for calculating and presenting rates, include the language below:*

4. **The [State HAI Program] chose not to present some rates** for individual hospital units, procedures or hospitals that did not meet a threshold (minimum value) for the reporting period. The minimum threshold numbers are based on CDC recommendations for reporting healthcare-associated infection data.

***Note to Authors**: If presenting SIRs and applying thresholds for calculating and presenting SIRs, include the language below:*

**The [State HAI Program] does not calculate an SIR when the number of predicted infections is less than 1**. In these situations, the "How Does This Facility Compare to the National Experience" text says "No conclusion." This does not mean that the hospital failed to report data, or that the hospital did not report all necessary data; it only means that the number of patients, devices (central lines or urinary catheters), and/or procedures that were seen at this hospital during this time period did not meet the established threshold (minimum value) for calculating an SIR. This minimum threshold is based on CDC recommendations. In other words, there is not enough information to make a reliable conclusion about this hospital's performance on this measure.

***Note to Authors**: If presenting LabID Event data, include the language below:*

5. **Laboratory-Identified Events (LabID Events):** *Clostridium difficile* infections (CDI) and methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia (blood infection) LabID events rely on laboratory data. Patients did not have to be ill to have a positive result, and a positive result can be determined without requiring clinical information about the patient. This allows for a much less labor-intensive means to track CDI and MRSA infections. Only those LabID events that occurred more than 3 calendar days after hospital admission are displayed in this report.

## *Results*

1. **INFECTION SUMMARY TABLE**

2. **READING GUIDE TO THE HAI DATA TABLES: AN EXPLANATION OF EACH VARIABLE (click here)**

3. **STATE-LEVEL AND HAI-SPECIFIC TABLES/REPORTS**

*Please refer to the "Data Tables" section of the toolkit to review example data tables.*

*(Below sections are optional. Use if presenting healthcare worker influenza vaccination data.)*

4. **SUMMARY DATA TABLE FOR HOSPITAL PROCESS MEASURES**

5. **HOW TO READ THE DATA TABLE FOR HEALTHCARE WORKER INFLUENZA VACCINATION (click here)**

6. **INFLUENZA VACCINATION DATA TABLE**

## *Conclusion/Discussion*

***Note to Authors**: The Conclusion section should include a high-level summary of the data presented and highlight some of the major "take-home" messages of the report (a sample Conclusion is not provided in this toolkit). The Workgroup recommends including information about how consumers can provide feedback and/or ask questions about the report, including contact information for the state HAI program and/or other HAI stakeholder organizations, as appropriate. This is also an opportunity for the state to provide details about the prevention collaboratives or other HAI prevention activities (e.g., use of the TAP strategy) that are occurring in the state.*

*The Conclusion section of the consumer report should also direct the reader to the report for healthcare providers if the reader is interested in more technical information.*

## *For More Information*

1. Fast Facts: What You Need to Know about Healthcare-Associated Infections
2. Guide to Understanding Healthcare Worker Influenza Vaccination
3. Things to Think About When Choosing a Healthcare Facility
4. What Patients Can Do to Prevent Infections

## *Acknowledgments*

***Note to Authors:** As appropriate, list any contributing authors, State HAI Advisory Group members, or others who should be acknowledged in the report. Several existing HAI publications include a statement to acknowledge the hospitals and IP community who conduct HAI surveillance and perform data entry into NHSN. Two examples of such statements are below:*

*"The authors are indebted to the NHSN participants for their ongoing efforts to monitor infections and improve patient safety."*

*Or*

*"The HAI Program would like to thank the Infection Prevention, Quality, and Information Technology staff at [STATE] hospitals for collaborating to provide the data presented in this report."*

## *Appendices*

***Note to Authors**: The following appendices are suggestions from the workgroup and have been used previously by other states.*

A. Fact sheets *(state-specific or national)* for each HAI type discussed in the report *(SHEA FAQs are available here: http://www.shea-online.org/Patients.aspx)*
B. Acronyms/Definitions *(An example list is provided below)*
C. Full list of hospitals, alphabetically. (*Consider grouping by bed size or geographic region. Any additional facility-specific information you would like to show can be included here.)*

## *References*

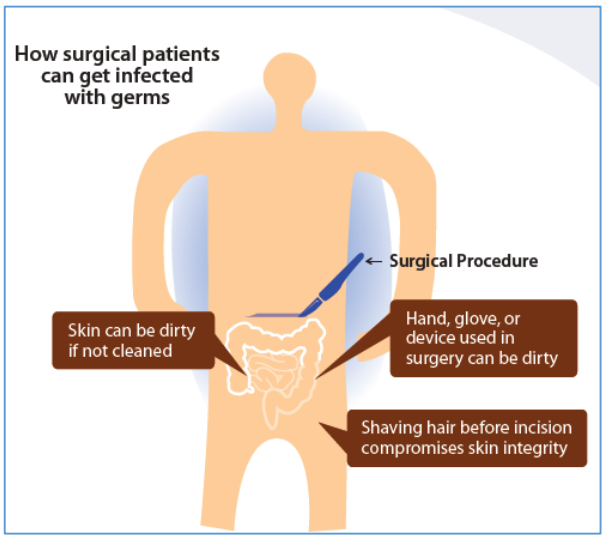
*List all references used in the report.*

**The following pages contain educational materials that were referenced earlier in this Report. An example of Appendix B is also included.**

# FAST FACTS: What You Need to Know About Healthcare-Associated Infections

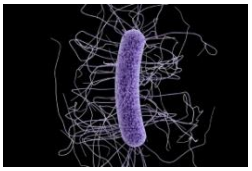
***Note to Authors:*** *Edit this fact sheet as needed, depending on the infections/events presented in your state's consumer report. Fast Facts was created with the permission of the Kansas Department of Health and Environment– infographics were taken from their report. Images of MRSA and C. diff are from CDC.*

- A **surgical site infection (SSI)** occurs after surgery in the part of the body where the surgery took place. These infections may involve only the skin or may be more serious and involve tissue under the skin or organs. SSIs sometimes take days or months after surgery to develop. Symptoms may include fever, redness or pain around the surgical site, or drainage of fluid from the wound.



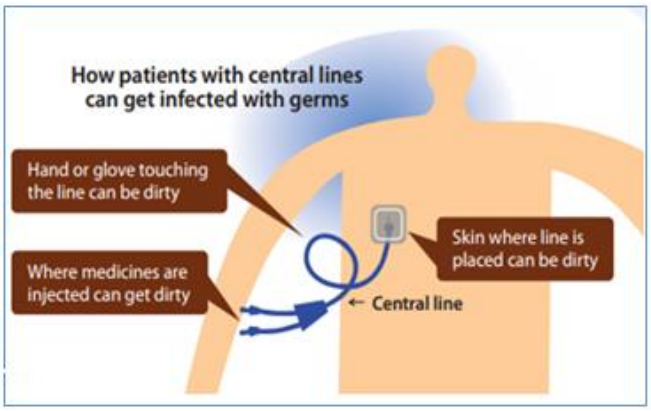

- **Methicillin-resistant *Staphylococcus aureus* (MRSA)** infections are caused by bacteria that are resistant to certain types of drugs. MRSA can cause skin or wound infections. Sometimes, MRSA can infect the blood and cause serious illness and even death. Only [bloodstream infections] are shown in this report.

- ***Clostridium difficile* (*C. difficile*)** is a type of bacteria that causes severe diarrhea and can be deadly. *C. difficile* infections usually occur in people who have recently taken antibiotics and have been under medical care.

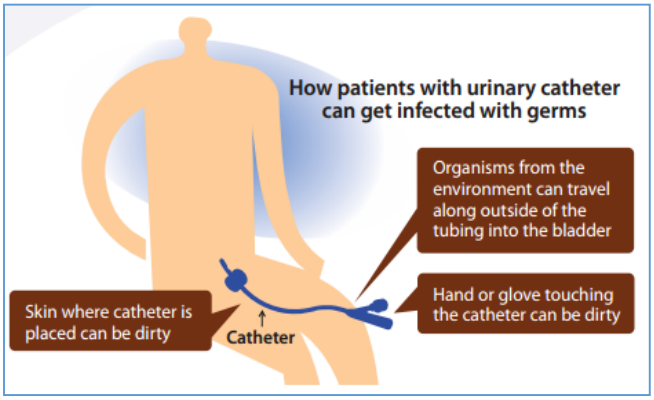


Sometimes, patients have medical devices inserted into their bodies to provide necessary medical care. These devices are called “invasive devices” and patients with these devices have a higher chance of getting an infection. Here is what you need to know about invasive devices and what kinds of infections they can be associated with:

- A **central line** is a tube placed in a large vein to allow access to the bloodstream and provide the patient with important medicine. A **central line-associated bloodstream infection (CLABSI)** can occur when bacteria or other germs travel along a central line and enter the blood. When not put in correctly or kept clean, central lines can become a pathway for germs to enter the body and cause serious infections in the blood.




- A **urinary catheter** is a tube placed in the bladder to drain urine. A **catheter-associated urinary tract infection (CAUTI)** can occur when bacteria or other germs travel along a urinary catheter, resulting in an infection in the bladder or the kidney.



*(Optional material to supplement the consumer report for those organizations publishing data on influenza vaccination of healthcare workers)*

# GUIDE TO UNDERSTANDING HEALTHCARE WORKER INFLUENZA VACCINATION

Influenza, or "the flu," is a mild to severe respiratory illness caused by the influenza virus. It is a contagious illness, meaning that it can easily spread from person to person. If healthcare workers (also known as healthcare personnel) become infected with the flu, they can spread this illness to their coworkers and patients. Some patients in a hospital are at high risk for complications from the flu, such as the elderly, very young, or those with severe chronic illnesses. Extra care should be taken to prevent the spread of the flu among healthcare workers and patients.

The best way to prevent the flu is by getting vaccinated. The Centers for Disease Control and Prevention (CDC) recommends that all healthcare personnel who work in a healthcare setting receive the flu vaccine each year to help prevent the spread of flu within the workplace. Healthcare personnel include all facility employees, licensed independent practitioners, adult students/trainees, volunteers, <and contractors> regardless of full time/part time status, clinical responsibility or patient contact. **Studies show that patients benefit when healthcare workers get vaccinated.**

Many hospitals choose to provide the flu vaccine to their employees, and some hospitals even have policies requiring mandatory vaccination. Currently, there are/are no state regulations requiring vaccination in State, and healthcare workers are able to decline the flu vaccine for any reason.

This report shows the percentage of all healthcare workers in each hospital who received the flu vaccine. Higher percentages are better, because this indicates that a greater number of healthcare workers are protected against the flu. For the 2014-2015 flu season (i.e., the most recent flu season with available data), the State's overall vaccination percentage was <xx%>. The Department of Health and Human Services (HHS) Healthy People 2020 goal for healthcare worker flu vaccination in the United States is 90%. In State, X% of hospitals met this goal for the 2014-2015 flu season.

*For more information about the CDC recommendations and the national trends of influenza vaccination coverage, see here:*
*http://www.cdc.gov/flu/healthcareworkers.htm*

# THINGS TO THINK ABOUT WHEN CHOOSING A HEALTHCARE FACILITY

***Note to Authors**: Edit or add to this section as needed to share information with consumers about what to consider, other than HAI performance, when evaluating a healthcare facility for medical care.*

- Does your doctor recommend the facility? Why or why not?
- Does your health insurance cover treatment at this facility? If not, ask your doctor if there are benefits of out-of-network care.
- Is your hospital accredited by a nonprofit organization that seeks to improve the quality and safety of healthcare (e.g., The Joint Commission or DNV-GL)?
- Do you know your doctor's or healthcare provider's qualifications? Is he or she licensed and board-certified? Consult your state licensing board for information on licensure and disciplinary actions that may have been taken.
- What infection prevention resources are at your healthcare facility? If you have questions, find out how you can get in touch with someone in infection prevention before you visit the facility.
- Does your healthcare facility have a patient advocate? If so, s/he may be able to provide additional consultation and services before, during, and after your medical treatment.
- If you are planning to have surgery:
    - Does the facility do a lot of the procedures that you will be having? Patients who have surgery at hospitals that do more surgical procedures may have better outcomes (Ho 2000).
    - Does the facility have a floor or unit that only does the type of surgery you are having? For example, for hip replacement surgery, does the facility have a floor or unit that is used only for joint replacement surgeries?
    - Does the facility have one or more operating rooms that are used only for your type of surgery?
    - Does the facility follow specific guidelines so that everyone who has your type of surgery receives consistent care?
- The federal government reports other quality information about hospitals, in addition to healthcare associated-infections. Find this information online at: www.hospitalcompare.hhs.gov
- The Centers for Medicare and Medicaid Services has a comprehensive guide available to assist patients in selecting a hospital. Find this at: http://www.medicare.gov/Pubs/pdf/10181.pdf

# WHAT PATIENTS CAN DO TO PREVENT INFECTIONS

***Note to Authors**: Edit this section as needed, depending on the infections presented in your state's consumer report.*

**To prevent *all* infections**:

- If you do not see your healthcare providers clean their hands before caring for you, don't be shy about asking them to do so. This is your healthcare, and you have a right to speak up!
    - Make sure you and your family members and friends keep their hands clean too!
- Ask your healthcare provider what specific steps s/he takes to prevent infections as well as what you can do to prevent infections before, during, and after your visit as it applies to your care.

**To prevent central line-associated bloodstream infections (CLABSIs) and catheter-associated urinary tract infections (CAUTIs)**:

If you have a central line or urinary catheter put in place, ask your doctors and nurses to explain why you need it and how long you will have it.

- Ask your healthcare providers each day if you still need it.
- If the bandage covering your central line becomes wet or dirty, tell your nurse or doctor immediately.
- Tell your nurse or doctor if the area around your central line or catheter is sore or red, or you feel feverish.
- Follow your healthcare providers' instructions for the care of the central line or urinary catheter to keep it working as it should and keep it clean and free of germs.
- Do not let family and friends touch the central line tubing or bandage.

**To prevent surgical site infections (SSIs)**:

*IMMEDIATELY AFTER YOUR SURGERY AND DURING RECOVERY*:

- Avoid touching your incision area and follow all instructions from your doctor about how to take care of your incision.
- Before and after taking care of your incision area, wash your hands or use an alcohol-based hand sanitizer and have any family member helping with your care do the same.
- If you have any infection signs/symptoms like redness, pain, fever, or drainage, call your doctor *ASAP*.
- Until the incision is completely healed, always use a different washcloth for the incision area than the one used for the rest of your body.
- Keep clean sheets on your bed and make sure the clothes that come in contact with your incision are clean.
- Keep pets away from the incision until healed.

*BEFORE YOU LEAVE THE HOSPITAL OR AMBULATORY SURGERY CENTER*:

- Make sure you understand how to take care of your wound and ask questions when you are unsure.
- Know who to contact if you have questions or problems after you get home.
- Keep all appointments scheduled at the time of discharge.

**To prevent *Clostridium difficile* infections**:

- Take antibiotics only as prescribed by your doctor and complete the course of treatment.
- Tell your doctor if you have recently been on antibiotics or if you get diarrhea within a few months of taking the antibiotics.
- Wash your hands before eating and after using the bathroom.

**To prevent methicillin-resistant *Staphylococcus aureus* (MRSA) infections**:

- Clean your hands often, especially before and after changing wound dressings or bandages.
- Keep wounds clean and change bandages as instructed until healed.
- Avoid sharing personal items such as towels or razors.
- Take antibiotics only as prescribed by your doctor and complete the course of treatment.

**To prevent influenza or the "flu"**:

- Get vaccinated against the flu each year, clean your hands often, and cover your cough with your sleeve.

# APPENDIX B: Acronyms

***Note to Authors**: Edit this section as needed, depending on the abbreviations and acronyms used in your consumer report.*

| | |
|---|---|
| ACH | Acute care hospital (short-term) |
| ACL | Adult Care Licensure |
| APIC-[State] | Association for Professionals in Infection Control and Epidemiology, [State] Chapter |
| ASA | American Society of Anesthesiologists |
| ASC | Ambulatory Surgery Center |
| BSI | Bloodstream infection |
| CAUTI | Catheter-associated urinary tract infection |
| CCU | Critical care unit (also known as intensive care unit – see ICU) |
| CDB | Communicable Disease Branch |
| CDC | Centers for Disease Control and Prevention |
| *C. diff* | *Clostridium difficile* |
| CDI | *Clostridium difficile* infection |
| CI | Confidence interval |
| CMS | Centers for Medicare and Medicaid Services |
| CLABSI | Central line-associated bloodstream infections |
| CRE | Carbapenem-resistant Enterobacteriaceae |
| CUSP | Comprehensive Unit-based Safety Program |
| DHHS | Department of Health and Human Services |
| DHSR | Division of Health Services Regulation |
| DPH | Division of Public Health |
| ED | Emergency department |
| FTE | Full-time equivalent |
| G.S. | General statute |
| HAI | Healthcare-associated infection |
| HRET | American Hospital Association's Health Research & Educational Trust |

| | |
|---|---|
| ICU | Intensive care unit (also known as critical care unit – see CCU) |
| IPs | Infection preventionists |
| IRF | Inpatient rehabilitation facility |
| LTACH | Long-term acute care hospital |
| MRSA | Methicillin-resistant *Staphylococcus aureus* |
| NHLC | Nursing Home Licensure and Certification |
| NHSN | National Healthcare Safety Network |
| NICU | Neonatal intensive (critical) care unit |
| QIO | Quality improvement organization |
| SIR | Standardized infection ratio |
| SSI | Surgical site infection |
| VAST | Vascular Access Safety Team |
| VRE | Vancomycin-resistant *Enterococcus* |

**The following pages should be included in the Results section of the Report.**

# READING GUIDE TO THE HAI DATA TABLES: EXPLANATION OF EACH VARIABLE

***Note to Authors:*** *Edit this guide as needed, depending on the variables shown in the data tables of your consumer report.*

Below is a list of all variables shown in the HAI data tables:

- **Title**: The title of the table gives you information about the infection type, time period, geographic location, and facility type included in the table.

- **Facility Name:** This is the name of the facility. Facilities with multiple campuses will have each campus identified separately.

- **Procedure Type:** This is the specific type of surgery for which the surgical site infection (SSI) data are presented (such as abdominal hysterectomy or colon surgery). If acronyms are used, you can find the full name of the surgery in the legend or in the table's title.

- **Unit/Unit Type:** This is the specific unit/type of unit in the hospital from which the data were collected. Hospitals have distinct locations, or units, within the facility that are designated for certain types of patients. For example: "Med/Surg ICU" represents the intensive care unit (ICU) for very sick patients needing medical or surgical care.

- **Number of Procedures:** This is the total number of surgeries performed by a facility during <time frame>.

- **Observed Infections (or Observed Events):** This is the number of infections (or events, for LabID measures) that was reported by the facility.

- **Predicted Infections (or Predicted Events):** This is a calculated value that reflects the number of infections (or events, for LabID measures) that we have "predicted" to occur in this facility, based on the national experience.

- **"How Does This Facility Compare to the National Experience?"** Colors and symbols are used to help you quickly understand and interpret the facility's data. This is the "take-home message" about healthcare-associated infections in this facility.

  ★ **Indicates that the facility had fewer infections than were predicted (better than the national experience)**

  = **Indicates that the facility had about the same number of infections as were predicted (same as the national experience)**

✖ **Indicates that the facility had more infections than were predicted (worse than the national experience)**

**No Conclusion:** Indicates that this facility reported data, but there was not enough information to make a reliable comparison to the national experience (number of predicted infections was less than 1).

# HOW TO READ THE DATA TABLE FOR HEALTHCARE WORKER INFLUENZA VACCINATION

- **Title**: The title of the table gives you information about the time period (flu season), geographic location, and facility type(s) included in the table.

- **Facility Name:** This is the name of the facility. Facilities with multiple campuses will have each campus identified separately. <Add more details on facility stratification depending on state requirements>.

- **Percentage of Healthcare Workers Vaccinated:** This is calculated as a percentage (how many per hundred) of all healthcare workers in the hospital who received the flu vaccine. This includes all facility employees, licensed independent practitioners, adult students, adult volunteers, <and contractors> regardless of full time/part time status, clinical responsibility or patient contact.

$$\frac{\text{Number of healthcare workers vaccinated}}{\text{Total number of healthcare workers at the hospital}} \times 100 \ \%$$

- **"How Does This Facility Compare to <the Healthy People 2020 Goal>"?**

1. Vaccination is higher (**better**) than the <Healthy People 2020 Goal>: ★ better
2. Vaccination is **similar** to the <Healthy People 2020 Goal>: = **same**
3. Vaccination is lower (**worse**) than the <Healthy People 2020 Goal>: ✖ worse
4. Data were not reported from this facility: **not reported** (no affiliated symbol)

## Template Report: HAI Data for Providers

### Key Concepts for Displaying HAI Data to a Technical Audience: Information for HAI Report Authors

In this section of the toolkit, we will describe the characteristics of a standard report template for a technical audience. An example of an HAI report introduction, methods section, and supporting reference/educational materials are also provided, all of which have been tailored to this audience, which may include healthcare providers, clinicians, administrators, public health professionals, biostatisticians or others with background knowledge of HAI data.

"Notes" in italic font are provided throughout the template to assist the HAI report authors in understanding the workgroup's rationale for certain decisions or to provide other instructions/clarifications. The "Other Considerations" chapter of the toolkit contains additional details on the workgroup's rationale and decision-making process.

The working group acknowledges that individual state mandates and/or available resources may not allow for complete adoption of the standard data elements and template provided, therefore some alternatives are also presented, with caveats to consider.

## *Explanation of Standard Report Elements to Include in Data Tables*

Below is a list of standard data elements that can be displayed on the technical HAI data report and an explanation of how each should be presented.

- **Title**: The title should clearly state the geographic location (your state's name), the HAI type, infection metric, time period, location or procedure type if applicable, and facility type included in the table.

- **Facility Name:** This should be the "doing business as" name that is recognized by the general public. Facilities with multiple campuses should have each campus identified separately in a clear and understandable way.

- **Procedure Type:** This is the specific type of procedure (surgery) that procedure-associated infections are being presented for (e.g., COLO, HYST).

  *<u>NOTE</u>**:** The workgroup recommends producing a separate data table for each procedure type, in which case the full procedure name (e.g., Colon Surgery, Abdominal Hysterectomy) should be included in the title, and report authors can consider removing this column from the tables. Additional considerations are found in the "Other Considerations" chapter.*

- **Unit/Unit Type:** This is the specific unit in the facility that device-associated infections are attributed to. It can be unit-specific (e.g., Medical/Surgical ICU, Cardiac ICU) or unit type-specific (e.g., Adult/Pediatric ICUs, Neonatal ICUs, Inpatient Wards).

> *<u>NOTE</u>**:** The workgroup recommends that the technical data report display the most granular level of data possible while maintaining data integrity.*

- **Number of Procedures:** For surgical site infection (SSI) data, this is the number of procedures (surgeries) performed by a facility during the time frame of interest.

- **Device Days:** This is the number of device days that were reported by the facility for device-associated infections. A device day is a daily count of the number of patients with a specific device in the patient care location during a time period. This may be central line days if displaying CLABSI data, urinary catheter days if displaying CAUTI data, or ventilator days if displaying ventilator-associated events.

- **Patient Days**: This is a daily count of the number of patients in a patient care location during a time period. To calculate patient days, for each day of the month, at the same time each day, record the number of patients. At the end of each month, the daily counts are added together. This is displayed for LabID events only (e.g., MRSA bacteremia or *Clostridium difficile*).

- **Observed Infections (or Observed Events):** This is the number of infections (or events, for LabID measures) that were reported by the facility for a given time period and unit type or procedure. This number is the numerator in the SIR calculation and should be displayed for all HAI types.

- **Predicted Infections (or Predicted Events):** This is a calculated value that reflects the number of infections (or events, for LabID measures) that were "predicted" to have occurred in the facility, based on the national baseline data. This is the denominator in the SIR calculation and should be displayed for all HAI types. Refer to the "Methods for Composing HAI Reports" chapter of the toolkit for an explanation of using the term "predicted" instead of "expected."

- **SIR:** The Standardized Infection Ratio (SIR) is the primary metric for HAI data and compares the number of observed infections to the number predicted. Use of an infection rate is discussed in the "Methods for Composing HAI Reports" chapter of this toolkit.

- **95% Confidence Interval (CI):** This measure is used to indicate statistical significance and is recommended for display in the technical report. The workgroup advocates the use of the 95% confidence interval over the p-value to indicate significance because the CI provides additional information about the

precision of the SIR calculation. However, it would also be acceptable to display the p-value in addition to the confidence interval, if states prefer to do so.

- **SIR Interpretation**: The information in this column represents the SIR's statistical significance using understandable language and symbols. For additional considerations and workgroup rationale, see the "Other Considerations" chapter.

  The workgroup recommends using three main categories for the SIR, with an additional category that indicates when an SIR is not calculated. For each of these categories, the workgroup recommends the following symbol and accompanying words:

  A) SIR is significantly < 1 : ★Better
  B) SIR is not statistically different from 1 : = Same
  C) SIR significantly > 1 : ✖Worse
  D) # of predicted infections < 1 : "**No Conclusion**" (no affiliated symbol)

*NOTE: The workgroup offers a second choice for symbol considerations. See the "Other Considerations" chapter for more information about these chosen symbols and accompanying language.*

- **Legend:** The workgroup recommends displaying a legend at the top of each page of data tables. The legend should include the full explanations for each of the SIR categories, as well as information about the time frame used to determine the predicted number of infections or events (i.e., years of the national baseline). Note the change in terminology in the legend used for LabID events, which references "events" instead of "infections."

  **Lengthier Explanations and Corresponding Image for each SIR Category:**

  A) "Significantly fewer infections (**better**) observed than predicted, based on the national baseline.": ★

  B) "No significant difference (**same**) between the number of observed and predicted infections, based on the national baseline.": =

  C) "More infections (**worse**) than predicted, based on the national baseline.": ✖

  D) "The SIR is not calculated when the number of predicted infections is less than 1.": "**No Conclusion**"

  A blanket statement addressing the time frame for collection of national baseline data can be listed at the bottom of legend:

**The national baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA bacteremia and C. difficile Laboratory-Identified Events.*

## Sample State HAI Report for a Healthcare Technical Audience

The following pages contain an example HAI report template compiled by the Data Analysis and Presentation Standardization Workgroup that has been specifically tailored to a healthcare **technical** audience.

Supporting educational materials and images are also provided to aid in understanding, and these may be copied and/or modified for your report. Along with the materials below, please review the "Data Tables" chapter of the toolkit for standard data display templates using the best practices outlined in the "Methods for Composing HAI Reports" chapter to present HAI data to a technical audience. The "Technical Resources" chapter of the toolkit provides the image files used in the educational materials, as well as SAS code that can be used to create each data table.

**NOTE:** Edit the highlighted sections as needed to ensure this text accurately represents the information you are presenting in your report. The *italicized* text provides instruction to the toolkit reader (i.e., HAI report authors) while developing a report from this template.

# [STATE DEPARTMENT OF HEALTH]
# HEALTHCARE-ASSOCIATED INFECTIONS REPORT FOR A HEALTHCARE PROVIDER AUDIENCE
# [TIME PERIOD]

## *Table of Contents*

An HAI report should include a Table of Contents listing the main sections of the report. If appropriate for your state, providing internal hyperlinks connecting the Table of Contents to the particular sections may be helpful for some audiences.

## *Introduction*

Consider including a brief introduction to the report and its contents. This part of the report should explain to readers why this information is important and how to use the information.

This section is meant to be short so that readers are not discouraged by the report's length. Some report authors may choose to include an executive summary that highlights the major findings and conclusions of the state's HAI experience, but caution is given to keep the summary brief.

***Note to Authors:*** *The workgroup has created and compiled specific information that can be helpful for HAI report users. This includes how to read and interpret the data, an explanation of the variables, and HAI educational materials. Feel free to adopt all or part of the language presented below in the report's introduction.*

### WHAT IS THE PURPOSE OF THE REPORT?

This report is meant to provide healthcare-associated infection (HAI) information in an understandable way to enable readers to view facility-specific HAI performance, evaluate interventions to drive change within a facility, understand the entire state's HAI performance as a whole, and/or to compare a facility's HAI performance to that of the rest of the country.

Hospitals track and report HAIs for many reasons. In some cases they are required to do so—either by state public health authorities or by federal health agencies. In most cases, hospitals report data about certain HAIs because they want to know how well they are doing in preventing them, and how they compare with other hospitals of similar size and with similar kinds of patients.

Patients and their family members can also use this information to ask healthcare providers questions before seeking and while receiving medical treatment. Asking the

right questions can help patients and family members learn what they can do to prevent infections.

This report looks at <five> HAIs:

1. Central line-associated bloodstream infections (CLABSI)
2. Catheter-associated urinary tract infections (CAUTI)
3. Surgical site infections (SSI) following <types of surgeries>
4. Positive laboratory results for methicillin-resistant *Staphylococcus aureus* (MRSA) found in the bloodstream
5. Positive laboratory results for *Clostridium difficile* (*C. difficile*) in stool

The report also shares information on healthcare worker vaccination for influenza. The Centers for Disease Control and Prevention (CDC) <and the State Health Department> recommend that all personnel who work in a healthcare setting receive the flu vaccine each year to help prevent the spread of influenza.

**Click here for a guide to understanding healthcare worker influenza vaccination.**

Hospitals are <required by law> to report these <five> HAIs and healthcare worker influenza vaccination rates to the <State Health Department>. More information about <State's> mandatory reporting can be found here: <insert link>.

These measures do not represent all possible infections, but were selected because they give a good overview of how a hospital is doing in preventing healthcare-associated infections. These infections are largely preventable when healthcare providers use infection prevention steps recommended by the CDC <and the State Health Department>.

**Click here for things healthcare providers can do to prevent infections.**

## *Methods and How to Use the Information in the Report*

### HOW DO I READ THE REPORT?

***Note to Authors**: If presenting **SIRs,** use the following text to explain to the technical audience how they should read and interpret SIR data:*

Using a measure called the *standardized infection ratio* (SIR), this report looks at the HAI performance of hospitals in this state by displaying how many HAIs they reported during <TIME FRAME>. The SIR shows whether a hospital had significantly more HAIs, fewer HAIs, or about the same number of HAIs compared to the number predicted for that hospital based on national baseline data.

$$\text{SIR} = \frac{\text{Number of observed infections}}{\text{Number of predicted infections}}$$

The SIR is a summary measure that can be used to track HAIs over time and can be calculated on a variety of levels, including unit, facility, state, and nation. It adjusts for differences between healthcare facilities such as types of patients and procedures, as well as other factors such as the facility's size and whether it is affiliated with a medical school (see page X for more information about risk adjustment). It compares the number of infections reported in a given time period to the number of infections that were predicted using data from a baseline time period, which varies for different infection types. Lower SIRs indicate better performance.

When the SIR is calculated, there are three possible results:

- The SIR is **less than 1.0** – this indicates that there were fewer infections reported during the surveillance period than would have been predicted given the baseline data.
- The SIR is **equal to 1.0** – as in any ratio, the value of 1 indicates that the numerator and denominator are equal. In this case, the number of infections reported during the surveillance period is the same as the number of infections predicted given the baseline data.
- The SIR is **greater than 1.0** – this indicates that there were more infections reported during the surveillance period than would have been predicted given the baseline data.

This report also looks at the percentage of all healthcare workers in each hospital who received the influenza vaccine. Higher percentages are better, because this indicates that a greater number of healthcare workers are protected against certain strains of influenza. The report shows whether a hospital had a higher percentage, lower percentage, or similar percentage of vaccinated healthcare workers compared to the Department of Health and Human Services (HHS) Healthy People 2020 goal (90%).

***Note to Authors**: If presenting infection **rates,** use the following text to explain to consumers how they should read and interpret rate data:*

*Delete the first sentence if both SIRs and rates are presented, as it is redundant with the first paragraph on the prior page.*

This report looks at the HAI performance of hospitals in this state by displaying how many HAIs they reported during <TIME FRAME>. The data tables that follow show an infection rate for each hospital/location type and each HAI. An infection rate measures the number of new infections seen in a hospital during a given time frame for those patients at risk for infection. It provides information about how often infections are occurring in a particular location within the hospital, and can identify the types of surgical procedures that may pose the highest risk for infection.

A rate is calculated for each infection/event type (CLABSI, CAUTI, MRSA, *C. difficile*) as the total number of infections or events reported during <TIME FRAME>, divided by the total number of days that patients were in the hospital/location and at risk for that infection or event.

A rate for surgical site infections (SSI) is calculated as the total number of infections reported for surgical procedures during <TIME FRAME>, divided by the total number of procedures performed of that type.

## WHAT DO THE NUMBERS MEAN?

It's important to understand that numbers alone won't show how well a hospital is doing in preventing HAIs. This report shows how hospitals performed during a single year (2014), and compares each hospital's performance to the national baseline. It does not track the hospital's performance over time.

Infection rates and SIRs are calculated using a numerator (number of infections) and a denominator (population at risk). Readers should evaluate the numerator and denominator as well as the summary SIR or rate in order to obtain an accurate picture of the facility's infection experience. Larger hospitals that see more patients or do more surgeries may have more infections compared to smaller hospitals. Therefore, it is important not only to consider the SIR interpretation for each hospital, but to also look at the total number of procedures performed and the total number of infections observed (or identified) in that time period.

Although HAIs are a significant patient safety and public health concern, they are not the only available quality metric. Information about other healthcare quality data measures (at both the state and federal level) can be included here.

### If a Hospital Has Zero (0) Infections, What Does That Mean?

The total number of infections listed in the data tables represents a count of the number of infections reported by this hospital. If the number of infections is zero (0), this means that the hospital saw no infections of this type during <time period>. It does NOT mean

that the hospital failed to report all of their infections. If a hospital reported zero infections, it may be important to consider the size of the hospital and to look at the total number of procedures performed and the total number of infections that were predicted (also shown in the data tables).

## WHERE DO THE NUMBERS COME FROM?

***Note to Authors**: The template assumes data are abstracted from NHSN. Modify as needed to provide details of the surveillance system that collects the data you present.*

Hospitals self-report their HAI data to the CDC and the [state] using a free, web-based software system called the National Healthcare Safety Network (NHSN). CDC and [state HAI program] provide training to hospital staff on the appropriate use of this system and provide guidance on how to track infections in a standard way.

Although efforts were made through education and training to improve the standardization and understanding of NHSN surveillance guidelines, definitions, and criteria, there can be variability in interpretation and application, leading to differences in reporting practices among hospitals. Furthermore, hospitals with more resources and/or a robust HAI surveillance program may be able to identify and report more infections compared to a hospital with fewer resources.

In this report, the number of predicted infections is an estimate based on infections reported to NHSN by participating facilities nationwide during the following baseline time periods:

- 2006 to 2008: CLABSI and SSI [acute care hospitals (ACHs)]
- 2009: CAUTI (ACHs)
- 2010 to 2011: MRSA bacteremia and *C. difficile* laboratory-identified events (ACHs)
- 2013: CLABSI [long-term acute care hospitals (LTACHs)] and CAUTI [LTACHs and inpatient rehabilitation facilities (IRFs)]

Once CDC updates the national baselines, [state] will be able to publish SIRs that compare infections to a more recent time period.

These reports cover data that were collected during [TIME PERIOD] and were downloaded from NHSN on [DATE]; any changes made to the data after this date are not reflected in this report.

More information about NHSN can be found here: http://www.cdc.gov/nhsn/

***Note to Authors:** If presenting LabID Event data, include the language below:*

## LABORATORY-IDENTIFIED (LABID) EVENT ANALYSES

*Clostridium difficile* infection (CDI) and methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia LabID events rely on laboratory data. Patients do not have to meet

clinical criteria for their events to be reported to NHSN, which allows for a much less labor-intensive means to track CDI and MRSA infections. LabID events that occurred more than 3 calendar days after admission are included in the numerator of the SIR.

The [state HAI Program] would like to highlight certain caveats in using and interpreting LabID event data. For example, experience in other states has shown that CDI rates tend to be higher when using LabID event data compared to a clinical case definition. Reasons for this may include differences in how individual facilities define and classify clinical disease, when specimens are obtained, and variations in hospital laboratory testing methods and practices. LabID events should be considered a 'proxy' measure to estimate the number of CDI and MRSA infections actually occurring.

Despite these caveats, there are benefits to using LabID data. LabID events do not depend on clinical interpretation by providers and thus offer a more standardized and consistent method of collecting and reporting CDI and MRSA surveillance data. Moreover, LabID events are currently being used by CMS (Centers for Medicare and Medicaid Services) for quality reporting programs. Improving prevention practices as described in existing clinical guidelines should result in a decrease in the number of observed CDI and MRSA LabID events as well as a decrease in the number of clinical infections.

## RISK ADJUSTMENT

***Note to Authors***: *Modify as needed to specify the risk adjustment performed by the state and/or the SIR model used in the report*).

The SIRs are adjusted for risk factors that may impact the number of infections reported by a hospital, such as type of patient care location, bed size of the hospital, patient age, and other factors. The SIR is adjusted differently depending on the type of infection measured.

The SIRs for CLABSIs and CAUTIs are adjusted for:

- Type of patient care location
- Hospital affiliation with a medical school (for some units)
- Bed size of the patient care location (for some units)

The SIRs for hospital-onset *C. difficile* and MRSA bloodstream LabID events are adjusted using slightly different risk factors:

- Facility bed size
- Hospital affiliation with a medical school
- The number of patients admitted to the hospital who already have a *C. difficile* or an MRSA bloodstream LabID event ("community-onset" cases)
- For hospital-onset *C. difficile*, the SIR also adjusts for the type of test the hospital laboratory uses to identify *C. difficile* from patient specimens

The SSI SIRs are presented using CDC's Complex Admission/Readmission (A/R) model, which takes into account patient differences and procedure-related risk factors within each type of surgery. These risk factors include:

- Duration of surgery

- Surgical wound class
- Use of endoscopes
- Re-operation status for orthopedic surgeries (e.g., knee replacement, hip replacement)
- Patient age
- Patient assessment at time of anesthesiology

However, while NHSN collects information on many important factors that may put a patient at risk for an HAI, the system is not able to obtain every detail about every person. Each patient and healthcare location has a different set of risks that may not be fully accounted for in the calculation of the standardized infection ratio.

***Note to Authors***: *If presenting rates, modify the text as needed.*

The data presented have a limited risk-adjustment that may not take into account patient or facility differences that could contribute to the incidence of HAIs.

## STATISTICAL SIGNIFICANCE

***Note to Authors****: Edit as appropriate based on the report's use of the p-value and/or 95% confidence interval.*

The p-value and 95% confidence interval are statistical measures that describe the likelihood that what we observed was due to random chance.

*HAI measures*
For HAIs and LabID events, the p-value and confidence interval tell us whether or not a facility's SIR is significantly different from 1 (the value we would expect if the facility performed exactly the same as what was predicted based on the national data). If the p-value is less than or equal to 0.05, we can conclude that the number of observed infections is *significantly different* than the number of predicted infections (i.e., the facility's SIR is significantly different from 1). If the p-value is greater than 0.05, we can conclude that the number of observed infections in a facility *is not significantly different* than the number predicted (i.e., the facility's SIR is no different than 1).

The 95% confidence interval is a range of values. We have a high degree of confidence (in this case, 95%) that the true SIR lies within this range. The upper and lower limits are used to determine the significance and accuracy (or precision) of the SIR. If the confidence interval includes the value of 1, then the SIR is *not significant* (i.e., the number of observed events is not significantly different than the number predicted). If the confidence interval does not include the value of 1, then the SIR *is significant*. 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.

*Influenza vaccination measures*
For influenza vaccination data, the p-value compares the observed vaccination percentage to the chosen benchmark. If the p-value is less than or equal to 0.05, we can conclude that the facility's vaccination percentage is *significantly different* than the benchmark. If the p-value is greater than 0.05, we can conclude that the facility's vaccination percentage is *not statistically different* than the benchmark.

## QUALITY ASSURANCE AND DATA VALIDATION

The data are preliminary. Although efforts were made by hospitals and the [state HAI Program] to ensure that the data were accurate and complete, a [formal validation of the data has not yet been performed]. Until data validation is completed, data should be interpreted with caution.

**OR**

These data have been validated using [xxxxxx] validation protocol. [State HAI Program] has also performed a data quality assessment of outliers and/or medical record review to audit case ascertainment. Validated data may result in the identification of additional infections or corrections to the data.

## OTHER DATA CAVEATS AND LIMITATIONS

There may be variation between results published by the [state HAI Program] and results published elsewhere (e.g., CMS - Centers for Medicare and Medicaid Services Hospital Compare). Hospitals have the ability to modify their data in NHSN at any time once entered, and as such, results may appear to vary if other sources use different data collection periods or report cutoff dates than [state's] reports.

***Note to Authors**: If presenting infection rates and applying thresholds for presenting data, include the language below:*

The infection rates were not included for HAIs in some facilities. Calculating rates with small numbers of persons at risk will lead to unstable estimates. Therefore the [state HAI Program] chose not to present rates for units, procedures, or facilities that did not meet a minimum threshold value for the reporting period. The minimum threshold numbers are based on CDC recommendations for reporting HAI data:

- Central line-associated bloodstream infections: [50] central line days;
- Catheter-associated urinary tract infections: [50] catheter days; and
- Surgical site infections: [20] procedures.
- Include threshold for *C. difficile* and MRSA, if applicable

***Note to Authors:** If presenting SIRs and applying thresholds for calculating and presenting SIRs, include the language below:*

**The [State HAI Program] does not calculate an SIR when the number of predicted infections is less than 1**. In these situations, the "SIR Interpretation" text says "No Conclusion." This does not mean that the hospital failed to report data, or that

the hospital did not report all necessary data; it only means that the number of patients, devices (central lines or urinary catheters), and/or procedures that were seen at this hospital during this time period did not meet the established threshold (minimum value) for calculating an SIR. This minimum threshold is based on CDC recommendations. In other words, there is not enough information to make a reliable conclusion about this hospital's performance on this measure.

## *Results*

1. **INFECTION SUMMARY TABLE**

2. **READING GUIDE TO THE HAI DATA TABLES: AN EXPLANATION OF EACH VARIABLE (click here)**

3. **STATE-LEVEL AND HAI-SPECIFIC TABLES/REPORTS**

*Please refer to the "Data Tables" section of the toolkit to review example data tables.*

*(Below sections are optional. Use if presenting healthcare worker influenza vaccination data)*

4. **SUMMARY DATA TABLE FOR HOSPITAL PROCESS MEASURES**

5. **HOW TO READ THE DATA TABLE FOR HEALTHCARE WORKER INFLUENZA VACCINATION (click here)**

6. **INFLUENZA VACCINATION DATA TABLE**

## *Conclusion/Discussion*

***Note to Authors**: The Conclusion section should include a high-level summary of the data presented and highlight some of the major "take-home" messages of the report (a sample Conclusion is not provided in this toolkit). The Workgroup recommends including information about how readers can provide feedback and/or ask questions about the report, including contact information for the state HAI program and/or other HAI stakeholder organizations, as appropriate. This is also an opportunity for the state to provide details about the prevention collaboratives or other HAI prevention activities (e.g., use of the TAP strategy) that are occurring in the state.*

*The Conclusion section of the provider report should also direct the reader to the consumer report if the reader is interested in additional information and resources for patients, family members, and other healthcare consumers.*

## *For More Information*

1. Guide to Understanding Healthcare Worker Influenza Vaccination
2. What Healthcare Providers Can Do to Prevent Infections

## *Acknowledgments*

***Note to Authors:*** *As appropriate, list any contributing authors, State HAI Advisory Group members, or others who should be acknowledged in the report. Several existing HAI publications include a statement to acknowledge the hospitals and IP community who conduct HAI surveillance and perform data entry into NHSN. Two examples of such a statement are below:*

*"The authors are indebted to the NHSN participants for their ongoing efforts to monitor infections and improve patient safety."*

*Or*

*"The HAI Program would like to thank the Infection Prevention, Quality, and Information Technology staff at [STATE] hospitals for collaborating to provide the data presented in this report."*

## *Appendices*

***Note to Authors****: The following appendices are suggestions from the workgroup and have been used previously by other states.*

A. Fact sheets *(state-specific or national)* for each HAI type discussed in the report *(SHEA FAQs are available here: http://www.shea-online.org/Patients.aspx)*
B. Acronyms/Definitions *(An example list is provided below)*
C. Full list of hospitals, alphabetically. (*Consider grouping by bed size or geographic region. Any additional facility-specific information you would like to show can be included here.)*

## *References*

*List all references used in the report.*

**The following pages contain educational materials that were referenced earlier in this Report. An example of Appendix B is also included.**

*(Optional material to supplement the technical report for those organizations publishing data on influenza vaccination of healthcare workers)*

# GUIDE TO UNDERSTANDING HEALTHCARE WORKER INFLUENZA VACCINATION

Influenza, or "the flu," is a mild to severe respiratory illness caused by the influenza virus. It is a contagious illness, spread from person to person through droplets. If healthcare workers (also known as healthcare personnel) become infected with the flu, they can spread this illness to their coworkers and patients. Some patients in a hospital are at high risk for complications from the flu, such as the elderly, very young, or those with severe chronic illnesses or immunosuppressive conditions. Extra care should be taken to prevent the spread of the flu among healthcare workers and patients.

The best way to prevent influenza is by getting vaccinated. The Centers for Disease Control and Prevention (CDC) recommends that all healthcare personnel who work in a healthcare setting receive the flu vaccine each year to help prevent the spread of influenza within the workplace. Healthcare personnel include all facility employees, licensed independent practitioners, adult students/trainees, volunteers, <and contractors> regardless of full time/part time status, clinical responsibility or patient contact. **Studies show that patients benefit when healthcare workers get vaccinated.**

Many hospitals choose to provide the flu vaccine to their employees, and some hospitals even have policies requiring mandatory vaccination. Currently, there are/are no state regulations requiring vaccination in State, and healthcare workers are able to decline the flu vaccine for any reason.

This report shows the percentage of all healthcare workers in each hospital who received the flu vaccine. Higher percentages are better, because this indicates that a greater number of healthcare workers are protected against the flu. For the 2014-2015 flu season (i.e., the most recent flu season with available data), the State's overall vaccination percentage was <xx%>. The Department of Health and Human Services (HHS) Healthy People 2020 goal for healthcare worker flu vaccination in the United States is 90%. In State, X% of hospitals met this goal for the 2014-2015 flu season.

*For more information about the CDC recommendations and the national trends of influenza vaccination coverage, see here:*
*http://www.cdc.gov/flu/healthcareworkers.htm*

# WHAT HEALTHCARE PROVIDERS CAN DO TO PREVENT INFECTIONS

***Note to Authors**: Edit this section as needed, depending on the infections presented in your state's technical report and/or include infection-specific prevention fact sheets.*

**To prevent *all* infections**:

- Follow standard and transmission-based precautions meticulously, use appropriate personal protective equipment, and perform hand hygiene as indicated.
- Ensure that all medical devices and equipment are cleaned, disinfected, sterilized, and/or discarded appropriately.
- Ensure the environment of care is maintained appropriately.
- Speak up if you see co-workers who are not following appropriate infection prevention measures.
- Ensure that information about infection and colonization is communicated during transitions of care.

**To prevent central line-associated bloodstream infections (CLABSIs) and catheter-associated urinary tract infections (CAUTIs)**:

- Follow recommended device insertion practices.
- Follow recommended device maintenance practices.
- Every day, evaluate whether the device is still needed. Ensure it is removed as soon as it is no longer needed.

**To prevent surgical site infections**:

- Follow a safe surgery checklist before, during, and after surgery.
- When indicated, give an antibiotic before surgery. Make sure the dose is appropriate and the drug is discontinued in a timely manner.
- Follow recommendations for hand hygiene, personal protective equipment, and antiseptic skin preparation.
- Post-discharge, provide the patient with wound care instructions and education on symptoms of infection.

**To prevent *Clostridium difficile* infections**:

- Use antibiotics judiciously.
- Implement contact precautions for patients with known or suspected *C. difficile* infection.
- Ensure proper cleaning and disinfection of the environment.

**To prevent methicillin-resistant *Staphylococcus aureus* (MRSA) infections**:

- Ensure compliance with contact precautions for MRSA-colonized and infected patients.
- Ensure proper cleaning and disinfection of the environment.
- Implement an alert system to enable prompt notification of laboratory-identified or readmitted patients with MRSA to allow timely initiation of control measures.

**To prevent influenza infections**:

- Promote good respiratory hygiene practices.
- Encourage people in common areas who have respiratory symptoms to distance themselves from others or wear a surgical mask, if they are able to tolerate it.
- Implement droplet precautions for patients with influenza.
- Administer antiviral treatment and chemoprophylaxis to patients and healthcare personnel when appropriate.
- If sick with flu-like illness, stay home for at least 24 hours after fever subsides and limit contact with other people.

For more information on HAI prevention strategies, see: <insert state HAI website> and www.cdc.gov/hai

# APPENDIX B: Acronyms

***Note to Authors**: Edit this section as needed, depending on the abbreviations and acronyms used in your consumer report.*

| | |
|---|---|
| ACH | Acute care hospital (short-term) |
| ACL | Adult Care Licensure |
| APIC-[State] | Association for Professionals in Infection Control and Epidemiology, [State] Chapter |
| ASA | American Society of Anesthesiologists |
| ASC | Ambulatory Surgery Center |
| BSI | Bloodstream infection |
| CAUTI | Catheter-associated urinary tract infection |
| CCU | Critical care unit (also known as intensive care unit – see ICU) |
| CDB | Communicable Disease Branch |
| CDC | Centers for Disease Control and Prevention |
| *C. diff* | *Clostridium difficile* |
| CDI | *Clostridium difficile* infection |
| CI | Confidence interval |
| CMS | Centers for Medicare and Medicaid Services |
| CLABSI | Central line-associated bloodstream infections |
| CRE | Carbapenem-resistant Enterobacteriaceae |
| CUSP | Comprehensive Unit-based Safety Program |
| DHHS | Department of Health and Human Services |
| DHSR | Division of Health Services Regulation |
| DPH | Division of Public Health |
| ED | Emergency department |
| FTE | Full-time equivalent |
| G.S. | General statute |
| HAI | Healthcare-associated infection |
| HRET | American Hospital Association's Health Research & Educational Trust |
| ICU | Intensive care unit (also known as critical care unit – see CCU) |

| | |
|---|---|
| IPs | Infection preventionists |
| IRF | Inpatient rehabilitation facility |
| LTACH | Long-term acute care hospital |
| MRSA | Methicillin-resistant *Staphylococcus aureus* |
| NHLC | Nursing Home Licensure and Certification |
| NHSN | National Healthcare Safety Network |
| NICU | Neonatal intensive (critical) care unit |
| QIO | Quality improvement organization |
| SIR | Standardized infection ratio |
| SSI | Surgical site infection |
| VAST | Vascular Access Safety Team |
| VRE | Vancomycin-resistant *Enterococcus* |

**The following pages should be included in the Results section of the Report.**

# READING GUIDE TO THE HAI DATA TABLES: EXPLANATION OF EACH VARIABLE

***Note to Authors:*** *Edit this guide as needed, depending on the variables shown in the data tables of your technical report.*

Below is a list of all variables shown in the HAI data tables:

- **Title**: The title of the table gives you information about the HAI type, infection metric, time period, geographic location, and facility type included in the table.

- **Facility Name:** This is the name of the facility. Facilities with multiple campuses will have each campus identified separately.

- **Procedure Type:** This is the specific type of surgery for which the surgical site infection (SSI) data are presented (such as abdominal hysterectomy or colon surgery). If acronyms are used, you can find the full name of the surgery in the legend or in the table's title.

- **Unit/Unit Type:** This is the specific unit/type of unit in the hospital from which the data was collected. Hospitals have distinct locations, or units, within the facility that are designated for certain types of patients. For example: "Med/Surg ICU" represents the intensive care unit (ICU) for very sick patients needing medical or surgical care.

- **Number of Procedures:** This is the total number of surgeries performed by a facility during <time frame>.

- **Device Days:** This is the number of device days that were reported by the facility for device-associated infections. A device day is a daily count of the number of patients with a specific device in the patient care location during a time period. These are central line days for CLABSI and urinary catheter days for CAUTI.

- **Patient Days**: This is a daily count of the number of patients in a patient care location during a time period. Patient days are calculated by recording the number of patients each day at the same time in a specific patient care location. At the end of each month, the daily counts are added together. This is displayed for LabID events only (MRSA bacteremia and *Clostridium difficile*).

- **Observed Infections (or Observed Events):** This is the number of infections (or events, for LabID measures) that was reported by the facility.

- **Predicted Infections (or Predicted Events):** This is a calculated value that reflects the number of infections (or events, for LabID measures) that we have

"predicted" to occur in this facility, based on the national experience during the baseline time period.

- **Standardized Infection Ratio (SIR)**: This measure divides the number of observed infections (or events) by the number of predicted infections (or events). A value of 1 indicates that the facility observed the same number of infections (or events) than were predicted. Lower SIR values are better.

- **95% Confidence Interval (CI)**: We have a high degree of confidence (95%) that the true SIR lies within this range of values. If this range includes the value of 1, then the SIR is *not statistically significant* (i.e., the number of observed infections or events is not significantly different than the number predicted). A confidence interval cannot be calculated if the SIR is not calculated. 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.

- **SIR Interpretation**: Colors and symbols are used to help you quickly understand and interpret the statistical significance of the SIR. This is the "take-home message" about the facility's performance on this HAI measure.

  ★ **Indicates that the facility had significantly fewer infections than were predicted (better than the national baseline)**

  = **Indicates that the facility had about the same number of infections as were predicted (same as the national baseline)**

  ✖ **Indicates that the facility had significantly more infections than were predicted (worse than the national baseline)**

  **No Conclusion:** Indicates that this facility reported data, but there was not enough information to make a reliable comparison to the national baseline (number of predicted infections was less than 1).

# HOW TO READ THE DATA TABLE FOR HEALTHCARE WORKER INFLUENZA VACCINATION

- **Title**: The title of the table gives you information about the time period (flu season), geographic location, and facility type(s) included in the table.

- **Facility Name:** This is the name of the facility. Facilities with multiple campuses will have each campus identified separately. <Add more details on facility stratification depending on state requirements>.

- **Percentage of Healthcare Workers Vaccinated:** This is calculated as a percentage (how many per hundred) of all healthcare workers in the hospital who received the flu vaccine. This includes all facility employees, licensed independent practitioners, adult students, adult volunteers, <and contractors> regardless of full time/part time status, clinical responsibility or patient contact.

$$\frac{\text{Number of healthcare workers vaccinated}}{\text{Total number of healthcare workers at the hospital}} \times 100 \ \%$$

- **Comparison P-Value**: If the p-value is less than or equal to 0.05, we can conclude that the healthcare worker influenza vaccination percentage is *significantly different* than the comparison group's value (i.e., 90%). If the p-value is greater than 0.05, we can conclude that the healthcare worker influenza vaccination percentage *is not significantly different* than the comparison group.

- **"How Does This Facility Compare to <the Healthy People 2020 Goal>"?**

1. Vaccination is higher (**better**) than the <Healthy People 2020 Goal>: ★ better
2. Vaccination is **similar** to the <Healthy People 2020 Goal>: = **same**
3. Vaccination is lower (**worse**) than the <Healthy People 2020 Goal>: ✖ worse
4. Data were not reported from this facility: **not reported** (no affiliated symbol)

# Other Considerations: Decision-Making Rationales and Additional Analytic and Display Ideas for HAI Reports

## Background on the Toolkit Workgroup's Decision-Making Processes, Additional Display and Analytic Considerations, and an Overview of Maryland Focus Groups

**I. Discussion of Additional Display/Analytic Ideas and Rationales for Toolkit Recommendations**

- **a. Facility-level Report Cards**
- **b. Considerations for Incorporating the Cumulative Attributable Difference**
- **c. Comparing a Facility to Its Peers Using State or National Data**
- **d. Presenting Trend Data**
- **e. Presenting Device Days and/or Patient Days in the Consumer Report**
- **f. Presenting the SIR in the Consumer Report**
- **g. Presenting Procedure Types**
- **h. Colors and Symbols Used for the SIR**
  - ❖ **Extended Rationale for Using a Red 'X'**
- **i. Consumer-Friendly Language Used Around the SIR Interpretation and National Baseline**
- **j. Granularity of Data Presented**
- **k. How to List Facilities Within a Data Table**
- **l. Rationale for Discussing Differences Between Data Presented by State HAI Programs and Other Data Sources**

**II. Overview of Maryland Focus Groups**

## *I. Discussion of Additional Display/Analytic Ideas and Rationales for Toolkit Recommendations*

### a) Facility-level "Report Cards"

Several states have created one-page "report cards", or summary pages, for each facility. This allows the report audience to view all of a facility's HAI data on a single page in the state's HAI report. The states currently using this method have received positive feedback from the facilities. The "report cards" can include various data points such as facility-specific SIRs (and SIR components) for each HAI, an indication of the facility's performance relative to the overall state and/or national percentile distributions, or a comparison to the facility's performance in the prior year*. Other demographic information, such as the type of facility and number of beds, may be included as well. We realize that this option would be resource-intensive and may be impractical for larger states with many facilities.

Samples of facility-specific report cards can be found here:

**-New Hampshire** (the report cards begin on page 87):
http://www.dhhs.nh.gov/dphs/cdcs/hai/documents/hai2013-hospital.pdf

-**Tennessee** (the report cards begin on page 195):
http://health.state.tn.us/Ceds/PDFs/TNReportHAI0914.pdf

*Note that if you choose to present data over multiple years, the data caveats of trending should be mentioned in the report (e.g., protocol or definitional differences between the time periods). See part (d) of this document for more information about presenting trend data.

### b) Considerations for Incorporating the Cumulative Attributable Difference

Targeted Assessment for Prevention (TAP) reports are an element of the TAP strategy that use a metric called the cumulative attributable difference (CAD) to quantify and rank the excess number of infections in reference to a comparison goal based on a target SIR (e.g., 1, HHS HAI Action Plan goal, state-specific goal). The CAD subtracts the number of predicted infections (given the target SIR) from the number of observed infections. Lower CADs are better. More information about the TAP strategy can be found here:
http://www.cdc.gov/hai/prevent/tap.html

- TAP reports are one piece of a strategy to create/bolster partnerships as well as identify and prioritize facilities (or locations) for targeted infection prevention interventions.

- Findings from TAP reports are best used by internal health department, multidisciplinary Advisory Group, or other HAI stakeholders, as tools for recruitment and evaluation of infection prevention interventions. If included in an HAI public report, the use of the CAD may have several unintended consequences which may include:
    - Confusion on how to interpret the results, depending on the target SIR that is used (i.e., the CAD may not be a simple subtraction of observed minus predicted if the national HHS goals or state-specific goals are used for the target SIR).
    - Pushback from healthcare facilities if the CAD is used to rank or compare facilities; the TAP reports are not meant to be used in a way that could be viewed as punitive.

### c) Comparing a Facility to its Peers Using State or National Data

Many stakeholders have expressed interest in comparing each facility's SIR to the overall state or national experience to gauge the performance of a facility relative to their peers.

Performing a statistical comparison between an individual facility's SIR and the current national or state SIR is not recommended as they may not be strictly comparable to one another. The methodology* used to compare two SIRs assumes that the distribution of risk exposure between a cohort (e.g. facility, state) and the standard population (i.e., national data) are proportional.

However, a facility's SIR can be compared to a single nominal value, such as a "goal" or "target" SIR. This can be done using the NHSN TAP Reports, or using the SIR macro posted on the NHSN website that compares a "single SIR to 1 or other nominal value" (http://www.cdc.gov/nhsn/ps-analysis-resources/index.html). If using the macro, first adjust the number of predicted events for each hospital based on the target SIR.

- For example, facility A has an SIR of 0.98, and we would like to compare this value to the target SIR of 0.80. To compare this facility's SIR to the target value, we must multiply the number of predicted events by the target SIR.

- Facility A's original SIR: 2 observed events / 2.04 predicted events = 0.98

- Number of predicted events, adjusted for the target SIR: 2.04 predicted events x 0.80 = **1.63**

- 1.63 becomes the "new" predicted number of events. We can then use the SAS macro comparing a single SIR to 1 to determine whether or not the 2 observed events is significantly different from 1.63. If the two-sided p-

value is ≤ 0.05, we can conclude that facility A's SIR of 0.98 is significantly different from the target SIR of 0.80.

*Reference: Breslow N.E., Day N.E. Statistical Methods in Cancer Research, Volume II. *IARC Scientific Publications No. 82*. Available for download here: http://www.iarc.fr/en/publications/pdfs-online/stat/sp82/ (see chapter 3)

In addition to the comparison above, states also can consider presenting the facility-level percentile distributions (either national or state data) and providing information on where in that distribution a facility is located. This level of detail is more suited toward a technical audience, and would ideally not be presented in a consumer report.

- National Percentile Distributions:

  The national percentile distributions for each HAI type can be found in the Excel Data Tables within the HAI Progress Report (http://www.cdc.gov/hai/progress-report/index.html). See **example** screen shot below.

| HAI and Patient Population or or Surgical Procedure | Facility-specific SIRs at Key Percentiles[1] | | | | |
|---|---|---|---|---|---|
| | | | Median | | |
| | 10% | 25% | (50%) | 75% | 90% |
| CLABSI, all[4] | 0.000 | 0.180 | 0.438 | 0.736 | 1.129 |
| ICUs[5] | 0.000 | 0.108 | 0.416 | 0.750 | 1.175 |
| Wards[6] | 0.000 | 0.169 | 0.464 | 0.814 | 1.212 |
| NICUs[7] | 0.000 | 0.162 | 0.441 | 0.806 | 1.209 |
| CAUTIs, all[8] | 0.000 | 0.310 | 0.762 | 1.305 | 1.938 |
| ICUs[5] | 0.000 | 0.359 | 0.886 | 1.491 | 2.225 |
| Wards[6] | 0.000 | 0.188 | 0.570 | 1.027 | 1.642 |
| Hospital-onset MRSA bacteremia, facility-wide | 0.000 | 0.383 | 0.785 | 1.310 | 1.940 |
| Hospital-onset *C. difficile* infections, facility-wide | 0.000 | 0.406 | 0.746 | 1.074 | 1.424 |

- Calculating a State's Facility-level Percentile Distribution:

  An agency may want to provide a percentile distribution of facility SIRs for each HAI included in the report. If this approach is used, the percentile distributions should only be calculated using the facilities that have at least 1 predicted infection (i.e., a calculated SIR). Furthermore, consider establishing a minimum number of facility SIRs needed to calculate and display the percentile distribution. In the HAI Progress Report, CDC calculates percentile distributions only when at least 20 facilities have a calculated SIR (i.e., ≥ 1 predicted infection).

## d) Presenting Trend Data

States with multiple years of data may want to display trends in a table or chart to show progress in HAI measures. The workgroup has not yet developed recommendations for how best to accomplish this, but it is recommended that if trends are displayed, they be included in the technical report and not the consumer report. American Institutes for Research (2012) published findings from a study on publicly reporting trend data and concluded that "including trend data in public reports of health professional performance may lead consumers to misinterpret performance data and inappropriately influence their decision-making process." Consumers may be confused as to whether they should compare the facility to itself across points in time, compare the facility's history to other facilities' histories, or compare to a specific benchmark. However, it is important to note that "trend data can play a valuable role for healthcare professionals, and can help providers (facilities or individual healthcare workers) track their progress, measure their progress with that of their peers, and share best practices to facilitate improvement." (American Institutes for Research 2012)

## e) Presenting Device Days and/or Patient Days in the Consumer Report

The workgroup recognized that device and patient days are challenging concepts to describe to a consumer audience. However, example language and concepts are provided below if your state decides to present and explain these denominators to consumers.

- **Device Days:** This is the number of device days that were reported by the facility for device-associated infections. A device day is a daily count of the number of patients with a specific device in the patient care location during a time period, collected at the same time each day. This includes central line days if displaying CLABSI data, urinary catheter days if displaying CAUTI data, or ventilator days if displaying ventilator-associated events.
- **Patient Days**: This is a daily count of the number of patients in a patient care location or facility during a time period. A patient day is a daily count of the number of patients residing in a location or facility during a given time period, collected at the same time each day. This is displayed for LabID events only (e.g., MRSA bacteremia or *Clostridium difficile*).

## f) Presenting the SIR in the Consumer Report

Through focus group testing (as outlined in Section II of this document), the workgroup determined that it may not be necessary to present the actual SIR value on the consumer report. It may be easier for consumers to understand the

HAI data presented in the table if the SIR is not shown, as this ratio may create information overload. Focus group participants were able to interpret the data tables by only seeing columns for observed and predicted infections. However, example language is provided below if your state decides to present and explain this metric to consumers. If the SIR is displayed, the workgroup recommends displaying the individual components of the SIR (observed and predicted events) to the left of the SIR in the table.

- **SIR:** The Standardized Infection Ratio (SIR) is the primary metric for HAI data and compares the number of observed infections (or events) to the number of predicted infections (or events).

### g) Presenting Procedure Types

The workgroup recommends producing a separate data table for each procedure type, in which case the full procedure name (e.g., Colon Surgery, Abdominal Hysterectomy) should be included in the title, and report authors can consider removing this column from the tables. States with a large number of hospitals should consider retaining this variable in the tables to facilitate consumer understanding. Presenting the procedure acronym is acceptable given that the full procedure name is in the title and/or legend.

### h) Colors and Symbols Used for the SIR

To aid in the interpretation of the SIR, images or symbols should be used to help the audience quickly understand the meaning of the SIR's value and corresponding statistical significance. To further aid in the interpretation of an image (especially for persons with visual impairment), descriptive words have been included with the shapes. While the colors and symbols are meant to allow for a fast interpretation of the data, the workgroup also recommends including a legend at the top of each "Results" page to ensure the reader is able to quickly reference the full interpretation of the symbols.

The workgroup considered several colors and symbols and has outlined some considerations for their use, based on group discussions and focus group feedback.

1. **Color Considerations**: Considerations were made on using **red (worse than the baseline)**, yellow (about the same as the baseline), and **green (better than the baseline)**. However, the workgroup felt that the yellow color conveys "caution" when in actuality, the category indicates no significant difference. The workgroup suggests using **grey as the color for the "no significant difference"** category, as grey is a neutral color with limited connotations. **Blue (better than the baseline)** was suggested as an alternative to green.

**1a. Extended Rationale for Using the Red 'X':**

Through initials reviews of this toolkit, the workgroup heard several concerns about associating a red 'X' with an individual hospital, particularly around anticipated push-back from the state HAI Advisory Group and/or the facilities themselves. While the workgroup understands and appreciate these concerns, the red "X" has been selected to clearly identify those facilities that have a statistically significantly high SIR. One purpose of surveillance and reporting is to identify those facilities that have a high burden of HAIs and prompt them to take action to reduce infections. The public has a right to know which facilities have the highest SIRs, and facilities should be prepared to address the reported data. A red "X" should cause concern, encourage the facility to investigate the problem further, and prompt prevention efforts. If at the time the report is issued, the facility has demonstrated significant improvement, the prevention efforts can be can be described in a progress report or note. It was also mentioned during the discussions that state health departments are held to the same standard on CDC's HAI Progress Report, where states with a significantly high SIR are associated with the red color.

2. **Symbol and Word Considerations**: Several symbols were discussed. The workgroup wanted to convey the SIR interpretation in easily recognized symbols, while being sensitive to the many interpretations that may result. The workgroup also felt that it was important to recommend symbols that could be used across multiple quality indicators, regardless of which direction was "good" and which direction was "bad." The workgroup acknowledges that the symbols used in this template may not be the best option for all populations. For states that wish to use different symbol combinations, the workgroup recommends adding concise verbiage to the symbols to help readers decipher the meaning of the symbol.

   To aid in a fast and accurate interpretation of the data, a single descriptive word should be shown next to the symbol. The workgroup considered various wording schemes such as higher/lower, more infections/fewer infections, and better/worse. In many other contexts, being "high" or having "more" is a positive attribute. When viewing a sample HAI consumer report, focus group participants were not sure if "more" was good or bad, despite a description in the legend. "Better" and "worse" language was noted to be simpler, more meaningful, and preferred for ease of comprehension. While the workgroup feels that better/worse could have strong connotations, these words are most clearly understood by the average consumer and can be applied to any quality indicator.

## 3. Notes on specific symbols from workgroup and focus group discussions:

OCTAGON/RED 'X':

- There was debate among the workgroup members about the connotation of an octagon (or 'X') meaning "stop" and anticipation of pushback from healthcare facilities if either of these symbols were used. However, if HAI reports are for the public and the goal is to drive performance and encourage better outcomes, the workgroup agreed that these symbols are appropriate to be used. These symbols are easily recognized by a wide audience, and have a single, universal meaning to almost all populations.

TRIANGLE:

- To those familiar with HAI data, the use of triangles may imply that the data displayed are trend data (e.g., a hospital with an upward arrow may be interpreted to mean the hospital's SIR is increasing over time, when in actuality this arrow only implies the hospital's current SIR is higher than the baseline).
- Direction of triangle may be interpreted by some people as "thumbs up" (i.e., "good") or "thumbs down" (i.e., "bad"). This may not align with the symbol's actual meaning (e.g., downward arrow usually used to denote fewer infections, which is better).
- MONAHRQ, a quality data reporting tool from the Agency for Healthcare Research and Quality uses a downward-facing triangle for "below average" performance (a high SIR) and an upward-facing triangle for "above average" performance (a low SIR).
- Due to possible misinterpretation, the workgroup does not recommend the use of triangles.

CIRCLE:

- This symbol is more neutral than other options and may be better suited for the "same" category than the "worse" category, for example.

CHECK MARK:

- It was noted that to some populations, a check mark could indicate an incorrect item or be interpreted as a negative symbol. The workgroup felt that the green color and the word "better" next to the check mark would help to alleviate this concern.

EMPTY SQUARE:

- The workgroup considered this symbol for the category where data were reported, but not enough to reliably calculate an SIR. Focus

group members thought the empty box was confusing and wanted to see words or a question mark to explain the meaning of the symbol.

### i) Consumer-Friendly Language Used Around the SIR Interpretation and National Baseline

The workgroup concluded that the phrase "national experience" is easier for consumers to understand, compared to "national baseline." Focus group participants were shown a draft of an HAI data table with "national baseline" terminology used, and a citation of the actual year(s) of the baseline (e.g., 2009). Focus group participants were confused by this term, and thought that the data presented in the table were from 2009. Therefore, the workgroup felt that it is best to include the years of the baseline in the legend, rather than in the column title itself.

The workgroup acknowledged additional symbol options as follows:

- SIR is significantly < 1: ✓ better
- SIR is not statistically different from 1 : = same
- SIR significantly > 1 : ● worse
- # of predicted infections < 1: **"No Conclusion"** (no affiliated symbol)

### j) Granularity of Data Presented

Consumer Report:

The workgroup recommends careful consideration of the trade-off between granularity and reliability in decisions about the extent to which summary data should be stratified. For example, if data are stratified too much, it may result in small denominators and many cases in which the predicted number of infections is less than 1. In this situation, the workgroup recommends the SIR not be calculated if omission of the SIR is permitted by reporting mandates. On the other hand, if data are not stratified enough, some of the information value of the data may be lost, potentially sacrificing the use of available data to identify localized problems. Further, focus group feedback was mixed on the display of unit-specific data. For some, it was too much information and having multiple units from the same facility in the same table was confusing. With these challenges in mind, the workgroup recommends displaying unit type-specific SIR data for device-associated infections (i.e., a separate SIR for ICUs, NICUs, wards, etc.) and procedure-specific SIR data for procedure-associated infections. LabID Event SIR data should be presented on a facility-wide level.

If data are aggregated to the facility level for device-associated or procedure-associated infections, the "Unit Type"/"Procedure Type" column may be removed from the data tables.

Technical Report:

The workgroup recommends that device-associated data be stratified by unit-type, at a minimum. The technical report audience may be especially interested in reviewing unit-specific or unit-type specific data. Procedure-associated data should be displayed for each procedure type individually, and some states may choose to additionally calculate an SSI SIR for multiple procedure types combined. LabID Event SIRs should be presented at the facility-wide level only.

## k) How to List Facilities Within a Data Table

Consumer Report

After much discussion and consideration, the workgroup recommends that individual facilities be ordered alphabetically within a data table for a consumer audience to allow a consumer to easily find a facility of interest. This is preferred to "ranking" of facilities in order of increasing/decreasing SIR. The SIR measure is not intended to allow for direct comparison between facilities; rather, the SIR should be used to compare the performance of a facility (or one or more units, depending on the analyses) to the national baseline.

Technical Report

While the workgroup still recommends displaying facilities alphabetically at this time, several states have explored additional options for stratification of facilities including bed size categories and geographic region/county. If this option is chosen, facilities should be listed alphabetically within each stratum.

Samples of state reports that use other facility stratification techniques can be found here:

**- Missouri** (interactive reports include comparisons to hospitals of similar size)
http://health.mo.gov/data/hai/drive_noso.php

**-North Carolina** (facility-specific reports include comparisons to hospitals of similar size, see page 13 of the 2015 report as an example)
http://epi.publichealth.nc.gov/cd/hai/figures/hai_apr2015_providers.pdf

## l) Rationale for Discussing Differences Between Data Presented by State HAI Programs and Other Sources

Data posted on the Centers for Medicare and Medicaid Services (CMS) Hospital Compare website are updated often and do not reflect changes that are made to the data after submission deadlines. However, any changes made to the data are included in data from real-time surveillance systems like NHSN. Due to different freeze dates, populations under surveillance, and analytic methods, there is potential for conflicting information about a hospital's HAI performance to be posted on a state public report, Hospital Compare, and other reporting sites (like Consumer Reports or the Leapfrog Group). The workgroup feels that it is important to clarify this point in a state HAI report, and provide a rationale for discrepancies the audience may see in the data posted elsewhere.

## *II. Overview and Demographics of Maryland Focus Groups*

The Maryland Health Care Commission, a regulatory agency within the state of Maryland, held several focus groups between 2013 and 2014 in an effort to receive consumer feedback on the redesign of the Maryland Hospital Performance Guide which included HAI data displays. Questions from the HAI DAPS toolkit workgroup were incorporated into four of the focus groups. All focus groups were held in Rockville, MD in 2014 and participants received a stipend.

**April 18, 2014**

| | **Morning session** | **Evening session** |
|---|---|---|
| Total participants | 8 | 9 |
| Age | 30-34 (1), 35-44 (3), 45-54 (3), 55-64 (1) | 30-34 (2), 35-44 (5), 45-54 (1), 55-64 (1) |
| Sex | 5 female, 3 male | 5 male, 4 female |
| Marital status | 4 married, 2 divorced, 1 single, 1 widowed | 4 married, 3 divorced, 2 single |
| Race/ethnicity | 3 African-American, 3 White, 2 Asian, 0 Hispanic/Latino | 4 White, 3 African-American, 2 mixed race, 3 Hispanic/Latino |
| Education | 2 post-graduate, 5 graduate, 1 some college | 1 post-graduate, 6 graduate, 1 some college, 1 some high school |
| Employment | 3 full-time, 2 retired, 2 unemployed, 1 part-time | 5 full-time, 2 part-time, 2 unemployed |

**July 29, 2014**

| | **Morning session** | **Evening session** |
|---|---|---|
| Total participants | 7 | 12 |
| Age | 35-44 (1), 45-54 (2), 55-64 (3), 65-74 (1) | <30 (1), 30-34 (1), 35-44 (2), 45-54 (5), 55-64 (2), 65-74 (1) |
| Sex | 6 female, 1 male | 6 female, 6 male |
| Marital status | 3 divorced, 2 single, 1 widowed, 1 cohabitating | 6 married, 3 single, 2 divorced, 1 widowed |
| Race/ethnicity | 3 African-American, 2 White, 1 mixed race, 1 unspecified, 0 Hispanic/Latino | 6 White, 5 African-American, 1 mixed race, 0 Hispanic/Latino |
| Education | 1 graduate, 1 associate's degree, 3 some college, 2 high school graduate | 2 graduate, 2 associate's degree, 7 some college, 1 high school graduate |
| Employment | 3 unemployed, 2 retired, 2 part-time | 6 full-time, 2 part-time, 2 retired, 2 unemployed |

## Sample Data Table: Infection Summary Table

| Legend | | | | | |
|---|---|---|---|---|---|
| ★ | Fewer infections (**better**) than predicted based on the national experience.* | = | About the **same** number of infections as predicted based on the national experience.* | ✖ | More infections (**worse**) than predicted based on the national experience.* | **No Conclusion** | When the number of predicted infections is less than 1, no conclusion can be made. |
| **National experience contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | |

**Sample Report Title: [STATE] Infections Compared to the National Experience, Acute Care Hospital Report, [2014]**

| Facility Name | Bloodstream Infections (CLABSI)** | Urinary Tract Infections (CAUTI) ** | Surgical Site Infections (SSI) from Colon Surgeries | Surgical Site Infections from Abdominal Hysterectomies | *C. difficile* Events† | Methicillin-Resistant *Staphylococcus aureus* (MRSA) Events† |
|---|---|---|---|---|---|---|
| Clean Memorial | ★ | ✖ | = | ✖ | ★ | ★ |
| Town Surgical Hospital | **No Conclusion** | = | ★ | = | = | **No Conclusion** |
| Vine Medical Center | = | = | = | = | ✖ | ✖ |

***CLABSI and CAUTI data include only adult and pediatric intensive care units (ICUs); data from neonatal ICUs (NICUs) and ward locations can be found in HAI-specific data tables.*
*† These refer to hospital-onset laboratory-identified events. MRSA events include only those identified in the bloodstream.*

# Sample Data Tables: Infection Tables for Consumer Report

***Note to Authors**: Consider providing a link to a Glossary or the HAI "Fast Facts" page at the beginning of the Results section of your report in order to assist those readers who may not have read the introductory materials.*

| Legend | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ★ | Fewer infections (**better**) than predicted, based on the national experience.* | = | About the **same** number of infections as predicted based on the national experience.* | ✖ | More infections (**worse**) than predicted based on the national experience.* | **No Conclusion** | When the number of predicted infections is less than 1, no conclusion can be made. | | |
| **National experience contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | | | |

**Sample Report Title: Central Line-Associated Bloodstream Infections (CLABSI) in [STATE's] Acute Care Hospitals, [TIME PERIOD]**

**[STATE] collects CLABSI data from adult and pediatric intensive care units (ICUs), neonatal ICUs (NICUs), and inpatient wards. Only those unit types from which data have been reported and/or that are present in the facility will be shown in the table below.*

| Facility Name | Unit Type | Observed Infections | Predicted Infections | How Does This Facility Compare to the National Experience? |
|---|---|---|---|---|
| Clean Memorial | Adult and pediatric ICUs | 1 | 2.8 | ★ Better |
| | Neonatal ICUs (NICUs) | 0 | 1.8 | ★ Better |
| | Wards | 3 | 4.1 | = Same |
| Town Surgical Hospital | Adult and pediatric ICUs | 0 | Less than 1.0 | No Conclusion |
| Vine Medical Center | Adult and pediatric ICUs | 3 | 3.2 | = Same |
| | Wards | 2 | 2.8 | ★ Better |

| Legend | | | | | | | |
|---|---|---|---|---|---|---|---|
| ★ | Fewer infections (**better**) than predicted, based on the national experience.* | = | About the **same** number of infections as predicted based on the national experience.* | ✖ | More infections (**worse**) than predicted based on the national experience.* | **No Conclusion** | When the number of predicted infections is less than 1, no conclusion can be made. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | |

**Sample Report Title: Catheter-Associated Urinary Tract Infections (CAUTI) in [STATE's] Acute Care Hospitals, [TIME PERIOD]**

**[STATE] collects CAUTI data from adult and pediatric intensive care units (ICUs) only. Only those unit types from which data have been reported and/or that are present in the facility will be shown in the table below.*

| Facility Name | Unit Type | Observed Infections | Predicted Infections | How Does This Facility Compare to the National Experience? |
|---|---|---|---|---|
| Clean Memorial | Adult and pediatric ICUs | 6 | 4.3 | ✖ Worse |
| Town Surgical Hospital | Adult and pediatric ICUs | 3 | 2.1 | = Same |
| Vine Medical Center | Adult and pediatric ICUs | 5 | 4.0 | = Same |

| Legend | | | | | | | |
|---|---|---|---|---|---|---|---|
| ★ | Fewer infections (**better**) than predicted, based on the national experience.* | = | About the **same** number of infections as predicted based on the national experience.* | ✖ | More infections (**worse**) than predicted based on the national experience.* | **No Conclusion** | When the number of predicted infections is less than 1, no conclusion can be made. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | |

**Sample Report Title: Surgical Site Infections (SSI) from Colon Procedures in [STATE's] Acute Care Hospitals, [TIME PERIOD]**

| Facility Name | Procedure Type | Number of Procedures | Observed Infections | Predicted Infections | How Does This Facility Compare to the National Experience? |
|---|---|---|---|---|---|
| Clean Memorial | Colon Surgery | 54 | 0 | 1.7 | = Same |
| Town Surgical Hospital | Colon Surgery | 265 | 2 | 2.7 | ★ Better |
| Vine Medical Center | Colon Surgery | 161 | 4 | 3.6 | = Same |

**Sample Report Title: Surgical Site Infections (SSI) from Abdominal Hysterectomy Procedures in [STATE's] Acute Care Hospitals, [TIME PERIOD]**

| Facility Name | Procedure Type | Number of Procedures | Observed Infections | Predicted Infections | How Does This Facility Compare to the National Experience? |
|---|---|---|---|---|---|
| Clean Memorial | Abdominal Hysterectomy | 78 | 5 | 3.0 | ✖ Worse |
| Town Surgical Hospital | Abdominal Hysterectomy | 200 | 5 | 6.8 | = Same |
| Vine Medical Center | Abdominal Hysterectomy | 107 | 6 | 5.6 | = Same |

| Legend | | | | | | | |
|---|---|---|---|---|---|---|---|
| ★ | Fewer events (**better**) than predicted, based on the national experience.* | = | About the **same** number of events as predicted based on the national experience.* | ✖ | More events (**worse**) than predicted based on the national experience.* | **No Conclusion** | When the number of predicted events is less than 1, no conclusion can be made. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | |

**Sample Report Title: *Clostridium difficile* Events[1] in [STATE's] Acute Care Hospitals, [TIME PERIOD]**

| Facility Name | Observed Events | Predicted Events | How Does This Facility Compare to the National Experience? |
|---|---|---|---|
| Clean Memorial | 3 | 6.52 | ★ Better |
| Town Surgical Hospital | 5 | 4.09 | = Same |
| Vine Medical Center | 7 | 5.11 | ✖ Worse |

[1]This includes hospital-onset laboratory-identified events

**Sample Report Title: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Events[1] in [STATE's] Acute Care Hospitals, [TIME PERIOD]**

| Facility Name | Observed Events | Predicted Events | How Does This Facility Compare to the National Experience? |
|---|---|---|---|
| Clean Memorial | 4 | 6.5 | ★ Better |
| Town Surgical Hospital | 1 | Less than 1 | No Conclusion |
| Vine Medical Center | 6 | 3.0 | ✖ Worse |

[1]This includes hospital-onset laboratory-identified bacteremia (blood infection) events

# Sample Data Tables: Infection Tables for Technical Report

| Legend | | | | | | | |
|---|---|---|---|---|---|---|---|
| ★ | Significantly fewer infections (**better**) observed than predicted, based on the national baseline.* | = | No significant difference (**same**) between the number of observed and predicted infections, based on the national baseline.* | ✖ | Significantly more infections (**worse**) observed than predicted, based on the national baseline.* | **No Conclusion** | The SIR is not calculated when the number of predicted infections is less than 1. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | |

**Sample Report Title: Central Line-Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR) Report by Facility and Unit Type, Acute Care Hospitals, [STATE], [TIME PERIOD]**
**[STATE] collects CLABSI data from adult and pediatric intensive care units (ICUs), neonatal ICUs (NICUs), and inpatient wards. Only those unit types from which data have been reported and/or that are present in the facility will be shown in the table below.*

| Facility Name | Unit Type | Device Days | Number of Infections | | SIR and 95% Confidence Interval (CI)† | | SIR Interpretation |
|---|---|---|---|---|---|---|---|
| | | | Observed | Predicted | SIR | 95% CI (Lower, Upper) | |
| Clean Memorial | ICUs | 1,523 | 1 | 2.80 | 0.36 | (0.21, 0.58) | ★ Better |
| | NICUs | 803 | 0 | 1.80 | 0.00 | (., 0.87) | ★ Better |
| | Wards | 986 | 3 | 4.11 | 0.73 | (0.71, 1.02) | = Same |
| Town Surgical Hospital | ICUs | 251 | 0 | 0.64 | N/A | N/A | No Conclusion |
| Vine Medical Center | ICUs | 2,961 | 3 | 3.21 | 0.93 | (0.76, 1.98) | = Same |
| | Wards | 1,002 | 2 | 2.84 | 0.70 | (0.64, 0.93) | ★ Better |

† 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.

| Legend | | | | | | | |
|---|---|---|---|---|---|---|---|
| ★ | Significantly fewer infections (**better**) observed than predicted, based on the national baseline.* | = | No significant difference (**same**) between the number of observed and predicted infections, based on the national baseline.* | ✖ | Significantly more infections (**worse**) observed than predicted, based on the national baseline.* | **No Conclusion** | The SIR is not calculated when the number of predicted infections is less than 1. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | |

**Sample Report Title: Catheter-Associated Urinary Tract Infection (CAUTI) Standardized Infection Ratio (SIR) Report by Facility and Unit Type, Acute Care Hospitals, [STATE], [TIME PERIOD]**

**[STATE] collects CAUTI data from adult and pediatric intensive care units (ICUs) only. Only those unit types from which data have been reported and/or that are present in the facility will be shown in the table below.*

| Facility Name | Unit Type | Device Days | Number of Infections | | SIR and 95% Confidence Interval (CI) | | SIR Interpretation |
|---|---|---|---|---|---|---|---|
| | | | Observed | Predicted | SIR | 95% CI (Lower, Upper) | |
| Clean Memorial | ICUs | 6,798 | 6 | 4.33 | 1.39 | (1.31, 1.97) | ✖ Worse |
| Town Surgical Hospital | ICUs | 598 | 3 | 2.10 | 1.43 | (0.89, 2.89) | = Same |
| Vine Medical Center | ICUs | 5,139 | 5 | 3.98 | 1.26 | (0.87, 1.35) | = Same |


| Legend | | | | | | | |
|---|---|---|---|---|---|---|---|
| ★ | Significantly fewer infections (**better**) observed than predicted, based on the national baseline.* | = | No significant difference (**same**) between the number of observed and predicted infections, based on the national baseline.* | ✖ | Significantly more infections (**worse**) observed than predicted, based on the national baseline.* | **No Conclusion** | The SIR is not calculated when the number of predicted infections is less than 1. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | | | | | |

**Sample Report Title: Surgical Site Infection (SSI) Standardized Infection Ratio (SIR) Report by Facility, Colon Procedures (COLO), Acute Care Hospitals, [STATE], [TIME PERIOD]**

| Facility Name | Procedure Type | Number of Procedures | Number of Infections | | SIR and 95% Confidence Interval (CI)† | | SIR Interpretation |
|---|---|---|---|---|---|---|---|
| | | | Observed | Predicted | SIR | 95% CI (Lower, Upper) | |
| Clean Memorial | COLO | 54 | 0 | 1.70 | 0.00 | (., 1.45) | = Same |
| Town Surgical Hospital | COLO | 265 | 2 | 2.70 | 0.74 | (0.51, 0.82) | ★ Better |
| Vine Medical Center | COLO | 161 | 4 | 3.60 | 1.11 | (0.73, 1.27) | = Same |

† 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.

**Sample Report Title: Surgical Site Infection (SSI) Standardized Infection Ratio (SIR) Report by Facility, Abdominal Hysterectomy Procedures (HYST), Acute Care Hospitals, [STATE], [TIME PERIOD]**

| Facility Name | Procedure Type | Number of Procedures | Number of Infections | | SIR and 95% Confidence Interval (CI) | | SIR Interpretation |
|---|---|---|---|---|---|---|---|
| | | | Observed | Predicted | SIR | 95% CI (Lower, Upper) | |
| Clean Memorial | HYST | 78 | 5 | 3.00 | 1.67 | (1.44, 3.98) | × Worse |
| Town Surgical Hospital | HYST | 200 | 5 | 6.80 | 0.74 | (0.62, 1.04) | = Same |
| Vine Medical Center | HYST | 107 | 6 | 5.61 | 1.07 | (0.63, 1.47) | = Same |

| Legend | | | |
|---|---|---|---|
| ★ Significantly fewer events (**better**) observed than predicted, based on the national baseline.* | = No significant difference (**same**) between the number of observed and predicted events, based on the national baseline.* | ✕ Significantly more events (**worse**) observed than predicted, based on the national baseline.* | **No Conclusion** The SIR is not calculated when the number of predicted events is less than 1. |
| **National baseline contains data from 2006 – 2008 for CLABSI and SSI, 2009 for CAUTI, and 2010-2011 for MRSA and C. difficile Laboratory-Identified Events.* | | | |

**Sample Report Title: *Clostridium difficile* Standardized Infection Ratio (SIR) Report, Hospital-Onset Laboratory-Identified Events, Acute Care Hospitals, [STATE], [TIME PERIOD]**

| Facility Name | Patient Days | Number of Events | | SIR and 95% Confidence Interval (CI) | | SIR Interpretation |
|---|---|---|---|---|---|---|
| | | Observed | Predicted | SIR | 95% CI (Lower, Upper) | |
| Clean Memorial | 6,700 | 3 | 6.52 | 0.46 | (0.41, 0.97) | ★ Better |
| Town Surgical Hospital | 1,202 | 5 | 4.09 | 1.22 | (0.93, 1.49) | = Same |
| Vine Medical Center | 10,209 | 7 | 5.11 | 1.37 | (1.02, 1.59) | ✕ Worse |

**Sample Report Title: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Bacteremia Standardized Infection Ratio (SIR) Report, Hospital-Onset Laboratory-Identified Events, Acute Care Hospitals, [STATE], [TIME PERIOD]**

| Facility Name | Patient Days | Number of Events | | SIR and 95% Confidence Interval (CI) | | SIR Interpretation |
|---|---|---|---|---|---|---|
| | | Observed | Predicted | SIR | 95% CI (Lower, Upper) | |
| Clean Memorial | 6,798 | 4 | 6.52 | 0.61 | (0.41, 0.97) | ★ Better |
| Town Surgical Hospital | 1,202 | 1 | 0.98 | N/A | N/A | No Conclusion |
| Vine Medical Center | 10,802 | 6 | 3.03 | 1.98 | (1.24, 2.01) | ✕ Worse |

# Sample Summary Data Table for Hospital Process Measures

| Legend | | | | | |
|---|---|---|---|---|---|
| ★ | Vaccination is higher (**better**) than the Healthy People 2020 Goal | = | Vaccination is **similar** to the Healthy People 2020 Goal | ✖ | Vaccination is lower (**worse**) than the Healthy People 2020 Goal |

**Sample Report Title: [STATE] Hospital Process Measures, 2014-2015**

| Hospital Name | Healthcare Worker Flu Vaccination 2014-2015* | Other Process Measure can be Included Here |
|---|---|---|
| Clean Memorial | ★ Better | |
| Town Surgical Hospital | = Same | |
| Vine Medical Center | ✖ Worse | |
| Vine Pediatric Center | ★ Better | |
| [STATE] Total | ✖ Worse | |

* The 2014-2015 flu season is from October 1, 2014 – March 31, 2015. This is the most recent flu season for which data are available.

***Note to authors***: If planning to include another process measure in this table, be sure to update the legend to remove any references to vaccination. Make sure the comparison group for each measure is noted at the bottom of the legend.

# Sample Data Tables for Healthcare Worker Influenza Vaccination

Data Table for a Technical Audience

| Legend | | | | | |
|---|---|---|---|---|---|
| ★ | Vaccination is higher (**better**) than the Healthy People 2020 Goal | = | Vaccination is **similar** to the Healthy People 2020 Goal | ✖ | Vaccination is lower (**worse**) than the Healthy People 2020 Goal |

**Sample Report Title: [STATE] Hospital Healthcare Worker Influenza Vaccination Percentages, 2014-2015 Flu Season***

| Hospital Name | Percentage of Healthcare Workers Vaccinated | Comparison P-value** | How Does This Hospital Compare to the Healthy People 2020 Goal? ǂ |
|---|---|---|---|
| Clean Memorial | 93.0 % | 0.024 | ★ Better |
| Town Surgical Hospital | 90.0 % | 0.132 | = Same |
| Vine Medical Center | 75.5 % | 0.001 | ✖ Worse |
| Vine Pediatric Center | 91.5 % | 0.043 | ★ Better |
| [STATE] Total | 87.5 % | 0.038 | ✖ Worse |

* The 2014-2015 flu season is from October 1, 2014 – March 31, 2015. This is the most recent flu season for which data are available.
** P-value ≤ 0.05 is considered statistically significant.
ǂ The Healthy People 2020 goal for healthcare worker vaccination in the United States is 90%.

Data Table for a Consumer Audience: To tailor the data tables for a consumer audience, simply remove the p-value column from the above table.

# Report Dissemination Strategies: Consumer and Technical Reports

Your agency may have a developed relationship with the media throughout your state; if so, you can leverage that relationship to help receive media coverage on your HAI consumer and technical reports. Or, your agency may be new to working with the media and would like to learn more about opportunities. If possible, talk with someone with communication/media relations experience, such as a Public Information Officer (PIO), to garner feedback and engage the media.

First, decide if a low-key approach or "full court press" is preferred or needed for your state's report. From there, you can determine which dissemination format(s) may be best for this audience and your approach. It will be helpful to discuss the report background and your promotion ideas with the PIO for their feedback; however, be aware of any time constraints and plan to meet with your PIO well in advance of the anticipated publication date.

The workgroup recommends a "full court press" approach for those states who are publishing their first HAI report, or those who have published only a few reports in the past. For those states who are seasoned and experienced with publishing HAI reports, a full court press may not be needed, as facilities and the media should be well-aware of your report and its typical roll-out plan.

**Regardless of which approach is chosen, facilities should be notified in advance of the upcoming HAI report. It is recommended that facilities receive this notification, along with an embargoed copy of the state's report, about 1-2 weeks prior to the publication date. The embargoed state report should be de-identified so facilities are not able to distinguish which data belongs to which facility (aside from their own). Consider holding one or multiple conference calls in order to answer any questions from facilities, and be sure that facilities are fully prepared for potential media attention. Also, when planning your publication date and facility outreach, be aware and sensitive to any situations simultaneously occurring among your facilities that may also be garnering media attention (e.g., hospital outbreaks, designation of a hospital as an Ebola treatment center, hospital mergers, etc.) so as to not overwhelm hospitals and to ensure that media are available to capture your report.**

*What's the difference?*

- **A low-key approach** would involve posting the HAI report to your state's website, and notifying interested partners such as the state's American Hospital Association (AHA) chapter, Quality Improvement Organization (QIO), and state HAI Advisory Group/Committee of its release. Individual facilities may want to pursue publicity on their own. That means your agency's PIO should be fully briefed on when the report will be released and what the data indicate—or what they do not—about facilities' and the state's performance. At a minimum, prepare a press release and talking points in advance. Talking points are for internal use

and outline the important information, data, and findings from the report. Talking points should also include relevant information that would be needed to answer potential questions from outside sources. You may want to post the press release on your agency's website or have it ready to go should there be questions from the media. Be sure to alert your governmental affairs staff about the report, since lawmakers may take an interest in the findings as well.

*Ideally, an HAI report will be made publicly available in some way, such as via your agency's website. If you prepare a consumer report to accompany the technical report, the whole point is to get that information to your target audience (i.e., healthcare consumers) using communication resources that are appropriate for your audience and obtainable for your agency. This approach may call for a full court press.*

- **Full court press** means you will use all media relations tools at your disposal. This could include email blasts, promoting the press release, and sharing articles on social media. To reach traditional media (such as newspapers, broadcasters, or online outlets) you may want to hold one or several news conferences in different parts of your state with a spokesperson to review the findings and answer questions. If this is not an option, a conference call exclusively for the media could work. Again, a prepared script and talking points to answer common or expected questions are ideal. A good technique to generate coverage is to bring in partners and stakeholders to join your organization's spokesperson at the event. Consider holding the news conference at a hospital with especially good performance data, and invite a hospital representative to speak. To present the patient perspective, consider asking a consumer group representative or an HAI prevention advocate in the community to speak at your news conference about his/her personal experiences with HAIs and/or using your state's HAI report. Work with the representative to ensure messaging does not contradict the report findings.

An alternative to a news conference—especially a news conference "road show"—is a satellite media tour. It can be expensive, but you can cover many media markets in a relatively short period by booking time and pre-arranging appointments to have your spokesperson interviewed via satellite by various local television stations one after the other. Using "Skype" to conduct interviews with television stations may be a more affordable approach.

*What if your agency is interested in doing more than the low-key approach, but does not have resources for a full court press?*

- **Meet the media in the middle**. You could approach the dissemination plan with a strategy that goes beyond low-key, but doesn't hit full court press. You can pick dissemination formats based on your audience, but also based on what your agency can take on with their available resources. Once you know your audience and preferred format, reach out to your PIO for feedback on ways to disseminate. The PIO may also be able to share the report with outlets they have relationships with, and may be aware of specific writers who would be interested in a story. See below for ways to disseminate your report and findings.

## Formats to Disseminate the HAI Reports

### A) Traditional Media

**Your press release** (also called a news release) should cover the *Who*, *What, When, Where, Why* and *How* points succinctly. You may also want to prepare a *backgrounder* that provides detailed information about the data report, how data were collected, what the results indicate and how they are used to help improve patient safety in a healthcare setting. This could be in narrative or fact sheet format. Use plain language in an effort to make health information more understandable for the public. Post these materials on your web site where they can be *pulled* from, and *push* them out to partners and stakeholders and to the general public via social media. All informational materials should include a URL or, if electronic, a live link to the HAI report. Also include a live link in your social media.

**Pitch to the media** story ideas, or why the information is important and should be covered. While it takes some legwork, recruiting an "average consumer" who might speak to them about successfully using the report would be helpful, as the media outlet's readers/viewers could better identify with that person (i.e., "She used this information to benefit herself and her family; so could I").

**Prepare items for the media** to pull from, including the press release with quotations, one or two photos, and links to background information.

### B) Social Media

**Social media sites** such as Facebook, Twitter, LinkedIn, Google+, and YouTube are an excellent way to reach partners and stakeholders and can be particularly effective because of their interactivity, especially Facebook and Twitter. People will *like, share, comment* and *re-tweet*. Many members of the media also monitor these sites, along with agency blogs. Always include a link to the press release and monitor comments so that you can correct misinformation in real time. If your organization has a Twitter account, a "Twitter chat" can offer an opportunity to interact with the general public in real-time to share messages and answer questions about the report and the state's HAI prevention activities. If a Twitter chat is scheduled, typically for an hour, prepare responses to potential questions ahead of time. Remember to advertise the date/time of your Twitter chat (both on social media and through website postings), and provide details about how to participate. During the chat, you can disseminate links to your HAI report and other relevant websites as needed.

Twitter Chat Resources:

Example postings for a CDC-sponsored Twitter chat:
http://www.cdc.gov/Features/TwitterChat/

A Step-by-Step Guide to Hosting or Joining a Twitter Chat:
https://blog.bufferapp.com/twitter-chat-101

Forbes: The Ultimate Guide to Hosting a Tweet Chat: http://www.forbes.com/sites/stevecooper/2013/09/30/the-ultimate-guide-to-hosting-a-tweet-chat/

How to Create a Successful Tweet Chat: http://www.socialmediaexaminer.com/twitter-chats-with-pam-moore/

## C) Partner Outreach

**Engage patient advocates** in your state, especially if they sit on the HAI Advisory Group/Committee. Getting their permission in advance to share their story with reporters and offer their contact information with reporters is also helpful.

**Hold a partners call** with your partners or stakeholders to prepare them for the release of the report and answer any questions well in advance. This should include state organizations such as the QIO, AHA chapter, and other relevant partners.

**Send an email blast** to partners and consumers with a direct link to the report, once the report is available online for viewing.

## D) Website

**Update your website** with the recent report, promote the report on related webpages, and always provide direct links to the report page. Consider including contact information on the website should anyone have questions or wish to provide feedback.

**Write a blog post** for your agency's blog, or ask a local outlet if they can share your press release and/or write a blog on their site.

# Toolkit Conclusion

### *Future Research*

The members of the HAI DAPS workgroup hope that this toolkit will be helpful in enhancing the HAI reports of state health departments and other organizations, or in aiding those who are creating HAI reports for the first time.

This toolkit is one significant step in working toward HAI data analysis and presentation standardization, but the workgroup members acknowledge that the toolkit is not exhaustive and may not suit all stakeholders' needs. Additional research, evaluation, and public health practice will help inform toolkit enhancements. The workgroup encourages organizations to adopt the toolkit principles as feasible, and toolkit users are encouraged to complete the evaluation and share lessons learned from their toolkit implementation experiences.

Despite the gains in knowledge over the past years regarding presenting quality data effectively, more research is needed to determine how to make the information most useful to consumers. The workgroup recognizes that many factors go into consumers' decisions on where to seek medical care, and that publicly reported HAI data are often *not* utilized to their fullest potential. As stewards of HAI data and public health practitioners, it should be our goal and responsibility to not only make these data publicly available, but to educate the community and present the data in such a way as to make the report approachable for different audiences. Raising public awareness of HAI reports is the first step in increasing transparency to empower individuals to consider these reports when making personal medical decisions and to motivate healthcare providers to drive change within the healthcare facility. The "Dissemination Strategies" chapter of the toolkit outlines practical ways to disseminate your report and offers guidance around how to reach your intended audience.

The HAI DAPS workgroup welcomes your feedback on any or all portions of this toolkit; we plan to improve and expand the toolkit as needed. We look forward to working together with organizations and stakeholders to promote standardized HAI data analyses and presentation techniques.

# HAI Data Analysis and Presentation Standardization (DAPS) Toolkit Evaluation

*Please take a moment to give us feedback about the toolkit. You may complete this survey online here:*

***https://www.research.net/r/haidaps***

1. Which of the following best describes your agency/organization?

___ Consumer group ___ State health department

___ Local health department ___ Other: _____

___ Tribal or territorial health department

2. Please describe your toolkit implementation plans:

I do not plan to use the toolkit

I am not sure if I will be using the toolkit

I plan to use the toolkit but have not implemented it yet

I have already implemented all or some of the toolkit

3. If you do not plan to use the toolkit or are not sure if you will be using the toolkit, please explain why:

4. If you have implemented the toolkit or plan to, what part(s) will/have been implemented? (*select all that apply*)

| | Have Implemented | Plan to Implement | Not Sure |
|---|---|---|---|
| Methods for composing HAI reports | | | |
| Summary table (outcome) | | | |
| Summary table (process) | | | |
| Consumer report table structure | | | |
| Consumer report language (e.g., report purpose, reading guide, things to consider) | | | |
| Consumer report colors/symbols | | | |
| Consumer report patient education resources | | | |
| Technical report table structure | | | |
| Technical report language (e.g., data caveats) | | | |
| Technical report colors/symbols | | | |
| Healthcare worker influenza vaccination materials | | | |
| Dissemination strategies | | | |
| SAS code or other technical resources | | | |
| Ideas listed in "Other Considerations" | | | |
| Other (specify): | | | |

5. Please rate your response to the following statements about the HAI DAPS Toolkit (*select one response per row*)

| | **Strongly agree** | **Agree** | **Disagree** | **Strongly disagree** |
|---|---|---|---|---|
| The toolkit was useful | | | | |
| The toolkit was easy to implement | | | | |
| The toolkit helped my organization tailor HAI data analysis to *consumer* audiences | | | | |
| The toolkit helped my organization tailor HAI data presentation to *consumer* audiences | | | | |
| The toolkit helped my organization tailor HAI data analysis to *technical* audiences | | | | |
| The toolkit helped my organization tailor HAI data presentation to *technical* audiences | | | | |
| The materials included in the toolkit were adequate to *create* an HAI report | | | | |
| The materials included in the toolkit were adequate to *revise* an HAI report | | | | |
| The toolkit helped my organization generate discussions about HAI data analysis and presentation with internal stakeholders (e.g., within the HAI Program) | | | | |
| The toolkit helped my organization generate discussions about HAI data analysis and presentation with external HAI stakeholder groups (e.g., state HAI Advisory Group) | | | | |

6. Which part(s) of the toolkit were most useful?

7. How could the toolkit be improved or refined?

8. What additional materials or resources would you like to see in the toolkit or would have made it easier to implement the toolkit?

9. If you implemented part of the toolkit, did you receive any feedback on the report(s)?

    a. If yes, describe the audience(s) that shared feedback:

    b. What comments/suggestions did you receive?

10. Would you/your organization be interested in being a part of a workgroup to revise the toolkit in the future? *If yes, please provide contact information.*

*Your thoughts are important to us. If you have additional questions or comments, please contact:*

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## Acknowledgments

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Zeshan Chisty, MPH, HAI Collaborative Coordinator, Hawaii
DHQP Statistics Team, CDC
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The original image files used in the HAI educational materials provided by Robert Geist, MPH, CIC, Epidemiologist, Kansas Department of Health.

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**13-ID-02**

**Committee:** Infectious Disease
**Subcommittee**: Healthcare-associated Infections Subcommittee

**Title:** Healthcare-Associated Infections Data Presentation and Reporting Standardization

**I. Statement of the Problem:**

*Executive Summary*

The National Healthcare Safety Network (NHSN) is a secure, internet-based surveillance system that collects healthcare-associated infection (HAI) process and outcome data. As of December 2012, over 11,300 healthcare facilities are enrolled in the system. The data submitted by those healthcare facilities are used to improve patient safety at the local and national levels. The Centers for Disease Control and Prevention (CDC) analyzes and publishes the surveillance data to estimate and characterize the national burden of HAIs. At the local level, participating facilities and user groups (such as state health departments) can access the data to generate reports and graphs that compare individual facility rates or state rates with national aggregate data.

As participation in NHSN increases and availability of HAI data extends to a variety of governmental and non-governmental organizations, it is imperative to outline some parameters for appropriate analysis and presentation of HAI data. Although individual states may have legislative or regulatory stipulations on how HAI data are to be displayed and shared, development of a standardized approach to data presentation that can serve as a model for best practices can fill a gap in the current practice of public reporting of HAI data analyses.

*Background*

Over the past decade, states have passed legislation and/or regulation to collect and report healthcare-associated infection (HAI) data. Federal agencies such as the CDC and the Centers for Medicare and Medicaid Services (CMS) as well as consumer groups (e.g., Consumers Union, the Leapfrog Group) also use these data for a variety of purposes including informing policy development, evaluating progress toward infection reduction targets, and aiding consumers in making decisions about health care. Although the multiple stakeholder groups use the same data source (NHSN), differing methods, time periods, populations, and presentation strategies can lead to conflicting results and different conclusions. This can cause confusion for consumers who are trying to use the information to make educated decisions.

Policymakers and healthcare providers also are key stakeholders that use and interpret publicly reported HAI data. According to Edmond and Bearman (2007), theoretically, there are four ways that public reporting can improve quality: (1) remediation (hospitals make a concerted effort to improve quality); (2) restriction (licensing and accreditation organizations use the data to restrict provision of care by poor performers); (3) removal (poor performers discontinue providing services); or (4) competition between providers on the basis of improving quality to improve market share. However, to improve quality, the data must be presented in a way that is meaningful and able to be readily understood by the intended audiences.

Prior CSTE position statements (10-ID-28, 10-SI-05, 11-SI-03, 12-ID-06) have made efforts toward standardizing HAI surveillance methods and promoting the complete and accurate reporting of HAIs but have not specifically addressed data presentation methods. As public reporting systems have matured and grown organically within states, so too have the individual approaches to the presentation of HAI statistics and measures in published reports and online data dashboards. Although consensus groups like the Healthcare

Infection Control Practices Advisory Committee have published standards on essential elements of an HAI reporting system, most of the focus to date has been on the specific measures that are collected and reported and not on the manner in which the data are displayed.

HAI data analyses are complex, and need to be displayed in ways that are accessible to different audiences with varied levels of mathematical sophistication, and in summary form for casual audiences, with access to details for those who want them. A variety of process and outcome measures exist for assessing facility performance, and many of them have complex underpinnings. Populations at risk vary between measures and infection types (e.g., urinary catheter days for catheter-associated urinary tract infections, surgical procedures for surgical site infections, patient days for *Clostridium difficile* infections). Some measures are compared to a reference population, such as the standardized infection ratio (SIR), which compares the observed number of infections to a predicted number based on a reference population, and are risk-adjusted. Others, like infection rates, may be crude, stratified, or risk-adjusted, and may or may not be compared to another population. Another challenge influencing the establishment of data presentation standards is the fact that different states may have regulations or legislation that prescribe how and when data are to be published and in what format.

As the science and practice of public reporting of HAI measures has progressed, some states and regions have involved consumer and stakeholder input to identify the data elements and presentation strategies that are of greatest interest to different groups and that maximize comprehension of the data. Some examples from state HAI programs include:

- **Maryland**: Prior to creating web-based public reports of HAI data, conducted two focus groups – one of consumers and one of healthcare professionals. After identifying differences in the audiences' ability to understand and interpret the presentation options presented, two websites were produced, each with a report tailored to the intended audience. The consumer site has number of observed and predicted infections and a SIR symbol noting comparison between the facility and the baseline national experience, while the report for healthcare professionals contains more data and is available at a more granular level.
- **New Mexico**: As part of a regional collaborative on HAI website design, held four focus groups with the general public to gather information on their interest in and current familiarity with HAI data, preferences for information on an HAI website, and get feedback on several possible displays of HAI data. Despite preferring a visualization that was thought to be simple, consumers still did demonstrate understanding of the data they were viewing and did not use the data that were reported.
- **Virginia**: Involved numerous stakeholder groups including infection preventionists, members of the multidisciplinary statewide HAI Advisory Committee, and a patient/consumer advocacy group to gather input on the development of a new central line-associated bloodstream infection report for healthcare providers and the general public. The patients/consumers were interested in highlighting the hospitals that achieved zero infections during the time period. Advisory Committee members and health department epidemiologists stressed the importance of including confidence intervals with the reported data to show statistical significance. Infection preventionists favored a color scheme where facilities that were statistically similar to the national experience were in blue while consumers preferred the "stoplight" colors of red, yellow, and green where red indicated that a hospital had statistically more infections than predicted and green indicated the hospital observed statistically fewer infections than predicted.
- **Washington:** Engaged in a variety of studies, collaborations, and research projects to examine the evidence behind public reporting of hospital performance data. A paper published by Birnbaum et al. (2010) explains an approach to improving the usage and impact of hospital comparison websites that involved developing prototype reports based on design principles to address issues related to poor usage and impact, and conducting focus group evaluations to test the prototypes. Research by Amini and colleagues (2013) examines the credibility and user-friendliness of state websites that publicly report hospital infection rates.

**II. Statement of the desired action(s) to be taken:**

CSTE requests that CDC convene a multidisciplinary committee to develop a toolkit that describes best practices and recommended methods of presenting HAI measures and statistical information, including analytic standards. This committee shall be co-chaired by representatives from CSTE and CDC. Members of this committee shall possess expertise in areas including but not limited to epidemiology, statistics, health communication, health literacy, and cultural competency and shall represent state/territorial health departments, CDC, and other relevant stakeholder groups and organizations. The document developed by the committee shall include the structure and preferred content of an HAI public information report as well as a template for a visual display that embodies the recommended best practice options. Domains of HAI data presentation and analytic standards to be addressed in the proposed HAI data presentation toolkit are outlined in Appendix 1.

Following the publication of the toolkit, where possible, CDC, states, and other agencies and organizations reporting and disseminating HAI data from the National Healthcare Safety Network should adopt the framework proposed in the toolkit for their HAI public information reports.

The toolkit will address an immediate need to create a more standardized approach to HAI data presentation and analysis. However, concurrently, additional research is required to understand the optimal approaches to presenting HAI data to various stakeholder groups. Funding agencies are encouraged to devote resources to continue to build the evidence base on this issue.

**III. Public health Impact:**

- Improves the ability for public health to meaningfully monitor trends in the HAI data.
- Improves stakeholders' capacity to understand and use HAI data.
    - Ensures that all recipients of HAI data are provided with adequate information about the importance, meaning, and interpretation of specific measures.
        - Helps to avoid common pitfalls that lead to misinterpreting the data.
    - Provides data users with guidance and support in using the information.
    - Increases healthcare providers' and consumers' trust in the data by using a consistent data presentation framework.
    - Facilitates provider understanding of and comfort with the data, and therefore encourages providers to more actively study and use the information to improve the quality of care in the facility.
    - Deepens consumers' understanding of HAI measures and statistical information by removing some of the confusion and conflicting results that exist currently.
        - Consistency of reporting and improved understanding may engage and motivate consumers to explore and use reports.
    - If consumers use the information to make informed choices, it may be likely that they will obtain high-quality health care for themselves and their family members.
        - Collectively, many consumers making informed choices may stimulate quality improvement among providers.

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Agency for Healthcare Quality and Research. Best Practices in Public Reporting No. 3: How To Maximize Public Awareness and Use of Comparative Quality Reports Through Effective Promotion and Dissemination Strategies: http://www.ahrq.gov/qual/pubrptguide3.htm

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## VII. Appendices

Appendix 1. Domains of HAI Data Presentation to be Addressed in the CSTE HAI Data Presentation Toolkit

A. Analytic conventions
    1. Use standardized definitions
    2. Assure data presented are statistically reliable
    3. Risk adjust data appropriately
B. Display and communication considerations
    1. Describe the report
        i. Purpose
        ii. Audience
        iii. Methodology
        iv. Intended uses of the data
    2. Describe the dataset(s) analyzed
        i. HAI type(s)
        ii. Facility type(s)
        iii. Place
        iv. Time
        v. Source
    3. Label charts, graphs, and tables
    4. Aid the reader in consuming HAI information by summarizing, interpreting, highlighting meaning, and narrowing options
        i. Language
        ii. Colors
        iii. Symbols
    5. Tailor report to the audience
    6. Provide a mechanism for users to evaluate the report by providing feedback

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