

Dataset Dictionary: Hospital-Acquired Infection Data

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Data Element Name	Data Description
Facility ID	<p>New York State (NYS) Facility Identification Number.</p> <p>Four hospitals report combined data from two campuses. In these cases, all data was assigned to one campus (1737->1740, 0698->0694, 0686->0699, 0042->0058).</p> <p>Facility ID '0000' represents the sum (or average) of all the reported data in NYS.</p>
Hospital name	Hospital Name
Indicator name	<p><u>Central line-associated blood stream infection (CLABSI) indicators:</u></p> <p>CLABSI Cardiothoracic Intensive Care Unit (ICU)</p> <p>CLABSI Coronary ICU</p> <p>CLABSI Medical ICU</p> <p>CLABSI Medical Surgical ICU</p> <p>CLABSI Neonatal ICU Level 2/3</p> <p>CLABSI Neonatal ICU Level 3</p> <p>CLABSI Neonatal ICU Regional Perinatal Center</p> <p>CLABSI Neurosurgical ICU</p> <p>CLABSI Pediatric ICU</p> <p>CLABSI Surgical ICU</p> <p>CLABSI Overall Standardized Infection Ratio (SIR) – summarizes the average performance across all available types of ICUs. The SIR compares the infection rates in a small population (a hospital) to infection rates in a standard population (NYS in the same year), after adjusting for risk factors that might affect the chance of developing an infection. The SIR is the actual number of infections in the hospital, divided by the number of infections that would be statistically predicted if the standard population (NYS) had the same risk distribution as the observed population.</p>

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- A SIR of 1.0 means the observed number of infections is equal to the number of predicted infections.
- A SIR above 1.0 means that the infection rate is higher than that found in the standard population. The difference above 1.0 is the percentage by which the infection rate exceeds that of the standard population.
- A SIR below 1.0 means that the infection rate is lower than that of the standard population. The difference below 1.0 is the percentage by which the infection rate is lower than that experienced by the standard population.

See 'Infections predicted' below for additional information.

Surgical Site Infection (SSI) Indicators

SSI Coronary artery bypass graft (CABG) chest site

SSI CABG donor site

SSI Colon

SSI Hip

SSI Abdominal hysterectomy

SSI Overall Standardized Infection Ratio (SIR) – summarizes the average performance across all available types of SSIs. The SIR is the ratio of the total observed number of SSIs in a given year to the total predicted number of SSIs in that year. See 'Infections predicted' below for additional information.

Clostridium difficile infection (CDI) indicators:

CDI Community Onset - cases in which the positive stool sample was obtained during the first three days of the patient's hospital admission and more than 4 weeks after any previous discharge from that same hospital. These cases are presumed unrelated to the patient's stay in that hospital.

CDI Hospital Onset – incident cases in which the positive stool sample was obtained on day four or later during the hospital stay.

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	<p>CDI Hospital Associated – incident cases in which the positive stool sample was obtained on day 4 or later during the hospital stay (that is, CDI hospital onset cases) and cases in which a patient who was discharged from the same hospital within the previous 4 weeks is readmitted to that hospital with a new positive <i>C. difficile</i> test during the first three days of admission (these are sometimes called ‘community onset healthcare facility associated’ or ‘possibly my hospital’ cases).</p>
Year	<p>Year of data. Hospital-specific pilot year data are not included. Thus, start dates are 2008 for CLABSIs, colon SSIs, CABG SSIs, and hip SSIs; 2010 for <i>C. difficile</i>; and 2013 for hysterectomy SSIs. All hospitals with complete data for a given year are included. In the case of hospital closures, data are provided up to the last complete year prior to closure.</p>
Infections observed	<p>Number of infections reported by hospital in the given year. Result is shown as long as at least 20 procedures were performed (for SSI data) or at least 50 central line days were reported (for CLABSI data).</p>
Infections predicted	<p>The number of infections predicted to occur in the hospital based on average infection rates in NYS among similar patients in the same year.</p> <p>For CLABSIs, the number of predicted infections is calculated using CLABSI rates within each type of ICU (and NICU birth weight category) in NYS in a given year. Result is shown if at least 50 central line days were reported.</p> <p>For SSIs, the number of predicted infections is calculated from procedure-specific logistic regression models (see annual NYS reports for risk factors included in the models). Result is shown as long as at least 20 procedures were performed.</p> <p>For CDI, no predictions are made due to insufficient data available for risk adjustment.</p> <p>No results are shown for “New York State – All Hospitals” since the predicted number is the same as the observed number.</p>
Denominator	<p>For CLABSI indicators, this is the number of central line days. For SSI indicators, this is the number of procedures. For CDI community onset, this is the number of admissions excluding newborns and NICU.</p>

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	For CDI hospital onset/associated, this is the number of patient days excluding newborns and NICU.
Indicator value	For CLABSI indicators within ICUs, this is the unadjusted CLABSI rate. For SSI procedure-specific indicators, this is the risk adjusted SSI rate. For CLABSI and SSI SIRs, this is the SIR. For CDI indicators, this is the unadjusted CDI rate.
Indicator lower confidence limit	Lower 95% confidence limit for indicator.
Indicator upper confidence limit	Upper 95% confidence limit for indicator.
Indicator units	Describes numerator and denominator used to calculate indicator. The SIR does not have units because it is the number of observed infections divided by the number of predicted infections.
Comparison results	For CLABSI and SSI, a statistical test was performed to determine if each hospital performed significantly better or worse than average for the given year. Result may be: Significantly higher than NYS average, Significantly lower than NYS average, Not significantly different than NYS average, Not compared - if fewer than 20 procedures or 50 central line days. Hospital CDI rates are not compared to the state average because insufficient patient risk factor data is available for risk-adjustment. However, each hospital's annual hospital onset rate was compared to that hospital's rate in the previous year. Results may be: Significantly higher than previous year's rate,

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	Significantly lower than previous year's rate, Not significantly different than previous year's rate, Not compared due to change in lab test method
Latitude	Latitude of the facility, obtained from the NYS Hospital Facility Information System.
Longitude	Longitude of the facility, obtained from the NYS Hospital Facility Information System.

Additional notes and caveats:

The data was downloaded from NHSN on July 25, 2013.

Surgical site infection data in this table should not be directly compared with other data from the National Healthcare Safety Network (NHSN), because the following New York State specific data exclusion was applied:

- Hospital-specific surgical site infection data exclude non-readmitted cases identified using post discharge surveillance. Detection of SSIs using post discharge surveillance is labor intensive and not standardized across hospitals; exclusion of these infections improves the comparability of the data. Each hospital-specific SSI rate should only be compared with the New York State average in that category because the rates were indirectly adjusted using New York State data.

CLABSI data in this table should not be directly compared with other data from the National Healthcare Safety Network (NHSN), because the following New York State specific data exclusion was applied:

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- Hospital-specific central line-associated blood stream infection data exclude cases in which multiple blood cultures were obtained, and only one blood culture was positive with a recognized pathogen considered clinically to be a contaminant. This exclusion allows the calculation of a more accurate CLABSI rate for the NYS report.

Each hospital-specific NICU CLABSI rate should only be compared with the New York State average in that category for that type of NICU because the rates were indirectly adjusted using New York State data.

Hospital CDI rates should not be compared to the state average due to differences in laboratory testing methods and patient risk factors between hospitals.

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Additional Technical Information on Risk Adjustment and the Standardized Infection Ratio (SIR)

This section describes the risk adjustment method in more detail. The method is called “Indirect Risk Adjustment”. We have contrived an example where we want to calculate SIRs and risk adjusted rates for two hospitals compared to the state average.

In this simple example, patients can be divided into three risk groups: low, medium, and high, based on their risk for developing an infection after surgery.

The first three columns in the table below summarize the HAI data for the state. Fifteen-thousand procedures were performed, equally divided among the three risk groups. In the low risk group 2% of the patients developed an HAI; in the medium risk group 5% of the patients developed an HAI; and in the high risk group 8% of the patients developed an HAI.

Column 4 states that both hospitals had a 4% HAI rate in the low risk group (higher than the state average), a 5% HAI rate in the medium risk group (the same as the state average), and a 6% HAI rate in the high risk group (lower than the state average). Each hospital performed the same number of procedures, and had the same HAI rate within each risk group, but hospital 1 had a lot more low risk patients, and hospital 2 had a lot more high risk patients.

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State HAI rate summary			Hospitals 1 and 2	Hospital 1: More low risk patients			Hospital 2: More high risk patients		
Risk Group	# procedures	HAI rate	HAI rate	# procedures	# observed infections	# predicted infections	# procedures	# observed infections	# predicted infections
low	5,000	2.0%	4.0%	200	8	4.0	50	2	1.0
medium	5,000	5.0%	5.0%	100	5	5.0	100	5	5.0
high	5,000	8.0%	6.0%	50	3	4.0	200	12	16.0
All	15,000	5.0%		350	16	13.0	350	19	22.0
Standardized Infection Ratio (SIR)				1.23			0.86		
Risk adjusted HAI rate				6.2%			4.3%		

The first step in the risk adjustment procedure is to calculate the predicted number of infections in each risk group in each hospital. The logic behind this step is that if you had to guess how many infections you would expect to see in Hospital 1 in each risk group, a good guess would be the state average. For example, across the state we know that 2%, or 2 out of every 100 low-risk patients, develop an infection. Therefore we would predict that 2% of the 200 procedures performed at Hospital 1 would become infected: 200 multiplied by 2 and divided by 100 is 4 predicted infections.

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The next step in the risk adjustment procedure is to calculate the SIR for each hospital. The SIR is equal to the total observed number of infections divided by the total predicted number of infections. At Hospital 1, 16 divided by 13 is 1.23. The HAI rate at Hospital 1 is 23% higher than the average state HAI rate, after making the distribution of patient risk in the state the same as in Hospital 1. At Hospital 2, 19 divided by 22 is 0.86. The HAI rate at Hospital 2 is 14% lower than the average state HAI rate, after making the distribution of patient risk in the state the same as in Hospital 2.

The last step in the risk adjustment procedure is to convert the SIRs to risk adjusted rates. Because the SIR at Hospital 1 is 1.23 times higher than the state average, the risk adjusted rate for Hospital 1 is 1.23 multiplied by the state average of 5%, which is equal to 6.2%.

The interesting anomaly to notice about this example is that the SIR and risk adjusted rate for Hospital 1 are higher than the SIR and risk adjusted rate for Hospital 2, despite the fact that each hospital had the same infection rate within each risk group (see Column 4). This shows that it is not statistically valid to compare SIRs and risk adjusted rates between hospitals; it is only valid to compare each SIR and risk adjusted rate to the state average. Both hospitals performed poorly in the low risk group, but because hospital 1 had so many more patients in this group, this had a strong negative impact on the overall hospital rate. Both hospitals performed well in the high risk group, but because hospital 2 had so many more patients in this group, this had a strong positive impact on the overall hospital rate. We cannot compare the rates between hospitals because during the risk adjustment procedure, we forced the state to have the same level of patient risk as the hospital rather than forcing the hospital to have the same level of patient risk as the state, in which case the hospital rates would have been comparable. (The latter method is called direct risk adjustment. In direct risk adjustment the predicted number of infections in the state would be the HAI rate in the hospital multiplied by the number of procedures in state. This calculation requires stable HAI rates in each hospital in each risk group. We do not use direct risk adjustment because rates can be very unstable in small hospitals that have only a small number of patients in each risk).

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This example explained how to calculate an SIR for one type of procedure. The method can be extended to calculate an SIR across all surgical procedures. The overall SSI SIR is calculated as the sum of the observed number of colon, CABG chest, CABG donor, and hip infections divided by the sum of the predicted number of colon, CABG chest, CABG donor, and hip infections. We do not convert the overall SSI SIR to an overall adjusted rate because the HAI rates for colon, CABG, and hip surgeries are different; there is no meaningful overall procedure SSI rate to use in such a calculation.

Additionally, there are several reasons why the SSI SIR and CLABSI SIR should not be combined into one overall HAI SIR. First, they are different types of infections with different prevention methods. One of the most important reasons for reporting infection data is to help hospitals determine which prevention measures need to be strengthened, which means that they need SIRs for each type of infection individually rather than a combined SIR. Second, there are many more SSIs than there are CLABSIs. If the numbers were combined, the resulting SIR would mostly reflect the SSI data. Third, SSIs and CLABSIs may each vary in severity and may have different implications for patients. It is inaccurate to say that an SSI equals a CLABSI, which is what combining the numbers would do. In other words, combining the numbers would be like adding apples and oranges.