



Guide to the NHSN Dialysis Event Surveillance Bloodstream Infection (BSI) Standardized Infection Ratio (SIR) Measure

What is a standardized infection ratio (SIR)?

The standardized infection ratio (SIR) is a ratio of the number of infections that are observed at a facility versus the number of infections that are predicted for that facility, based on national baseline data.

$$SIR = \frac{\text{Number of Observed BSI}}{\text{Number of Predicted BSI}}$$

What is the advantage of using an SIR instead of a rate?

These two measures serve different purposes. The SIR compares the number of bloodstream infections (BSIs) that a facility reported to the number of infections predicted for that facility based on the national aggregate data, across several vascular access type strata. Those data are summarized into a single number, which makes the SIR an easier measure to use for evaluation purposes. In contrast, vascular access-specific BSI rates provide more detailed information about BSI occurrence in the different strata and can be helpful for targeting infection prevention efforts.

How is the SIR calculated?

A facility's SIR is calculated by dividing their **Number of Observed BSIs** by their **Number of Predicted BSIs**.

- **Number of Observed BSIs:** is the total number of positive blood cultures that were reported by the facility to NHSN during a certain timeframe (e.g., calendar year 2014).
- **Number of Predicted BSIs:** is a number calculated by multiplying the national aggregate BSI Rates Stratified by Vascular Access Type from NHSN Dialysis Event Data 2014¹, by the facility's number of patient-months for each vascular access category. The number of patient-months are equal to the summed number of patient-month denominators reported by the facility to NHSN during the timeframe of interest (e.g., calendar year 2014). The total number of patients at a facility and the number of patients in different vascular access categories factor into the calculation. For example, a facility with many patients will tend to have more predicted BSIs than a facility with few patients.

How is the SIR interpreted?

The SIR is a ratio. If a facility reports an observed number of BSIs exactly equal to their predicted number of BSIs, the SIR is equal to 1. If a facility observed more BSIs than were predicted, the SIR is greater than 1. If a facility observed fewer BSIs than were predicted, the SIR is less than 1.

SIR > 1: more infections than predicted
SIR = 1: same as predicted
SIR < 1: fewer infections than predicted

¹ The 2014 national aggregate NHSN Dialysis Event Surveillance BSI rates are the aggregate pooled means from over 6,000 outpatient hemodialysis facilities that reported to NHSN in 2014. These data are referred to as the "baseline."

Example Dialysis Event Bloodstream Infection (BSI) Standardized Infection Ratio (SIR) for 2014

			A	B	C = A x B
Summary Year	Vascular Access Type	Number of Observed BSIs	Patient-months	2014 NHSN BSI Rate/100 Patient-months	Number of Predicted BSIs
2014	Fistula	0	114	0.26	0.30
2014	Graft	1	102	0.39	0.40
2014	Other Access	0	3	0.67	0.02
2014	Any CVC	3	72	2.16	1.56
2014	All	4	291	.	2.28

} Sum

In this example:

- In 2014, across all vascular access types, this facility observed 4 BSIs and 291 patient-months.
- Multiply **(A)** the number of patient-months for each vascular access type at the facility by **(B)** the BSI Rates Stratified by Vascular Access Type from NHSN Dialysis Event Data 2014, to calculate **(C)** the number of predicted BSIs for each vascular access type. These products **(C)** are then summed together for a total of 2.28 predicted BSIs for the facility.
- The SIR is calculated by dividing the number of observed BSIs (4) by the predicted number of BSIs (2.28).

$$SIR = \frac{\text{Number of Observed BSI}}{\text{Number of Predicted BSI}} = \frac{4}{2.28} = 1.75$$

- This ratio results in an SIR of 1.75, which means that this facility observed 75% more BSIs than were expected based on the national average.

Can I calculate my facility’s SIR using NHSN Reports?

An NHSN report to calculate an SIR is not yet available; however, the necessary data are available to calculate your SIR manually. A brief overview of the steps is below. For BSI Rates Stratified by Vascular Access Type from NHSN Dialysis Event Data 2014, see column **(B)** values in the example table above.

**** Note: This report will include facility data that were in NHSN when data sets were generated, which may vary from what were sent to CMS for QIP if the facility’s data were modified after the quarterly reporting deadlines. ****

1. After generating new data sets, under Output Options, open “Dialysis Events,” then “Rates,” then “CDC-Defined Output.” Next to the “Rate Table - Bloodstream Infection Data,” select the “Modify” button.
 - a. Select the time period (e.g., summaryYr: beginning 2014, ending 2014).
 - b. Toward the bottom of the page under Other Options, change “Group By” to “SummaryYr.”
 - c. Click the “Run” button to generate the NHSN BSI Rate Table.
2. Locate the *Number of Observed BSIs* in the “Number Bloodstream Infections” column, in the “All” row.
3. Calculate the *Number of Predicted BSIs*, as shown in the example above: multiply the number of the facility’s Fistula patient-months x 0.0026; Graft patient-months x 0.0039; Other Access patient-months x 0.0067; and Any CVC patient-months x 0.0216. Sum the results.
4. Divide the *Number of Observed BSIs* located in step 2, by the *Number of Predicted BSIs* determined in step 3, to calculate the facility’s SIR.

How is the SIR used for the CMS ESRD QIP?

For each facility eligible to participate in the Centers for Medicare and Medicaid Services (CMS) End Stage Renal Disease (ESRD) Quality Incentive Program, CDC may calculate a facility SIR and provide the data to CMS. CMS applies their scoring methodology, described in the year’s corresponding QIP rule. For questions about the QIP scoring methodology, please contact the QIP Helpdesk: ESRDQIP@cms.hhs.gov.