



Calculating Predicted Dialysis BSI Events and SIRs: 2014-Baseline and 2023-Baseline Methods

Tamara Hoxworth

Scientific Data Analyst II

Centers for Disease Control and Prevention

National Center for Emerging and Zoonotic Infectious Diseases

Division of Healthcare Quality Promotion Surveillance Branch

May 2026

Objectives

- Provide background and rationale for updating the Dialysis BSI SIR.
- Identify key differences between the 2014 and 2023 calculation methods.
- Compare SIR results using the old and new methods.
- Show how to access the old and new SIR reports in NHSN.
- Identify differences between the old and new SIR reports.
- Discuss the impact of the new SIR on facility performance interpretation.

Background

- Dialysis BSI SIR went through the Rebaseline process to develop an updated SIR that reflects current policy and practice.
- Measure Endorsement Committee endorsed BSI SIR in 2024 with condition that we rebaseline.
- Old SIR was based on 2014 data; new SIR is based on 2023 data.
- Old SIR did not utilize a risk adjusted model and only considered **access type**.
- New SIR utilizes a risk adjusted model that includes other factors, as other HAIs do.
- Old SIR uses 2014 national BSI rates for each access type to compute predicted BSI.
- New SIR uses a negative binomial regression model to generate parameters used to compute predicted BSI.

Calculating the NHSN Dialysis BSI SIRs

2014-baseline SIR Calculation:

observed BSI events / # predicted BSI events

Risk factor using 2014 data:

- Access Type
-

SIR calculation uses BSI rates by access type as the “model” that risk adjusts for access type using 2014 NHNS data.

Method: table of national BSI rates by access type

2023-baseline SIR Calculation:

observed BSI events / # predicted BSI events

Risk factors using 2023 data:

- Access Type
 - Location/Hospital-association
 - Number of Stations
-

SIR calculation uses a regression model that risk-adjusts for access type, location/hospital association, and number of stations using 2023 data.

Method: negative binomial regression model with these three factors

2014 Baseline Method Example

Calculating Predicted BSIs and the Old SIR (2014)

- Part 1: For each access type row:
 - Multiply patient-months by 2014 national BSI rate. This is the number of predicted BSI for the access type row.
- Part 2: Calculate the facility BSI SIR:
 - Sum number predicted and number observed across all access type rows.
 - Divide total number observed by total number predicted. This is the **facility SIR**.

Example: Calculating the Old SIR (2014)

- Example facility+access type data for a FREESTANDING facility with 26 stations.
- OrgID: TEST01

Access Type	Events	Patient-months
Fistula	2	591
Graft	0	163
CVC Tunneled	4	242
CVC Non-tunneled	0	0

Access Type	2014 BSI rate
Fistula	0.0026
Graft	0.0039
Other	0.0067
Any CVC (tunneled or non-tunneled)	0.0216

Example Continued: Calculating the Old SIR (2014)

Part 1: Calculate number of predicted

	2014 BSI Rate	Patient months	# predicted events
Fistula	0.0026	591	1.5366
Graft	0.0039	163	0.6357
CVC Tunneled	0.0216	242	5.2272
CVC Non-Tunneled	0.0216	0	0

Part 2: Calculate SIR

	# predicted events	# observed events
Fistula	1.5366	2
Graft	0.6357	0
CVC Tunneled	5.2272	4
CVC Non-Tunneled	0	0
TOTAL	7.3995	6

SIR for TEST01 facility
using 2014 method:
observed/# predicted
 $6/7.3995 = 0.8109$

2023 Baseline Method Example

Calculating Predicted BSIs and the New SIR (2023)

- Part 1: Calculate number predicted within each access type row:
 - Sum the parameter estimates that apply to the access type.
 - Take the exponent of the sum (negative binomial model is on the log scale).
 - Multiply by the number of patient months, this is the **number predicted** for the each access type row.
- Part 2: Calculate the facility BSI SIR:
 - Sum number predicted and number observed across all access type rows.
 - Divide total number observed by total number predicted. This is the **facility SIR**.

Example: Calculating the New SIR (2023)

- Example facility+access type data for a FREESTANDING facility with 26 stations
- OrgID: TEST01

Access type	Events	Patient-months
Fistula	2	591
Graft	0	163
CVC Tunneled	4	242
CVC Non-tunneled	0	0

Parameter	Category	Parameter Estimate
Intercept		-6.9888
Access Type	Fistula	REF
	Graft	0.6168
	CVC Non-tunneled	0.9552
	CVC Tunneled	1.8175
Location and Hospital Association	Freestanding (F)	REF
	Hospital affiliated (FH and H): includes both freestanding and hospital-located	0.8731
Number of in-center hemodialysis stations	1 – 21 stations	REF
	22 or more stations	0.0785

Example Continued: Calculating the New SIR (2023)

Part 1: Calculate number of predicted

	Intercept	AccessType	Location/Hosp -association	Stations	Sum of parameter estimates	Exp(Sum of param estimates)	Patient months	# predicted events
Fistula	-6.9888	0	0	0.0785	-6.9103	0.0010	591	0.5910
Graft	-6.9888	0.6168	0	0.0785	-6.2935	0.0018	163	0.2934
Tunneled	-6.9888	1.8175	0	0.0785	-5.0928	0.0061	242	1.4762
Non-Tunneled	-6.9888	0.9552	0	0.0785	-5.9551	0.0026	0	0.0000

Part 2: Calculate SIR

	# predicted events	#observed events
Fistula	0.5910	2
Graft	0.2934	0
Tunneled	1.4762	4
Non-Tunneled	0.0000	0
TOTAL	2.3606	6

SIR for TEST01 facility
using 2023 method:
observed/# predicted
6/2.3606 = 2.5417

View Old and New SIR Reports in NHSN

Example: Navigating to NHSN SIR Reports

The screenshot shows a web browser window with the URL <https://nhsn2.cdc.gov/dial/showAnalysisDSG.action>. The page header includes the CDC logo and the text "Centers for Disease Control and Prevention CDC 24/7: Saving Lives, Protecting People™" on the left, and the NHSN logo and "NATIONAL HEALTHCARE SAFETY NETWORK" on the right. Below the header is a dark blue navigation bar with the text "NHSN - National Healthcare Safety Network" and a user profile for "THOXWORTH SB Test Facility Dialysis Compo...".

The main content area is titled "Generate Data Sets (Dialysis)". It features a "Reporting Data Sets" section with a form to specify the time period for data generation. The form includes a "Beginning" date field set to "01/2023" and an "Ending" date field set to "mm/yyyy". A "Clear Time Period" button is located to the right of the date fields. Below the form is a "Generate Reporting Data Sets" button. A yellow box displays the "Last Generated" information: "(UTC) May 5, 2026 1:10 PM to include data beginning 01/2023". A link "Clear data sets and processing" is located below the yellow box.

A left sidebar contains a menu with the following items: NHSN Home, Alerts, Dashboard, Reporting Plan, Patient, Event, Summary Data, COVID-19, Import/Export, Surveys, Analysis, Users, Facility, Group, Cheat Sheets, and Logout. A blue arrow points to the "Analysis" menu item.

Example: Navigating to NHSN SIR Reports

The screenshot shows a web browser window with the URL <https://nhsn2.cdc.gov/dial/showAnalysisReport.action>. The page header includes the CDC logo and text "Centers for Disease Control and Prevention CDC 24/7: Saving Lives, Protecting People™" on the left, and the NHSN logo "NHSN NATIONAL HEALTHCARE SAFETY NETWORK" on the right. Below the header is a dark blue navigation bar with the text "NHSN - National Healthcare Safety Network" and a user profile for "THOXWORTH SB Test Facility Dialysis Compo...".

The main content area is titled "Analysis Reports" and features a left-hand navigation menu with the following items: NHSN Home, Alerts, Dashboard, Reporting Plan, Patient, Event, Summary Data, COVID-19, Import/Export, Surveys, Analysis, Users, Facility, Group, Cheat Sheets, and Logout. The "Reporting Plan" item is currently selected.

The "Analysis Reports" section contains a tree view of report categories. At the top of this section are buttons for "Expand All", "Collapse All", and a search box. The tree view includes the following items:

- Dialysis Events
 - Numerators
 - Denominators
 - Rates
 - Pediatric Rates
 - SIR
 - SIR SIR Table - Dialysis Event Bloodstream Infection (BSI)
 - SIR SIR Table - Dialysis Event Bloodstream Infection (BSI) - 2023 New Baseline
 - Outcomes
- Prevention Process Measures
- Central Line Insertion Practices
- Patient Vaccination
- Data Quality
- COVID-19 Module
- CMS Reports
- Advanced
- My Custom Reports

Example 2: Navigating to NHSN SIR Reports

The screenshot shows a web browser window with the URL <https://nhsn2.cdc.gov/dial/showAnalysisReport.action>. The page header includes the CDC logo and text "Centers for Disease Control and Prevention CDC 24/7: Saving Lives, Protecting People™" on the left, and the NHSN logo and text "NHSN NATIONAL HEALTHCARE SAFETY NETWORK" on the right. Below the header is a dark blue navigation bar with the text "NHSN - National Healthcare Safety Network" and a user profile for "THOXWORTH" with a dropdown menu.

The main content area is titled "Analysis Reports" and features a left-hand navigation menu with the following items: Alerts, Dashboard, Reporting Plan, Patient, Event, Summary Data, COVID-19, Import/Export, Surveys, Analysis, Users, Facility, Group, Cheat Sheets, and Logout. The "Analysis Reports" section is expanded, showing a tree view of report categories. The "SIR" category is selected and highlighted in blue. Under "SIR", there are two sub-items: "SIR SIR Table - Dialysis Event Bloodstream Infection (BSI)" and "SIR SIR Table - Dialysis Event Bloodstream Infection (BSI) - 2023 New Baseline".

At the top of the "Analysis Reports" section, there are buttons for "Expand All" and "Collapse All", and a search input field. The tree view includes the following categories and sub-items:

- Dialysis Events
 - Numerators
 - Denominators
 - Rates
 - Pediatric Rates
 - SIR**
 - SIR SIR Table - Dialysis Event Bloodstream Infection (BSI)
 - SIR SIR Table - Dialysis Event Bloodstream Infection (BSI) - 2023 New Baseline
 - Outcomes
- Prevention Process Measures
- Central Line Insertion Practices
- Patient Vaccination
- Data Quality
- COVID-19 Module
- CMS Reports
- Advanced
- My Custom Reports

Example: Old 2014 SIR Report Output

← ↻ 🏠 🔍 <https://nhsn2.cdc.gov/dial/runRequestAnalysisReport.action>

National Healthcare Safety Network

Standardized Infection Ratio (SIR) for Dialysis Event Bloodstream Infection (BSI) - By OrgID

As of: May 5, 2026 at 1:56 PM UTC

Date Range: All PBC_SIR

Bloodstream Infection: Any positive blood culture.

orgID=83053 CCN=032024

orgID	CCN	summaryYR	Months	patientMonths	ObservedBSI	numPredBSI	SIR	SIR95CI	facilityCAD
83053	032024	2023	1	10	1	0.0325	30.769	1.540, 151.751	0.968
83053	032024	2024	12	120	7	1.1571	6.05	2.646, 11.967	5.843
83053	032024	2025	12	111	4	1.2576	3.181	1.011, 7.672	2.742

Lower bound of 95% Confidence Interval only calculated if ObservedBSI > 0.

SIR and Number of Excess Infections excludes months where denominator data are missing.

SIRs and Number of Excess Infections not calculated for time periods less than a quarter (i.e. when data are grouped by summary year/month)

Calculations for SIRs and Number of Excess Infections may be unreliable if there is insufficient data.

Positive number of excess infections indicates that the facility reported more bloodstream infections than predicted.

Negative number of excess infections indicates that the facility reported fewer bloodstream infections than predicted.

Source of aggregate data used to determine Predicted Number of BSI: Predicted BSI are calculated using the 2014 NHSN Dialysis Event national rates provided to CMS for ESRD QIP: <http://www.cdc.gov/nhsn/pdfs/dialysis/bsi-rate-vat-de-2014.pdf>

Predicted BSI for pediatric facilities are calculated using the same data, which include all facilities (adult and pediatric facilities).

Data contained in this report were last generated on May 5, 2026 at 1:08 PM UTC to include data beginning January 2023.

Example: New 2023 SIR Report Output

← ↻ 🏠 🔒 <https://nhsn2.cdc.gov/dial/runRequestAnalysisReport.action>

National Healthcare Safety Network

Standardized Infection Ratio (SIR) for Dialysis Event Bloodstream Infection (BSI) - 2023 New Baseline - By OrgID

As of: May 5, 2026 at 1:57 PM UTC

Date Range: All PBC_SIR_2023

Bloodstream Infection: Any positive blood culture.

orgID=83053 CCN=032024

orgID	CCN	summaryYR	Months	patientMonths	ObservedBSI	numPredBSI	SIR	SIR95CI	facilityCAD
83053	032024	2023	1	10	1	0.031496	31.75	1.589, 156.588	0.969
83053	032024	2024	12	120	7	0.6926823	10.106	4.420, 19.990	6.307
83053	032024	2025	12	111	4	0.7314689	5.468	1.738, 13.191	3.269

Lower bound of the 95% Confidence Interval only calculated if Observed BSI > 0.

SIR excludes months where denominator data are missing.

SIR calculations may be unreliable if there is insufficient data.

Source of aggregate data used to determine Predicted Number of BSI: 2023 NHSN Dialysis Event Data.

Data contained in this report were last generated on May 5, 2026 at 1:08 PM UTC to include data beginning January 2023.

Example: Exporting a Data Set

The screenshot shows a web browser window with the URL <https://nhsn2.cdc.gov/dial/showAnalysisReport.action>. The page header includes the CDC logo and text: "Centers for Disease Control and Prevention, CDC 24/7: Saving Lives, Protecting People™". On the right, the NHSN logo is displayed: "NHSN NATIONAL HEALTHCARE SAFETY NETWORK". Below the header, a dark blue navigation bar contains the text "NHSN - National Healthcare Safety Network" and a user profile for "THOXWORTH SB Test Facility Dialysis Compo...".

The main content area is titled "Analysis Reports" and features a left-hand navigation menu with items such as "NHSN Home", "Alerts", "Dashboard", "Reporting Plan", "Patient", "Event", "Summary Data", "COVID-19", "Import/Export", "Surveys", "Analysis", "Users", "Facility", "Group", "Cheat Sheets", and "Logout".

The "Analysis Reports" section includes "Expand All" and "Collapse All" buttons, a search box, and a tree view of report categories. The tree view includes "Dialysis Events", "Numerators", "Denominators", "Rates", "Pediatric Rates", "SIR", "Pre", "Cer", "Pat", "Data Quality", "COVID-19 Module", "CMS Reports", "Advanced", and "My Custom Reports". Under the "SIR" category, two items are listed: "SIR SIR Table - Dialysis Event Bloodstream Infection (BSI)" and "SIR SIR Table - Dialysis Event Bloodstream Infection (BSI) - 2023 New Baseline". A context menu is open over the second item, with the "Export Data Set" option highlighted by a blue arrow.

Example: Exported Data Set from New SIR Report

AutoSave Off PBC_SIR_2023 - Read... Search

File Home Insert Draw Page Layout Formulas Data Review View Automate Developer Help

Clipboard Font Alignment Number Styles Cells Editing Sensitivity Add-ins Copilot

POSSIBLE DATA LOSS Some features might be lost if you save this workbook in the comma-delimited (.csv) format. To preserve these features, save it in an Excel file format. Don't show again Save As...

A1 fx accessType

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	accessType	orgID	location	summaryY	numpts	CCN	OID	name	city	state	zip	countyNar	summaryY	summaryY	summaryY	ObservedE	LocDialCenter	surveyYear	NumStations		
2	Fistula	83053	CENTER	2023M05	5	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2023Q2	2023	2023H1	1	F	2026	10		
3	Graft	83053	CENTER	2023M05	5	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2023Q2	2023	2023H1	0	F	2026	10		
4	Non-Tunneled	83053	CENTER	2023M05	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2023Q2	2023	2023H1	0	F	2026	10		
5	Tunneled	83053	CENTER	2023M05	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2023Q2	2023	2023H1	0	F	2026	10		
6	Fistula	83053	CENTER	2024M01	3	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	1	F	2026	10		
7	Graft	83053	CENTER	2024M01	2	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
8	Non-Tunneled	83053	CENTER	2024M01	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
9	Tunneled	83053	CENTER	2024M01	2	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
10	Fistula	83053	CENTER	2024M02	4	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
11	Graft	83053	CENTER	2024M02	2	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
12	Non-Tunneled	83053	CENTER	2024M02	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
13	Tunneled	83053	CENTER	2024M02	4	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	2	F	2026	10		
14	Fistula	83053	CENTER	2024M03	17	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
15	Graft	83053	CENTER	2024M03	3	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
16	Non-Tunneled	83053	CENTER	2024M03	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
17	Tunneled	83053	CENTER	2024M03	8	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q1	2024	2024H1	0	F	2026	10		
18	Fistula	83053	CENTER	2024M04	5	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q2	2024	2024H1	0	F	2026	10		
19	Graft	83053	CENTER	2024M04	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q2	2024	2024H1	0	F	2026	10		
20	Non-Tunneled	83053	CENTER	2024M04	1	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q2	2024	2024H1	0	F	2026	10		
21	Tunneled	83053	CENTER	2024M04	0	32024		SB Test Fai	Atlanta	GA	56789	Calhoun	2024Q2	2024	2024H1	0	F	2026	10		

PBC_SIR_2023

Summary and Wrap Up

- Provided background and rationale for updating the BSI SIR.
- Demonstrated how to calculate old & new SIRs, highlighting differences.
- Showed where to find the old and new SIR reports in NHSN.
- Showed what the output of the old & new SIR reports look like and how the old & new SIR values differ.
- Showed what the new SIR report's exported dataset looks like & how it differs from the old SIR report's dataset.
- New SIR allows us to measure performance under standards in current healthcare environment.
- Many will see increased SIRs, but the new SIR will be used for every facility.
- CMS will begin using new SIR in performance year 2027 for payment in 2029.

Contact Info:

Tamara Hoxworth

Scientific Data Analyst II

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion, Surveillance Branch
tze2@cdc.gov



Thank you.

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 <https://www.cdc.gov/>
Follow us on social @CDCgov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U. S. Centers for Disease Control and Prevention.

