AHRQ Quality Indicators™

Quality Indicators Software Instructions and Data Dictionary, SAS QI® v2021

Prepared for:

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Executive Summary

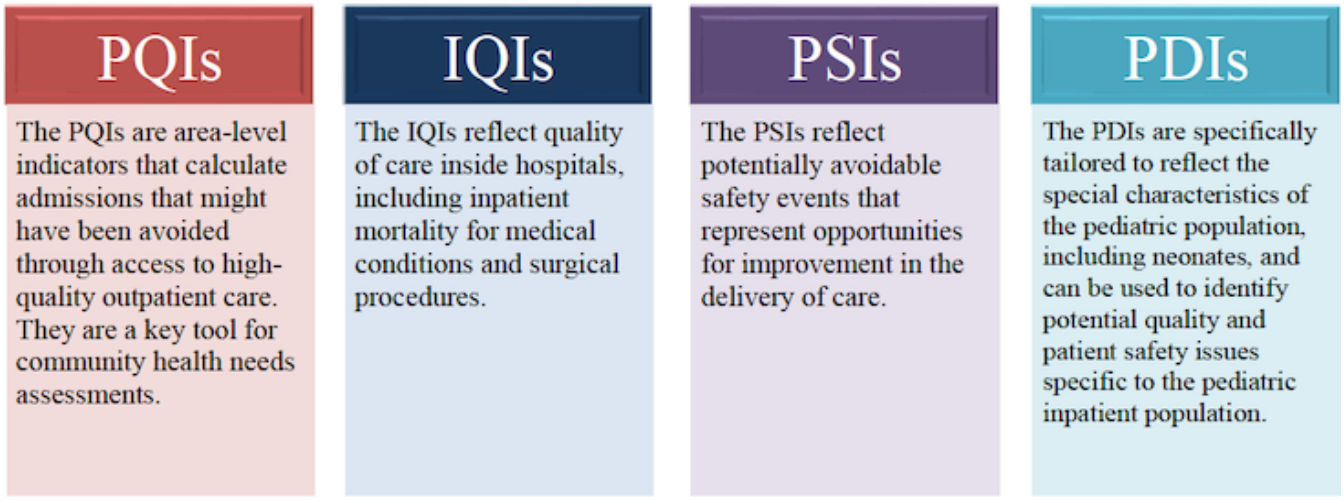
Background

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicators™ (QIs) were developed specifically to meet short-term needs for information on healthcare quality using standardized, user-friendly methods and existing sources of administrative data. AHRQ QI measures have been developed over time by AHRQ with input from numerous teams of clinical and technical experts. The AHRQ QIs are updated on a regular basis, incorporating new research evidence, empirical analyses, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement. The AHRQ QI program is unique in that it provides free, publicly available software tools that allow users to calculate QI rates based on their own administrative data using a standard desktop computer.

The AHRQ QIs are organized around four collections (modules) of indicators: Prevention Quality Indicators (PQIs), Inpatient Quality Indicators (IQIs), Patient Safety Indicators (PSIs), and Pediatric Quality Indicators (PDIs). Data captured by and characteristics of each of the modules are shown in Figure 1.

Detailed specifications for each indicator, with complete listings of diagnosis and procedure case definitions, are contained in the AHRQ QI Technical Specifications, available at http://www.qualityindicators.ahrq.gov. Each module also includes additional documentation on the risk adjustment models and benchmark national estimates of numerators, denominators, and observed rates for each indicator. Additional documentation on the empirical methods used to create and calculate each indicator is also available. Appendix A contains links to these documents and additional documentation on the AHRQ QIs.

Figure 1. Characteristics of AHRQ QI Modules



In addition to documentation, the AHRQ QI program annually creates software tools that can be used with the *International Classification of Diseases, 10th Revision, Clinical Modification/ Procedure Coding*

System (ICD-10-CM/PCS). Each version[1] of the AHRQ QI software generates numerators and denominators, as well as observed, expected, risk-adjusted, and smoothed rates across the modules for most indicators. Observed rates are the raw rates that are the count of discharge records with the health outcome of interest divided by the count of discharge records in the patient population at risk. Expected and risk-adjusted rates both acknowledge that areas of the country or individual hospitals are unique and may differ in important ways from the representative profile observed in the reference (general or standard) population. Smoothed or reliability-adjusted rates account for unreliable estimates based on small sample size. More information on the methodology for the calculation of these rates can be found in the *AHRQ Quality Indicators Empirical Methods* document posted on the AHRQ QIs website (http://www.qualityindicators.ahrq.gov/Modules/Default.aspx).

AHRQ QI software is available in two different platforms: a SAS®[2] application and a Microsoft Windows® application. The SAS software was first released in the late 1990s. It consists of several modules of SAS code and requires a SAS license to run. The QI Windows®-based software, known as WinQI, was first released in 2005. It was created to provide an easy-to-use, low-cost option for calculating the QIs that was not dependent on licensed software. Developed on Microsoft Visual Studio using C# and .NET, AHRQ WinQI runs on Windows operating systems and only requires freely available software components: AHRQ-produced software, Microsoft .NET (for runtime environment and core software libraries), and Microsoft SQL Server Express (for data storage and manipulation).

Differences between SAS QI version v2021 and WinQI version v2021 are shown in Table 1. The WinQI software is available as a 64-bit application and runs on Windows 8, or 10 operating systems.

Table 1. Differences Between SAS QI v2021 and WinQI v2021

SAS QI V2021	WINQI V2021
Requires licensed SAS software.	Requires free downloadable software.
User can modify the software.	User is unable to modify the software.
Data load and error checking are at the discretion of the user.	Includes data load and error-checking functions.
User must execute all programs from the control file for each module and all indicators in a module are displayed in output.	All QIs are calculated in a single program, and the user can select which indicators to output.
Area-level indicator denominators are adjusted on the basis of the combination of county, age, and sex in the numerator. Adjustments are generally small (<0.01%) in absolute terms.	Area-level indicator denominators are not adjusted.

SAS QI and WinQI software are updated annually to reflect changes in the AHRQ QI technical specifications. New software versions and updated technical specifications are released simultaneously. Routine annual updates include ICD-10-CM/PCS codes, Medicare Severity Diagnosis-Related Groups (MS-DRGs), Clinical Classifications Software Refined (CCSR), Major Diagnostic Category (MDC) definitions, Elixhauser Comorbidity Software Refined, an updated version of the 3M™ All Patient

[1] Previously released versions of the ICD-10-CM/PCS AHRQ QI software generated only numerators, denominators, and observed rates. Version 2021 also generates expected, risk-adjusted, and smoothed rates for the IQIs, PSIs, PQIs and PDIs.

[2] SAS is a statistical software package distributed by SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA. The company may be contacted directly regarding licensing of their products. SAS Institute Inc. has no affiliation with AHRQ or involvement in the development of the AHRQ QIs. For more information, visit the SAS Institute website at http://www.sas.com.

Refined Diagnosis-Related Group (APR-DRG) grouper,[3] new Census population files, and newly derived risk adjustment parameters.

Purpose

This document contains the instructions for the SAS QI v2021 software, which is provided for download on the AHRQ QI website (http://www.qualityindicators.ahrq.gov). The SAS programs are organized by module, and the user must execute the SAS programs within the control file by setting the appropriate flag for each program. This document will discuss the SAS program's software packages for all four modules of indicators, including one standalone software package that can be used to calculate a single indicator. Throughout the document, any differences in the module-specific software packages are highlighted and discussed.

Computer Software Requirements

SAS QI v2021 is designed as a personal computer-based, single-user application. It has been tested with SAS Version 9.4 (installed in 64-bit native mode) on 64-bit machines running Microsoft® Windows Server 2016. To use SAS QI, users must have access to a commercially available SAS statistical software package, including Base SAS, SAS/STAT, and SAS/ACCESS.

The APR-DRG Limited License Grouper program is only available in a 64-bit version and must be run on a 64-bit installation of Windows. The program also requires Microsoft Visual C++ Redistributable 2017, or later, to be installed on the computer prior to running. This is only needed if you are running the APR-DRG Limited License Grouper program to assign the APR-DRG codes to discharges used in the IQI_HOSP_RISKADJ.sas program. See Section 1.5 and Section 3.3.2 for more information.

Data Requirements

The AHRQ QI software is intended to be used with administrative billing and/or claims ICD-10-CM/PCS coded data that cover an entire patient population (e.g., all discharges from a hospital in a year) or that were sampled from a patient population using simple random sampling.

The data must be in a SAS-formatted dataset. Depending on the software module and the purpose of calculating the estimates of the indicator, the dataset should include some or all of the following information:

- Patient characteristics (age, sex, race, county of residence)
- ICD-10-CM coded principal and secondary diagnoses
- An indicator of whether the diagnoses were present on admission
- ICD-10-PCS principal and secondary procedures
- Procedure day for each procedure
- Associated classifications of diagnoses and procedures (MS-DRGs, MDCs, APR-DRGs)[4,5]

[3] APR-DRG codes are used in risk adjustment calculation for certain IQI indicators.
[4] The APR-DRGs can be created using the 3M Limited License grouper provided in the software package. The CMS Medicare Severity Diagnosis-Related Groups can be created using the CMS Grouper Software and Medicare Code Editor.
[5] MDCs are derived from the CMS MS-DRG grouper algorithm, which assigns the MDC based on the principal diagnosis. For more on MDC creation, see Section 3.3.1.

- Admission source/point of origin
- Admission type
- Length of stay
- Primary and secondary payers
- Discharge disposition
- Discharge quarter and year
- Unique identifiers for the record and the hospital

Chapter 3 provides a description of the selected data elements and coding conventions. Appendix F provides a full list of required data fields and formats for input data files, as well as a description of how the software handles missing data.

Acknowledgments

The AHRQ QI v2021 software program uses the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for 2018 to compile reference (general or standard) population data,[6] develop the AHRQ QIs, and create risk adjustment models with parameter estimates based on national estimates that can be used at the local level and to establish national benchmarks. HCUP is a family of healthcare databases and related software tools and products developed through a Federal-State-industry partnership and sponsored by AHRQ. HCUP databases bring together the data collection efforts of State data organizations, hospital associations, private data organizations, and the Federal government to create a national information resource of encounter-level healthcare data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services; medical practice patterns; access to healthcare programs; and outcomes of treatments at the national, State, and local market levels. In total, the HCUP SID encompasses about 97 percent of all annual inpatient discharges in the United States.

The AHRQ QI program would like to acknowledge the HCUP partner organizations that participated in the HCUP SID:

Alaska Department of Health and Social Services
Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
Delaware Division of Public Health
District of Columbia Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Laulima Data Alliance, a non-profit subsidiary of the Healthcare Association of Hawaii

[6] For further details on the reference population, please see the Empirical Methods document: https://www.qualityindicators.ahrq.gov/Modules/

Hawaii University of Hawaii at Hilo
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Center for Health Information and Analysis
Michigan Health & Hospital Association
Minnesota Hospital Association (provides data for Minnesota and North Dakota)
Mississippi State Department of Health
Missouri Hospital Industry Data Institute
Montana Hospital Association
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Health Authority
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Department of Health and Human Resources
Wisconsin Department of Health Services
Wyoming Hospital Association

For more information on HCUP, visit http://www.hcup-us.ahrq.gov.

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Chapter 1. Software Overview

This document describes the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators™ (QIs) SAS®[7] QI Version 2021 (v2021) software and is intended to be a complement to the *AHRQ Quality Indicators Empirical Methods* document (http://www.qualityindicators.ahrq.gov/Modules/Default.aspx) that describes the analytic approach to the development and calculation of the AHRQ QIs.

This document provides an overview of the software (Chapter 1) and a quick reference guide (Chapter 2). The main body of the document includes detailed discussion of the data elements necessary to calculate the AHRQ QIs (Chapter 3), descriptions (in nontechnical language) of the processing steps to produce quality indicator rates (Chapter 4), detailed descriptions of the SAS programs in each software package (Chapter 5), a discussion of the output expected from each of the programs (Chapter 6), information on user support (Chapter 7), and information on how to provide feedback (Chapter 8). The appendices include additional public resources available for AHRQ QI users (Appendix A), lists of area-level and hospital-level QIs (Appendix B), lists of components of SAS software packages (Appendix C), key variables created in the software (Appendix D), SAS input data and output analytic files (Appendix E), data dictionaries of required data elements for the input data files (Appendix F) data dictionaries of risk factors (Appendix G), data dictionaries of variables created in output files (Appendix H), the setnames for diagnoses and procedures used to flag outcomes and populations at risk (Appendix I), and lists of ways to print results in aggregation (Appendix J).

1.1 AHRQ QI SAS Software

The SAS programs are organized by module, and the user must execute the SAS programs within the control file by setting the appropriate flag for each program. This document will discuss the SAS program's software packages for all four modules of indicators, including a standalone software package that can be used to calculate a single indicator. Throughout the document, any differences in the module software packages are highlighted and discussed.

The SAS QI v2021 software consists of the following software packages, by module:

- Prevention Quality Indicators (PQI) Module
  - PQI SAS software package calculates all PQIs.
- Patient Safety Indicators (PSI) Module
  - PSI SAS software package calculates all PSIs except PSI 17–Birth Trauma Rate.
  - PSI 17 SAS software package calculates PSI 17.
- Inpatient Quality Indicators (IQI) Module
  - IQI SAS QI software package calculates all IQIs.

[7] SAS is a statistical software package distributed by SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA. The company may be contacted directly regarding licensing of its products. SAS Institute Inc. has no affiliation with AHRQ or involvement in the development of the AHRQ QIs. For more information, visit the SAS Institute website at http://www.sas.com.

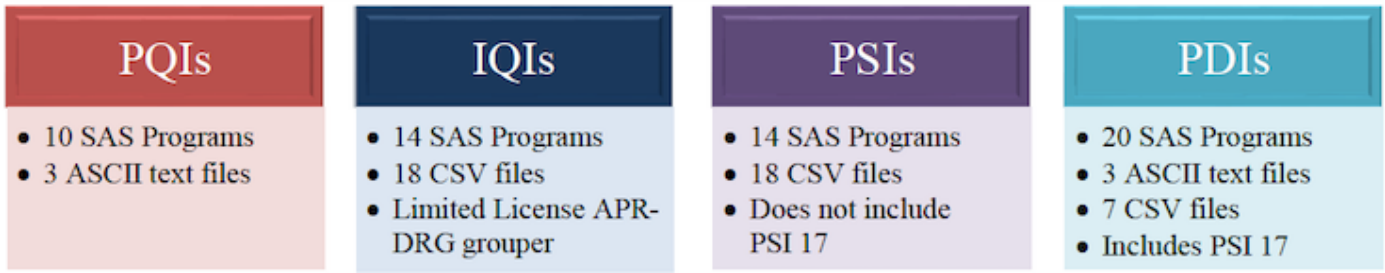
- Pediatric Quality Indicators (PDI) Module
  - PDI SAS software package calculates all PDIs and PSI 17.

In addition, two supplements to the AHRQ QI software are available. First, a population text file is available that can be used with all of the aforementioned software packages to calculate all area-level indicators (Appendix B). Second, the AHRQ QI program provides access to a Limited License edition of the 3M™ All Patient Refined Diagnosis-Related Group (APR-DRGs) grouper. The APR-DRGs are only required for risk adjustment covariates for some of the hospital-level IQIs (Appendix B).

1.2 Components of the Software Packages

As shown in Figure 2., the SAS QI v2021 software packages consist of various SAS programs and auxiliary data in ASCII text files (.txt) and a comma-separated values (CSV) file. These programs and text files are described in the subsequent sections of this document. Refer to Appendix C for a detailed list of all SAS programs and auxiliary files in each software package.

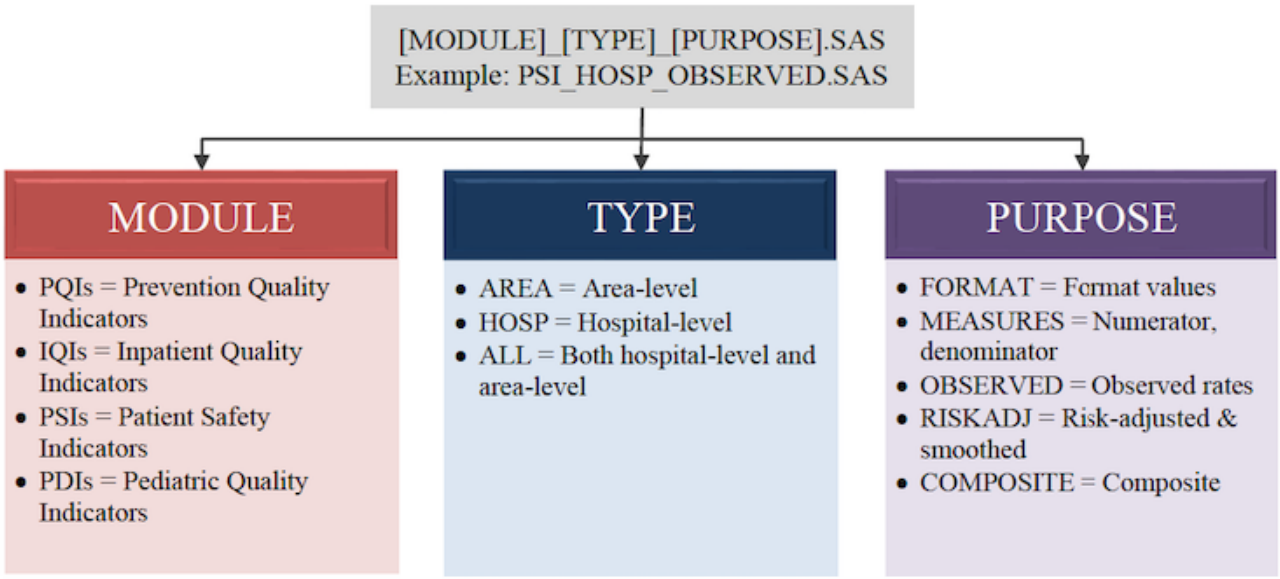
Figure 2. SAS Programs and ASCII Text Files for SAS QI v2021 Software Components



1.3 Naming Conventions of SAS Programs

The AHRQ QI v2021 SAS program file names contain three descriptive components separated by underscores in the format *XXI_TYPE_PURPOSE*.sas. The first component, denoted as *XXI*, indicates the module for the program. That is, *PQI* indicates a Prevention Quality Indicator, *IQI* indicates an Inpatient Quality Indicator, *PSI* indicates a Patient Safety Indicator, and *PDI* indicates a Pediatric Quality Indicator. The next component, denoted by *TYPE*, describes the type of indicators the program produces. One of three types will be designated: *AREA* indicates that area-level indicators are produced, *HOSP* indicates that hospital-level indicators are produced, and *ALL* indicates that the program is used for both area-level and hospital-level indicators. The final component of the name, denoted by *PURPOSE*, indicates the purpose of the program. Examples of the final component of the name include *FORMATS*, which creates a format library; *MEASURES*, which creates the numerator and denominator of the measures; *OBSERVED*, which creates observed rates; and *RISKADJ*, which creates risk-adjusted and sometimes smoothed rates. Figure 3 illustrates the program naming convention in the QI modules.

Figure 3. Naming Convention of the QI SAS Programs



The PQI module contains only area-level indicators, and the IQI and PSI modules contain only hospital-level indicators. The PDI module has both hospital-level and area-level indicators. See Appendix B for a list of area-level and hospital-level indicators.

Refer to Appendix C for a complete list of files in each of the module software packages.

1.4 Saving the Required Files to Run the SAS QI v2021 Software

Users can download the SAS QI v2021 software from the AHRQ QIs website into a directory on the user's computer (e.g., "C:\AHRQQI\"). Users can also create subfolders named for each of the modules (i.e., IQI, PDI, PQI, and PSI). The *XXI_TYPE*_CONTROL.sas program included with each module will need to be modified with the directory names used. Editing of the CONTROL files is described in Chapter 5 of this document.

1.5 Computer Requirements

SAS QI v2021 is designed as a personal computer-based, single-user application. It has been tested with SAS Version 9.4 (installed in 64-bit native mode) on 64-bit machines running Microsoft® Windows server 2016. SAS installations on z/OS and Unix HP or AIX systems will be able to run the program but will not be able to run the APR-DRG grouper. To use SAS QI v2021, users must have access to a commercially available SAS statistical software package, including Base SAS, SAS/STAT, and SAS/ACCESS. The Limited License APR-DRG grouper requires a Microsoft Windows operating system with Microsoft Visual C++ Redistributable 2017, or later. If users are running a 64-bit version of Microsoft Windows, they can download and install the corresponding 64-bit Limited License APR-DRG grouper auxiliary file for use with the IQI software package from the AHRQ QI website.

1.6 Data Requirements

1.6.1 User-Supplied Data

The data required for measuring these Quality Indicators come from hospital discharge abstracts or billing or claims data (administrative data), which are readily available within hospitals or from many State data organizations (although restrictions on use of the data may apply).

The AHRQ QI software is intended to be used with the *International Classification of Diseases, 10th Revision, Clinical Modification/Procedure Coding System* (ICD-10-CM/PCS) coded administrative billing and/or claims data that cover an entire patient population (e.g., all discharges from a hospital in a year) or discharges that are sampled from a patient population using simple random sampling.

The data must be in a SAS-formatted dataset. Depending on the software module and the purpose of calculating the estimates of the indicator, the dataset should include some or all of the following information:

- Patient characteristics (age, sex, race, county of residence)
- ICD-10-CM coded principal and secondary diagnoses
- An indicator of whether the diagnoses were present on admission (POA)
- ICD-10-PCS principal and secondary procedures
- Associated classifications of diagnoses and procedures MS-DRGs, MDC[8]
- Admission source/point of origin
- Admission type
- Procedure day
- Length of stay
- Primary and secondary payers
- Discharge disposition
- Discharge quarter and year
- Unique identifiers for the record and the hospital

Some of the data elements are required. For example, if age, sex, discharge quarter and year, or principal diagnosis are missing, the QI software will delete the record. The treatment of missing data elements and values varies across the software packages. If POA data are missing, the PSI or PDI measures that use POA for observed rate calculation will assume that all diagnoses are for conditions that occurred while in the hospital except where exempt from POA reporting. POA data are not necessary for the calculation of observed rates for PQIs or IQIs.

Chapter 3 provides a description of the selected data elements and coding conventions. Appendix F provides a detailed list of required data fields and formats for input data files, as well as a description of how the software handles missing data for each of the data elements.

1.6.2 Software-Supplied Data

The AHRQ QI software provides an additional data file to calculate area-level indicators. The 2000–2020 Population File (2000-2020_Population_Files_v2021.txt), is available on the AHRQ QI website as a

[8] The APR-DRG can be created using the 3M Limited License grouper provided in the software package. The MS-DRG can be created using the CMS Grouper Software and Medicare Code Editor.

separate download. The 2000–2020 Population File is an ASCII-based text file that contains 679,320 records with a fixed logical record length of 150 bytes, with population estimates for 3,145 counties or equivalent areas (identified by Federal Information Processing Standards [FIPS] codes) in the U.S. These estimates are derived from the U.S. Census Bureau. Each record includes county-specific yearly estimates of the number of people in a specific sex, single age, and race category. These estimates are used as the denominator for area-level indicators. See the 2000–2020 Population File documentation for additional information:
https://www.qualityindicators.ahrq.gov/Downloads/Software/SAS/V2021/2000-2020_Population_Files_V2021.zip.

1.7 Software Output

Each version[9] of the AHRQ QI software generates numerators and denominators and observed, expected, risk-adjusted, and smoothed rates across the modules for most indicators. Observed rates are the raw rates, which are the count of discharge records with the health outcome of interest divided by the count of discharge records in the patient population at risk. Expected and risk-adjusted rates both acknowledge that individual hospitals (or areas of the country) are unique and may differ in important ways from the representative profile observed in the reference (general or standard) population.[10] Smoothed or reliability-adjusted rates account for unreliable estimates based on small sample size. More information on the methodology for calculating these rates can be found in the *AHRQ Quality Indicator Empirical Methods* document posted on the AHRQ QI website (http://www.qualityindicators.ahrq.gov/Modules/Default.aspx).

1.7.1 Supporting Documentation

The AHRQ QI SAS software is supported by detailed documentation about the software as well as the development of the AHRQ QIs, as shown in Appendix A. In addition to the software instructions, each software package is supported by the documents below. They are available for download on the AHRQ QI website (http://qualityindicators.ahrq.gov).

- Technical specifications for each indicator
- Parameter estimates for all risk models
- National benchmark data
- Logs of all specification and software updates

The technical specifications provide a brief description of the measure, the numerator inclusion and exclusion criteria, and denominator inclusion and exclusion criteria, including a list of all ICD-10-CM/PCS coded diagnoses and procedures used in the technical specification. Each software package includes parameter estimates documents that provide the covariates and coefficients for risk adjustment models and the weights used in the hospital-level composites. The regression coefficients are used to calculate risk-adjusted rates that account for differences in the patient populations across areas or

[9] Early versions of the *International Classification of Diseases, 10th Revision, Clinical Modification/Procedure Coding System* (ICD-10-CM/PCS) AHRQ QI software generated only numerators, denominators, and observed rates. Software version v2021 can generate expected, risk-adjusted, and smoothed rates for IQIs, PSIs, PQIs and PDIs.

[10] The reference population consists of all relevant hospital discharges from HCUP SID for the year most recently released by AHRQ at the time of the QI software update. For further details on the reference population, please see the Empirical Methods document (https://www.qualityindicators.ahrq.gov/Modules/).

hospitals. Benchmark tables are also available. These tables provide nationwide comparative estimates for each of the indicators, including counts and numerator, denominator, and observed rates stratified by sex, age group, and expected payer. These documents are available only for ICD-10-CM/PCS coded data in v2021. In addition, each software package includes a log of coding updates and revisions. The logs provide a cumulative summary of all changes to the software, software documentation, and other documents made since the release of version 2.1 of the software in March 2003.

Chapter 2. Quick Reference Guide

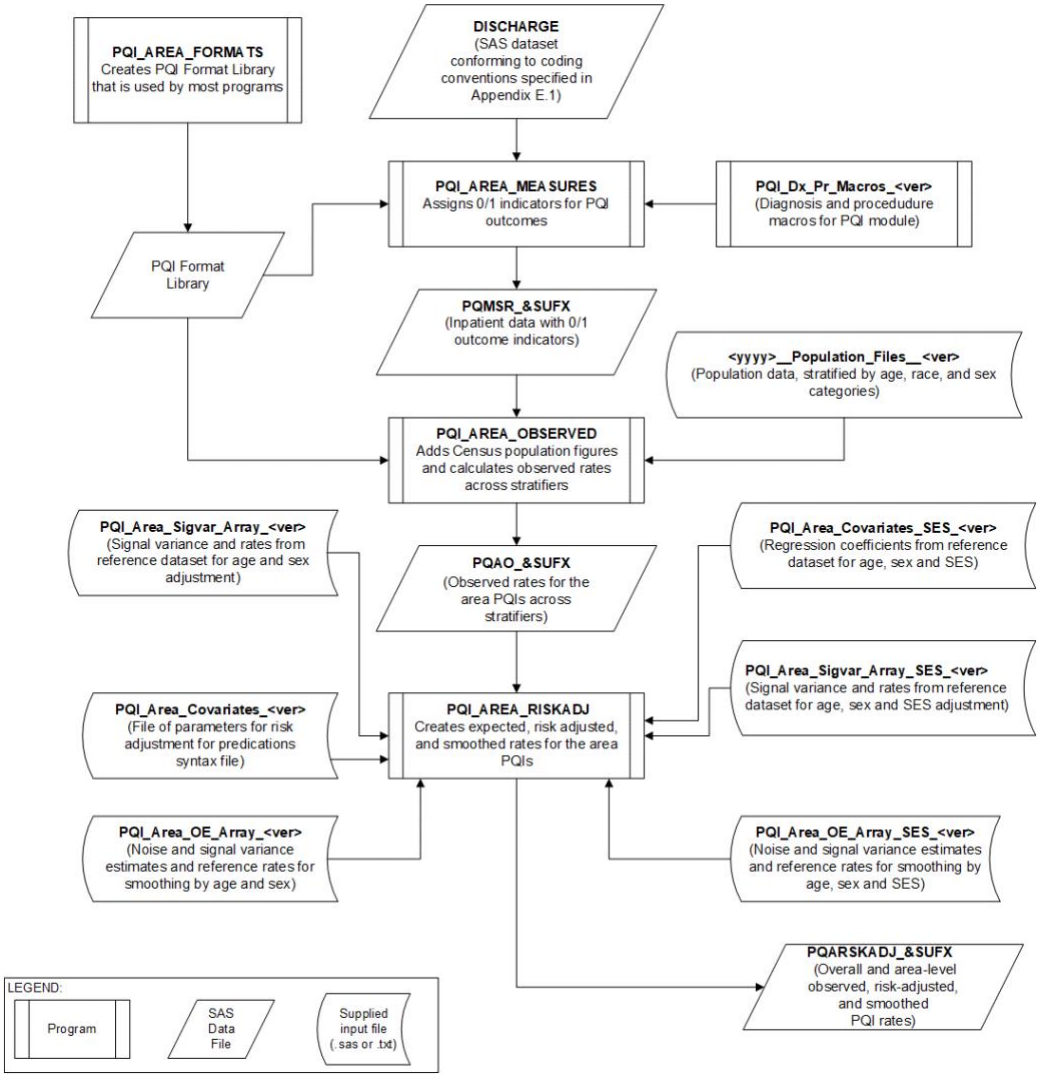
This chapter is intended to serve as a quick reference guide for each software package to assist in reading this documentation and in reviewing the SAS QI® software v2021 outputs. Processing steps are shown first, followed by tables explaining the variable naming convention and the files used in each software package.

2.1 Prevention Quality Indicators (PQIs) Quick Reference

2.1.1 Processing Steps

Figure 4. shows the processing steps for the PQI software package. Table 2. lists all PQIs, all of which are area-level indicators. All PQIs are calculated using the PQI software package.

Figure 4. Processing Steps for the Area-level Indicators in the PQI Software Package*



NOTE: Each of the SAS programs in this figure is executed in the PQI_AREA_CONTROL.sas program, which contains code the user must modify in order to run the PQI software. The modifications include such items as specifying the name and location of the input dataset, the population dataset, the format library, the macro programs,

and the output datasets; setting print options; setting default values; and setting individual flag variables to run each of the main SAS programs. See Appendix C for a complete list of programs in the software package.
* All indicators in the PQI module are at the area level.

Table 2. PQIs and Variable Abbreviations Used in Software

INDICATOR ABBREV	PREVENTION QUALITY INDICATOR	SAS VARIABLE ABBREV
AREA-LEVEL INDICATORS		
PQI 01	Diabetes Short-Term Complications Admission Rate	PQ01
PQI 03	Diabetes Long-Term Complications Admission Rate	PQ03
PQI 05	Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate	PQ05
PQI 07	Hypertension Admission Rate	PQ07
PQI 08	Heart Failure Admission Rate	PQ08
PQI 11	Community-Acquired Pneumonia Admission Rate	PQ11
PQI 12	Urinary Tract Infection Admission Rate	PQ12
PQI 14	Uncontrolled Diabetes Admission Rate	PQ14
PQI 15	Asthma in Younger Adults Admission Rate	PQ15
PQI 16	Lower-Extremity Amputation Among Patients with Diabetes Rate	PQ16
PQI 90	Prevention Quality Overall Composite	PQ90
PQI 91	Prevention Quality Acute Composite	PQ91
PQI 92	Prevention Quality Chronic Composite	PQ92
PQI 93	Prevention Quality Diabetes Composite	PQ93

2.1.2 Variable Naming

The SAS programs in the PQI software package use a consistent naming convention for the variables used to store the different indicator results. The first character of the variable name (the prefix) indicates what type of result the variable stores (see Table 3.). The second character is "A" to note that the indicator is calculated at the area level (all PQIs are area-level indicators). The remaining characters are an abbreviation that identifies the indicator by module (e.g., "PQ") and indicator number (e.g., "01").

Table 3. lists the prefixes used to name the PQI SAS variables; examples of this naming convention applied to PQI 01 are provided in the table. Appendix D provides a complete list of key variables calculated for each indicator.

Table 3. Prefixes for the Variables Used to Store PQI Results

PREFIX	TYPE OF RESULT	EXAMPLE AREA-LEVEL INDICATORS (PQI 01)
T	Numerator (top)	TAPQ01
P	Population denominator (pop)	PAPQ01
O	Observed rate	OAPQ01
E	Expected rate[1]	EAPQ01
R	Risk-adjusted rate[1]	RAPQ01
V	Variance of the risk adjusted rate[1]	VAPQ01

PREFIX	TYPE OF RESULT	EXAMPLE AREA-LEVEL INDICATORS (PQI 01)
L	Lower limit of confidence interval of risk-adjusted rate[1]	LAPQ01
U	Upper limit of confidence interval of risk-adjusted rate[1]	UAPQ01
SN	Reliability of the risk-adjusted rate[1]	SNAPQ01
S	Smoothed rate[1]	SAPQ01
X	Standard error of the smoothed rate[1]	XAPQ01

[1] Some types of results will not be applicable to certain indicators. See Appendix D for a complete list of variables by indicator.

2.1.3 Files in Software Package

Table 4. lists the SAS programs that are included in the PQI software package and indicates which auxiliary files (if any) are required by those program files. The PQI SAS programs load information from auxiliary files. These auxiliary files are in ASCII text (.txt) format. These files do not need to be converted to SAS format in order to use them with the software. The 2000–2020 Population File, 2000-2020_Population_Files_v2021.txt, is available on the AHRQ QIs website as a separate download. All of the other auxiliary files are included in the downloadable PQI software package. Appendix C provides a complete list of PQI SAS programs and auxiliary files in the PQI software package, including whether the programs are available for use with ICD-10-CM/PCS coded data.

Table 4. Files Included in the PQI Software Package

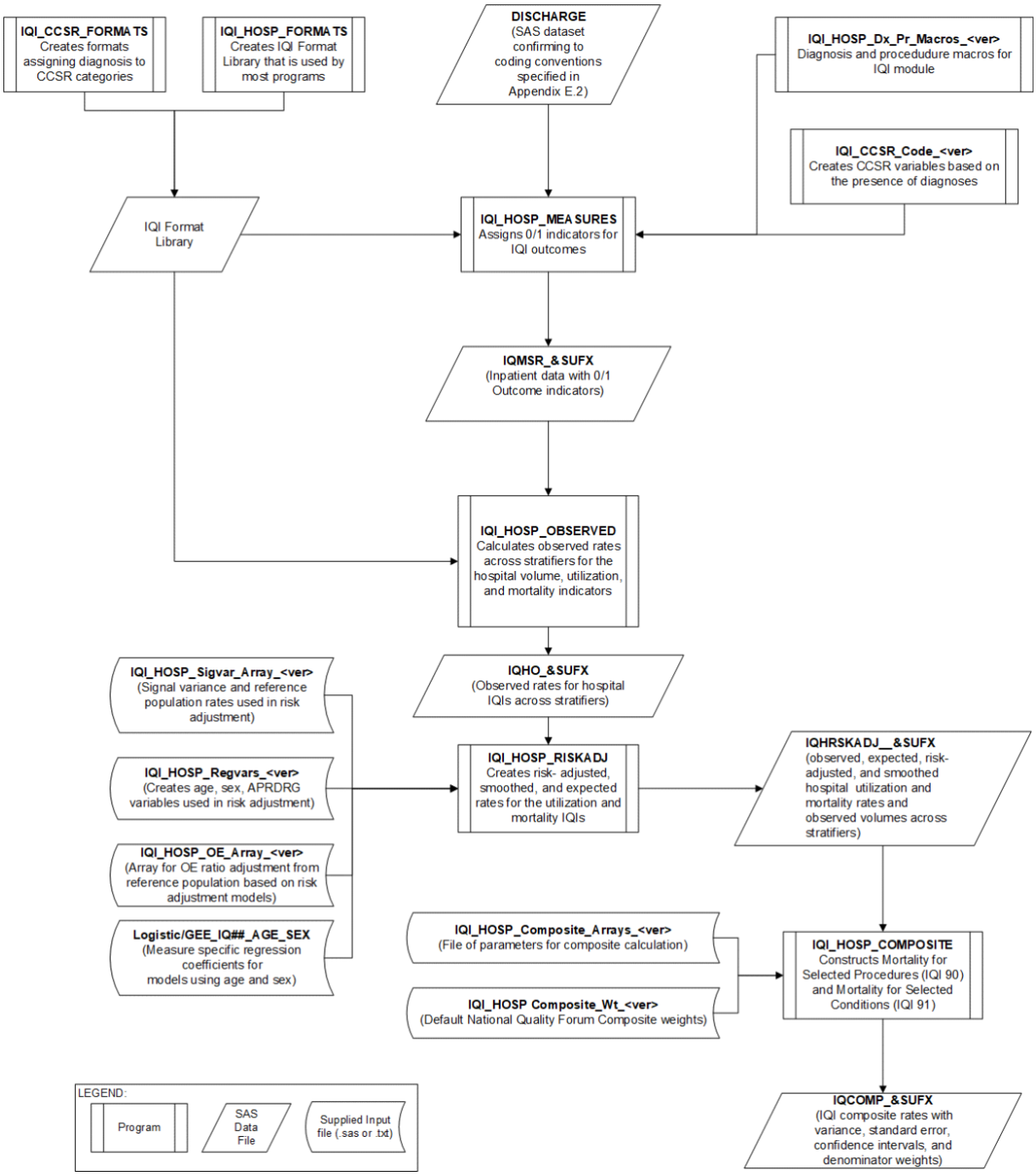
SAS PROGRAM FILE NAME	REQUIRED AUXILIARY MACRO AND ASCII FILES
PQI_AREA_CONTROL.sas	PQI_Dx_Pr_Macros_v2021.sas
PQI_AREA_FORMATS.sas	N/A
PQI_AREA_MEASURES.sas	N/A
PQI_AREA_OBSERVED.sas	2000-2020_Population_Files_v2021.txt
PQI_AREA_RISKADJ.sas	2000-2020_Population_Files_v2021.txt, PQI_Area_Sigvar_Array_v2021.sas or PQI_Area_Sigvar_Array_SES_v2021.sas, PQI_Area_Covariates_v2021.txt or PQI_Area_Covariates_SES_v2021.txt, and PQI_Area_OE_Array_v2021.sas or PQI_Area_OE_Array_SES_v2021.sas

2.2 Inpatient Quality Indicators (IQIs) Quick Reference

2.2.1 Processing Steps

Figure 5. shows the processing steps for the hospital-level indicators in the IQI software package. Table 5. lists all IQIs. All IQIs are calculated using the IQI software package.

Figure 5. Processing Steps for the Hospital-Level Indicators in the IQI Software Package



NOTE: Each of the SAS programs in this figure is executed in the IQI_HOSP_CONTROL.sas program, which contains code the user must modify in order to run the IQI software. The modifications include such items as specifying the name and location of the input dataset, the population dataset, the format library, the macro programs, and the output datasets; setting print options; setting default values; and setting individual flag variables to run each of the main SAS programs. See Appendix C for a complete list of programs in the software package.

Table 5. IQIs and Variable Abbreviations Used in the IQI Software Package

INDICATOR ABBREV	INPATIENT QUALITY INDICATOR	SAS VARIABLE ABBREV
HOSPITAL-LEVEL INDICATORS		
IQI 08	Esophageal Resection Mortality Rate	IQ08
IQI 09	Pancreatic Resection Mortality Rate	IQ09
IQI 09_WITH_CANCER	Pancreatic Resection Mortality Rate Stratum A: Presence of Pancreatic Cancer	IQ09_WITH_CANCER
IQI 09_WITHOUT_CANCER	Pancreatic Resection Mortality Rate Stratum B: Absence of Pancreatic Cancer	IQ09_WITHOUT_CANCER
IQI 11	Abdominal Aortic Aneurism (AAA) Repair Mortality Rate	IQ11
IQI 11_OPEN_RUPTURED	Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate Stratum: Open Repair of Ruptured AAA	IQ11_OPEN_RUPTURED
IQI 11_OPEN_UNRUPTURED	Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate Stratum: Open Repair of Unruptured AAA	IQ11_OPEN_UNRUPTURED
IQI 11_ENDO_RUPTURED	Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate Stratum: Endovascular Repair of Ruptured AAA	1Q11_ENDO_RUPTURED
IQI 11_ENDO_UNRUPTURED	Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate Stratum: Endovascular Repair of Unruptured AAA	IQ11_ENDO_UNRUPTURED
IQI 12	Coronary Artery Bypass Graft (CABG) Mortality Rate	IQ12
IQI 15	Acute Myocardial Infarction (AMI) Mortality Rate	IQ15
IQI 16	Heart Failure Mortality Rate	IQ16
IQI 17	Acute Stroke Mortality Rate	IQ17
IQI 17_HEMSTROKE_SUBARACH	Acute Stroke Mortality Rate Stratum: Subarachnoid Hemorrhage	IQ17_HEMSTROKE_SUBARACH
IQI 17_HEMSTROKE_INTRACER	Acute Stroke Mortality Rate Stratum: Intracerebral Hemorrhage	IQ17_HEMSTROKE_INTRACER
IQI 17_ISCHEMSTROKE	Acute Stroke Mortality Rate Stratum: Ischemic Stroke	IQ17_ISCHEMSTROKE
IQI 18	Gastrointestinal Hemorrhage Mortality Rate	IQ18
IQI 19	Hip Fracture Mortality Rate	IQ19
IQI 20	Pneumonia Mortality Rate	IQ20
IQI 21	Cesarean Delivery Rate, Uncomplicated	IQ21
IQI 22	Vaginal Birth After Cesarean (VBAC) Delivery Rate, Uncomplicated	IQ22
IQI 30	Percutaneous Coronary Intervention (PCI) Mortality Rate	IQ30
IQI 31	Carotid Endarterectomy Mortality Rate	IQ31
IQI 33	Primary Cesarean Delivery Rate, Uncomplicated	IQ33
IQI 90	Mortality for Selected Inpatient Procedures	IQ90
IQI 91	Mortality for Selected Inpatient Conditions	IQ91

2.2.2 Variable Naming

The SAS programs in the IQI software package use a consistent naming convention for the variables that store the different indicator results. The first character of the variable name (the prefix) indicates what type of result the variable stores (see Table 6.). The second character is "P" if the indicator is provider- or hospital-level (all IQIs are hospital-level indicators). The remaining characters are abbreviations that identify the indicator by module and number. The first two characters of the abbreviation are "IQ" to indicate that the result is associated with the IQI module. The last characters in the abbreviation are numbers and letters matching the indicator number and stratum (if applicable) within the module.

Table 6. lists the prefixes used to name the IQI SAS variables. Examples of this naming convention applied to IQI 08 are provided in the table. Not all variables are reported for all indicators. For example, the smoothed rate and standard error of the smoothed rate are not reported for stratified risk-adjusted hospital-level indicators. In the IQI module, this impacts the following indicators:

- IQI 09_WITH_CANCER
- IQI 09_WITHOUT_CANCER
- IQI 11_OPEN_RUPTURED
- IQI 11_OPEN_UNRUPTURED
- IQI 11_ENDO_RUPTURED
- IQI 11_ENDO_UNRUPTURED
- IQI 17_HEMSTROKE_SUBARACH
- IQI 17_HEMSTROKE_INTRACER
- IQI 17_ISCHEMSTROKE.

Appendix D provides a complete list of key variables calculated for each indicator.

Table 6. Prefixes for the Variables Used to Store IQI Results (Except Composites)

PREFIX	TYPE OF RESULT	EXAMPLE HOSPITAL-LEVEL INDICATORS (IQI 08)
T	Numerator (top)	TPIQ08
P	Population denominator (pop)	PPIQ08
O	Observed rate	OPIQ08
E	Expected rate[1]	EPIQ08
R	Risk-adjusted rate[1]	RPIQ08
V	Variance of the risk-adjusted rate[1]	VPIQ08
L	Lower limit of confidence interval of risk-adjusted rate[1]	LPIQ08
U	Upper limit of confidence interval of risk-adjusted rate[1]	UPIQ08
SN	Reliability of the risk-adjusted rate[1]	SNPIQ08
S	Smoothed rate[1]	SPIQ08
X	Standard error of the smoothed rate[1]	XPIQ08

[1] Some types of results will not be applicable to certain indicators. See Appendix D for a complete list of variables by indicator.

Hospital-level composite variables do not have prefixes. The variables for the composite indicators IQI 90 and IQI 91 are shown in Table 7.

Table 7. Variables Used for Hospital-Level IQI Composites

TYPE OF RESULT	IQI 90	IQI 91
Composite score	IQC90	IQC91
Variance for the composite score	IQC90VAR	IQC91VAR
Standard error for the composite score	IQC90SE	IQC91SE
Weighted denominator for the composite score	IQC90WHT	IQC91WHT
Lower confidence interval for the composite score	IQC90LB	IQC91LB
Upper confidence interval for the composite score	IQC90UB	IQC91UB

2.2.3 Files in Software Package

Table 8. lists the SAS programs included in the IQI software package and indicates which auxiliary files (if any) are required by those program files. The IQI SAS programs load data from auxiliary files. These auxiliary files are in ASCII text (.txt), SAS program (.sas), or comma-separated values (CSV) file formats. The text or CSV files do not need to be converted to SAS format in order to use them with the software. All of the other auxiliary files are included in the downloadable IQI software package. Appendix C provides a complete list of IQI SAS programs and auxiliary files in the IQI software package.

Table 8. Programs Included in the IQI Software Package

SAS PROGRAM FILE NAME	REQUIRED AUXILIARY MACRO, ASCII, AND CSV FILES
IQI_HOSP_CONTROL.sas	IQI_HOSP_Dx_Pr_Macros_v2021.sas
IQI_HOSP_FORMATS.sas	IQI_HOSP_CCSR_Format_v2021.sas
IQI_HOSP_MEASURES.sas	IQI_HOSP_CCSR_Code_v2021.sas
IQI_HOSP_OBSERVED.sas	N/A
IQI_HOSP_RISKADJ.sas	IQI_HOSP_Regvars_v2021.sas, IQI_HOSP_Sigvar_Array_v2021.sas, IQI_HOSP_OE_Array_v2021.sas, and auxiliary CSV files
IQI_HOSP_COMPOSITE.sas	IQI_HOSP_Composite_Array_v2021.sas, and IQI_HOSP_Composite_Wt_v2021.sas

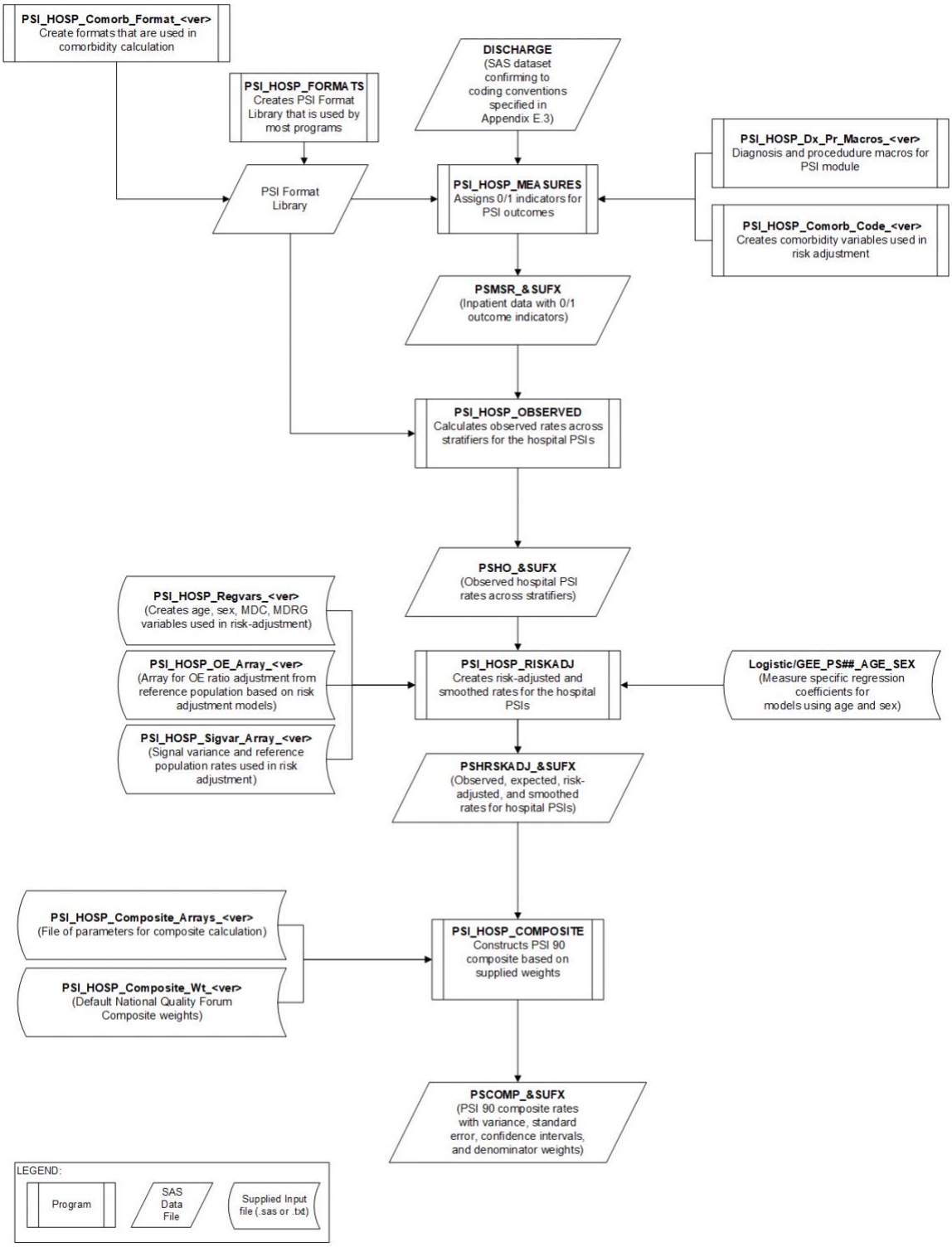
2.3 Patient Safety Indicators (PSIs) Quick Reference

2.3.1 Processing Steps

Figure 6. shows the processing steps for the hospital-level indicators in the PSI software package.

Table 9. lists all PSIs. All but one PSI is calculated using the PSI software package. PSI 17–Birth Trauma Rate–Injury to Neonate is an indicator that can be calculated using either the PSI 17 software package or the PDI module software package. The PSI 17 software package is available as a separate download from the AHRQ QIs website.

Figure 6. Processing Steps for the Hospital-Level Indicators in the PSI Software Package (except PSI 17)



NOTE: Each of the SAS programs in this figure is executed in the PSI_HOSP_CONTROL.sas program, which contains code the user must modify in order to run the PSI software. The modifications include such items as specifying the name and location of the input dataset, the population dataset, the format library, the macro programs,

and the output datasets; setting print options; setting default values; and setting individual flag variables to run each of the main SAS programs. See Appendix C for a complete list of programs in the software package. * PSI 17 can be calculated using the PSI 17 software package (with similar processing steps to the diagram above) or the PDI module software package.

Table 9. PSIs and Variable Abbreviations Used in Software

INDICATOR ABBR	PATIENT SAFETY INDICATOR	SAS VARIABLE ABBREV
HOSPITAL-LEVEL INDICATORS		
PSI 02	Death Rate in Low-Mortality Diagnosis-Related Groups (DRGs)	PS02
PSI 03	Pressure Ulcer Rate	PS03
PSI 04	Death Rate among Surgical Inpatients with Serious Treatable Complications	PS04
PSI 04 Stratum _DVT_PE	Death Rate Among Surgical Inpatients with Serious Treatable Complications Stratum: Deep Vein Thrombosis/Pulmonary Embolism (DVT/PE)	PS04_DVT_PE
PSI 04 Stratum _PNEUMONIA	Death Rate Among Surgical Inpatients with Serious Treatable Complications Stratum: Pneumonia	PS04_PNEUMONIA
PSI 04 Stratum _SEPSIS	Death Rate Among Surgical Inpatients with Serious Treatable Complications Stratum: Sepsis	PS04_SEPSIS
PSI 04 Stratum _SHOCK	Death Rate Among Surgical Inpatients with Serious Treatable Complications Stratum: Shock/Cardiac Arrest	PS04_SHOCK
PSI 04 Stratum _GIHEMORRHAGE	Death Rate Among Surgical Inpatients with Serious Treatable Complications Stratum: Gastrointestinal (GI) Hemorrhage/Acute Ulcer	PS04_GIHEMORRHAGE
PSI 05	Retained Surgical Item or Unretrieved Device Fragment Count	PS05
PSI 06	Iatrogenic Pneumothorax Rate	PS06
PSI 07	Central Venous Catheter-Related Blood Stream Infection Rate	PS07
PSI 08	In-Hospital Fall with Hip Fracture Rate[1]	PS08
PSI 09	Postoperative Hemorrhage or Hematoma Rate[2]	PS09
PSI 10	Postoperative Acute Kidney Injury Requiring Dialysis Rate[3]	PS10
PSI 11	Postoperative Respiratory Failure Rate	PS11
PSI 12	Perioperative Pulmonary Embolism or Deep Vein Thrombosis (PE/DVT) Rate	PS12
PSI 13	Postoperative Sepsis Rate	PS13
PSI 14	Postoperative Wound Dehiscence Rate	PS14
PSI 14 Stratum_OPEN	Postoperative Wound Dehiscence Rate Stratum: Open Approach	PS14_OPEN
PSI 14 Stratum_NONOPEN	Postoperative Wound Dehiscence Rate Stratum: Non-Open Approach	PSI14_NONOPEN
PSI 15	Abdominopelvic Accidental Puncture or Laceration Rate[4]	PS15
PSI 17[5]	Birth Trauma Rate—Injury to Neonate	PS17

INDICATOR ABBR	PATIENT SAFETY INDICATOR	SAS VARIABLE ABBREV
PSI 18	Obstetric Trauma Rate—Vaginal Delivery with Instrument	PS18
PSI 19	Obstetric Trauma Rate—Vaginal Delivery without Instrument	PS19
PSI 90	Patient Safety and Adverse Events Composite[6]	PS90

[1] Previously called "Postoperative Hip Fracture" prior to v6.0.
[2] Previously called "Perioperative Hemorrhage or Hematoma Rate" prior to v2021.
[3] Previously called "Postoperative Physiologic and Metabolic Derangement" prior to v5.0.
[4] Previously called "Unrecognized Abdominopelvic Accidental Puncture or Laceration Rate" prior to v2020.
[5] Calculated in the PSI 17 software package or PSI Module software package.
[6] Previously called "Patient Safety for Selected Indicators" prior to v6.0.

2.3.2. Variable Naming

The SAS programs in the PSI software package use a consistent naming convention for the variables used to store the different indicator results. The first character of the variable name (the prefix) indicates what type of result the variable stores (see Table 10.). The second character is "P" if the indicator is provider or hospital level (all PSIs are hospital-level indicators). The remaining characters are an abbreviation that identifies the indicator by module and number. The first two characters of the abbreviation are "PS" to indicate the result is associated with the PSI module. The last characters in the abbreviation are numbers and letters matching the indicator number and stratum (if applicable) within the module.

Table 10. lists the prefixes used to name the PSI SAS variables. Examples of this naming convention applied to PSI 08 are also provided in the table. Not all variables are reported for all indicators. For example, the smoothed rate and standard error of the smoothed rate are not reported for stratified risk-adjusted hospital-level indicators. In the PSI module, this impacts the following indicators:

- PSI 04_DVT_PE
- PSI 04_PNEUMONIA
- PSI 04_SEPSIS
- PSI 04_SHOCK
- PSI 04_GIHEMORRHAGE
- PSI 14_OPEN
- PSI 14_NONOPEN.

Appendix D provides a complete list of variables calculated for each indicator.

Table 10. Prefixes for the Variables Used to Store PSI Results (except Composite)

PREFIX	TYPE OF RESULT	EXAMPLE HOSPITAL-LEVEL INDICATORS (PSI 08)
T	Inpatient numerator (top)	TPPS08
P	Population denominator (pop)	PPPS08
O	Observed rate	OPPS08

PREFIX	TYPE OF RESULT	EXAMPLE HOSPITAL-LEVEL INDICATORS (PSI 08)
E	Expected rate[1]	EPPS08
R	Risk-adjusted rate[1]	RPPS08
V	Variance of the risk-adjusted rate[1]	VPPS08
L	Lower limit of confidence interval of risk-adjusted rate[1]	LPPS08
U	Upper limit of confidence interval of risk-adjusted rate[1]	UPPS08
SN	Reliability of the risk-adjusted rate[1]	SNPPS08
S	Smoothed rate (not reported for stratified indicators)[1]	SPPS08
X	Standard error of the smoothed rate[1]	XPPS08

[1] Some types of results will not be applicable to certain indicators. See Appendix D for a complete list of variables by indicator.

Hospital-level composite variables do not have prefixes. The variables for the composite indicator PSI 90 are shown in Table 11.

Table 11. Variables Used for Hospital-Level PSI Composite

TYPE OF RESULT	PSI 90
Composite score	COMP1
Variance for the composite score	COMP1VAR
Standard error for the composite score	COMP1SE
Weighted denominator for the composite score	COMP1WHT
Lower confidence interval for the composite score	COMP1LB
Upper confidence interval for the composite score	COMP1UB

2.3.3 Files in Software Package

The PSI SAS programs load data from auxiliary files. These auxiliary files are in ASCII text (.txt), SAS program (.sas), or comma-separated values (CSV) file formats. These files do not need to be converted to SAS format in order to use them with the software. Table 12. lists the SAS programs included in the PSI module and indicates which auxiliary files (if any) are required by those program files. All other auxiliary files are included in the PSI module download package. Appendix C provides a complete list of PSI SAS programs and auxiliary files in the PSI software package.

Table 12. Programs Included in the PSI Software Package

SAS PROGRAM FILE	REQUIRED AUXILIARY MACRO, ASCII, AND CSV FILES
PSI_HOSP_CONTROL.sas	PSI_HOSP_Dx_Pr_Macro_v2021.sas
PSI_HOSP_FORMATS.sas	PSI_HOSP_Comorb_Format_v2021.sas
PSI_HOSP_MEASURES.sas	PSI_HOSP_Comorb_Code_v2021.sas
PSI_HOSP_OBSERVED.SAS .sas	N/A
PSI_HOSP_RISKADJ.SAS.sas	PSI_HOSP_Regvars_v2021.sas, PSI_HOSP_Sigvar_Array_v2021.sas, PSI_HOSP_OE_Array_v2021.sas, and auxiliary CSV files
PSI_HOSP_COMPOSITE.sas	PSI_HOSP_Composite_Arrays_v2021.sas, PSI_HOSP_Composite_Wt_v2021.sas

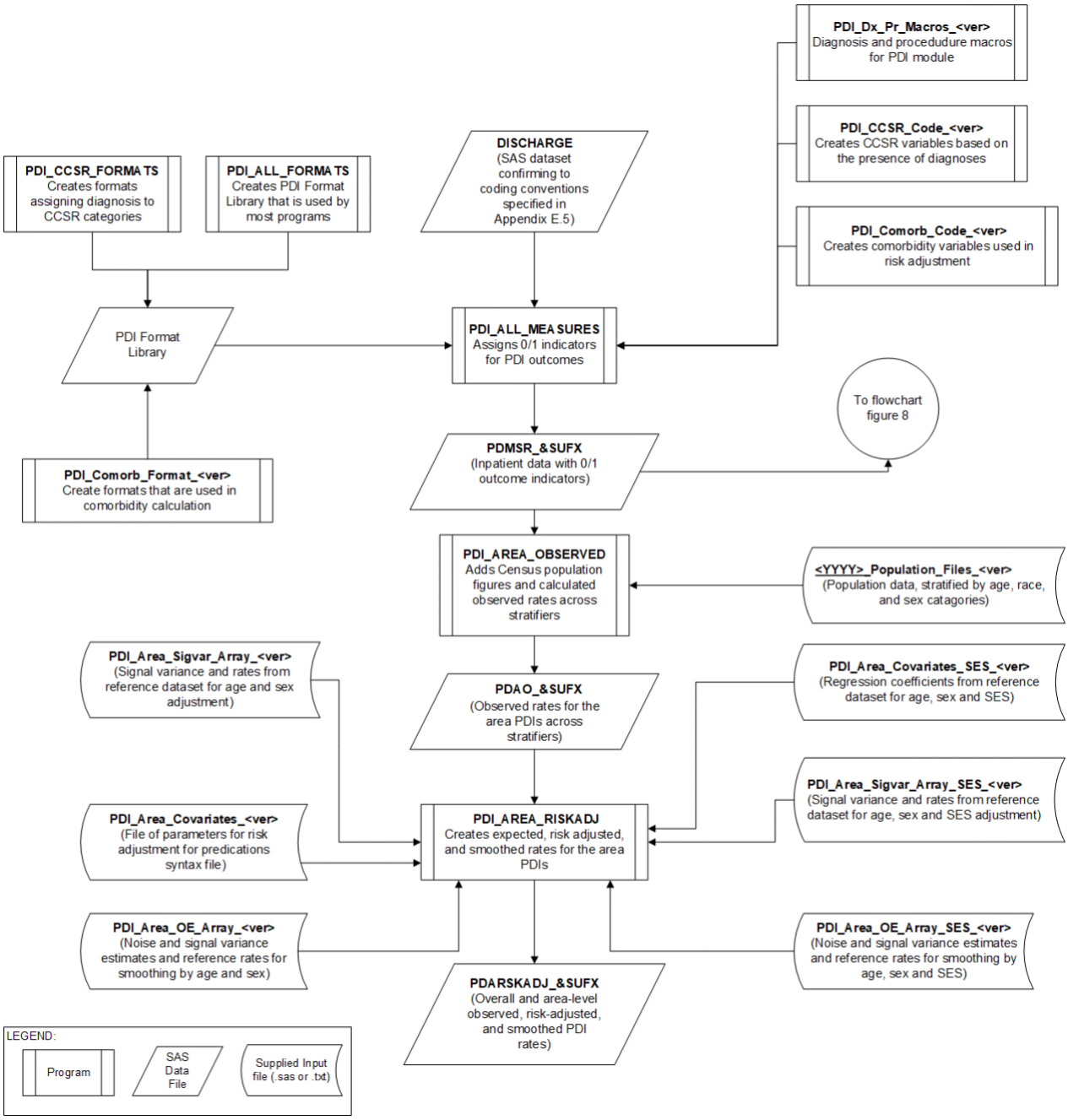
2.4 Pediatric Quality Indicators (PDIs) Quick Reference

2.4.1 Processing Steps

Figure 7. shows the processing steps for the area-level indicators in the PDI module, and Figure 8. shows the processing steps for the hospital-level indicators in the PDI module. Table 13. lists the indicators calculated in the PDI module, arranged by area level or hospital level. The module calculates four area-level indicators and six hospital-level indicators that focus on the pediatric population. In addition, the module calculates one Neonatal Quality Indicator (NQI) focused on neonatal care.

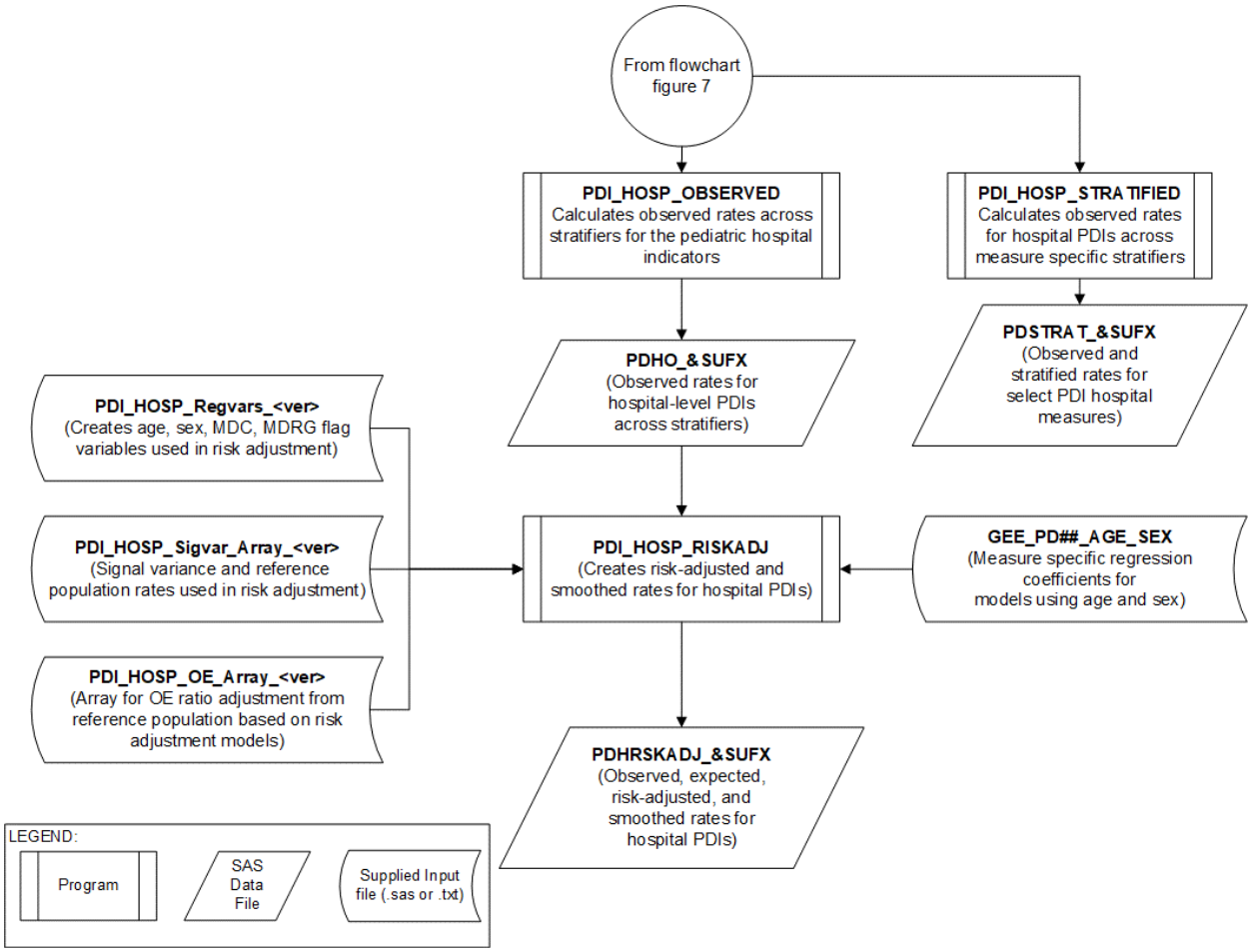
One indicator that is conceptually related to other modules, PSI 17 Birth Trauma Rate–Injury to Neonate, is calculated within the PDI module because it is based on the number of births. In addition, one standalone module was introduced with SAS QI v5.0. The PSI 17 software package calculates this indicator without the need to run the entire PDI software package. This standalone software package is available as a separate download from the AHRQ QI website. The standalone software package includes the same processing steps as the hospital-level PDI module for PSI 17.

Figure 7. Processing Steps for the Area-Level Indicators in the PDI Software Package



NOTE: Each of the SAS programs in this figure is executed in the PDI_ALL_CONTROL.sas program, which contains code the user must modify in order to run the PDI software. The modifications include such items as specifying the name and location of the input dataset, the population dataset, the format library, the macro programs, and the output datasets; setting print options; setting default values; and setting individual flag variables to run each of the main SAS programs. See Appendix C for a complete list of programs in the software package.

Figure 8. Processing Steps for the Hospital-Level Indicators in the PDI Software Package



NOTE: Each of the SAS programs in this figure is executed in the PDI_ALL_CONTROL.sas program, which contains code the user must modify in order to run the PDI software. The modifications include such items as specifying the name and location of the input dataset, the population dataset, the format library, the macro programs, and the output datasets; setting print options; setting default values; and setting the individual flag variables to run each of the main SAS programs. See Appendix C for a complete list of programs in the software package.

Table 13. PDIs and Variable Abbreviations Used in PDI Software

INDICATOR ABBREV	INDICATOR	SAS VARIABLE ABBREV
AREA-LEVEL INDICATORS		
PDI 14	Asthma Admission Rate	PD14
PDI 15	Diabetes Short-Term Complications Admission Rate	PD15
PDI 16	Gastroenteritis Admission Rate	PD16
PDI 18	Urinary Tract Infection Admission Rate	PD18
PDI 90	Pediatric Quality Overall Composite	PD90
PDI 91	Pediatric Quality Acute Composite	PD91
PDI 92	Pediatric Quality Chronic Composite	PD92
HOSPITAL-LEVEL INDICATORS		

INDICATOR ABBREV	INDICATOR	SAS VARIABLE ABBREV
NQI 03	Neonatal Blood Stream Infection Rate	NQ03
PDI 01	Accidental Puncture or Laceration Rate	PD01
PDI 05	Iatrogenic Pneumothorax Rate	PD05
PDI 08	Postoperative Hemorrhage or Hematoma Rate[1]	PD08
PDI 09	Postoperative Respiratory Failure Rate	PD09
PDI 10	Postoperative Sepsis Rate	PD10
PDI 12	Central Venous Catheter-Related Blood Stream Infection Rate	PD12

[1]Previously called "Perioperative Hemorrhage or Hematoma Rate" prior to v2021.

2.4.2 Variable Naming

The SAS programs in the PDI module use a consistent naming convention for the variables used to store the different indicator results. The first character of the variable name (the prefix) indicates what type of result the variable stores (see Table 14.). The second character is either "A" if the indicator is area level or "P" if the indicator is provider or hospital level. The remaining characters are an abbreviation that identifies the indicator by module and number. The abbreviation is based on the conceptual module to which the indicator belongs: "PD" for the indicators labeled as PDI, "NQ" for the indicators labeled as NQI, "PQ" for the indicator labeled as a PQI, and "PS" for the indicator labeled as PSI. The last characters in the abbreviation are numbers matching the indicator number.

Table 14. lists the prefixes used to name the PDI SAS variables. Examples of this naming convention applied to PDI 10 and PDI 14 are provided in the table. Appendix D: Complete List of Key Variables Created in the AHRQ SAS QI® Software provides a complete list of variables calculated for each indicator.

Table 14. Prefixes for the Variables Used to Store PDI Results

PREFIX	TYPE OF RESULT	EXAMPLES	
		AREA-LEVEL INDICATOR (PDI 14)	HOSPITAL-LEVEL INDICATOR (PDI 10)
T	Inpatient numerator (top)	TAPD14	TPPD10
P	Population denominator (pop)	PAPD14	PPPD10
G	Strata (group) flag (applies only to PDI 01, PDI 08, PDI 10, and PDI 12)	--	GPPD10
O	Observed rate	OAPD14	OPPD10
E	Expected rate	EAPD14	EPPD10
R	Risk-adjusted rate	RAPD14	RPPD10
V	Variance of the risk-adjusted rate	VAPD14	VPPD10
L	Lower limit of confidence interval for risk-adjusted rate	LAPD14	LPPD10
U	Upper limit of confidence interval for risk-adjusted rate	UAPD14	UPPD10
SN	Reliability of the risk-adjusted rate	SNAPD14	SNPPD10

PREFIX	TYPE OF RESULT	EXAMPLES	
		AREA-LEVEL INDICATOR (PDI 14)	HOSPITAL-LEVEL INDICATOR (PDI 10)
S	Smoothed rate	SAPD14	SPPD10
X	Standard error of the smoothed rate	XAPD14	XPPD10

NOTE: Dashes (--) indicate the variable is not created in the software. See Appendix D for a complete list of variables by indicator.

2.4.3 Files in Software Package

Table 15. lists the SAS programs included in the PDI software and indicates which auxiliary files (if any) are required by those program files. The PDI SAS programs load data from auxiliary files. These auxiliary files are in ASCII text (.txt), SAS program (.sas), or comma-separated values (CSV) file formats. The text or CSV files do not need to be converted to SAS format in order to use them with the software. The 2000–2020 Population File, 2000-2020_Population_Files_V2021.txt, is available on the AHRQ QIs website as a separate download. All of the other auxiliary files are included in the PDI software download package. Appendix C provides a complete list of PDI SAS programs and auxiliary files in the PDI software package.

Table 15. Programs Included in the PDI Software Package

SAS PROGRAM FILE NAME	REQUIRED AUXILIARY MACRO, ASCII, AND CSV FILES
PDI_ALL_CONTROL.sas	PDI_Dx_Pr_Macros_v2021.sas
PDI_ALL_FORMATS.sas	PDI_CCSR_Format_v2021.sas, PDI_Comorb_Format_v2021.sas
PDI_ALL_MEASURES.sas	PDI_CCSR_Code_v2021.sas, PDI_Comorb_Code_v2021.sas
PDI_AREA_OBSERVED.sas	2000-2020_Population_Files_v2021.txt
PDI_AREA_RISKADJ.sas	2000-2020_Population_Files_v2021.txt, either PDI_Area_Covariates_v2021.txt or PDI_Area_Covariates_SES_v2021.txt, either PDI_Area_Sigvar_Array_v2021.sas or PDI_Area_Sigvar_Array_SES_v2021.sas, and either PDI_Area_OE_Array_v2021.sas or PDI_Area_OE_Array_SES_v2021.sas
PDI_HOSP_OBSERVED.sas	N/A
PDI_HOSP_STRATIFIED.sas (applies only to PDI 01, PDI 08, PDI 10 and PDI 12)	N/A
PDI_HOSP_RISKADJ.sas	PDI_HOSP_Regvars_v2021.sas, PDI_HOSP_Sigvar_Array_v2021.sas, PDI_HOSP_OE_Array_v2021.sas, and auxiliary CSV files

Chapter 3. Data Elements and Coding Conventions

Appendix F: contains a detailed description of the input data elements and coding conventions used by the SAS QI® software v2021.

3.1 Software Input Data

- This software was written to process data from discharge data abstracts that contain information about hospital stays.
- The input data file for the QI software must be a SAS dataset.
- It is strongly recommended that users re-code data elements in their input file to be consistent with the coding expected by the software. This step will minimize the number of changes that will be necessary in the SAS programs. For example, re-coding the SEX data element in the input file to be consistent with the coding described in Appendix F (e.g., "1" for male and "2" for female) is easier than modifying all uses of the SEX data element in the SAS programs.
- To minimize changes to the SAS programs, all required data elements should be present in the input data file (Appendix F). If a required data element is not available, users must be cautious about creating a placeholder data element (i.e., a variable with the same name and format as the required data element but with missing values). In some instances, however, creating a placeholder data element with missing values can result in errors (e.g., MDC). The comments column of Appendix F highlights the critical data elements and the impact of calculation results should a placeholder data element be created.
- If a specific data element is not used by the program, it is not necessary to create a placeholder variable in the input data file. For example, the data element All Patient Refined Diagnosis-Related Group (APR-DRG) is used only by the IQI software package, so it is not necessary to have this data element in the input data file or create a placeholder variable for the Prevention Quality Indicators (PQI), Patient Safety Indicators (PSI), and Pediatric Quality Indicators (PDI) modules to run correctly.
- Not every value for every data element described in Appendix F is referenced by SAS programs. For example, only two of the discharge disposition (DISP) data element values are used in the software (DISP value "2" for short-term hospital and value "20" for died in the hospital). The complete set of values is included in Appendix F.
- Depending on user preferences, not all discharge data records need to be included in a dataset for analysis. For example, a user may decide to drop discharge records for hospice or swing bed patients. Discharge records for hospice patients can be dropped from the input data file using either the Type of Bill or Point of Origin (PointOfOriginUB04) data elements. Please note, however, that all records from community, non-rehabilitation, acute care, and non-long--term acute care hospitals are included in the analysis to develop parameter estimates for risk adjustment models and the calculation of nationwide rates.

3.2 Coding of Diagnoses, Procedures, Present on Admission, and External Cause of Injury

3.2.1 Diagnoses and Procedures

Diagnoses and procedures must be coded using the International Classification of Diseases, 10th Revision, Clinical Modification/Procedure Coding System (ICD-10-CM/PCS) (beginning October 1, 2015).

Significant modifications were made to ICD-9-CM codes in the early 1990s, and the Centers for Medicare & Medicaid Services (CMS) Diagnosis-Related Group (DRG) grouper was changed to the Medicare Severity Diagnosis-Related Groups (MS-DRGs) grouper in 2007. AHRQ QI ICD-9-CM definitions only reflect ICD-9-CM codes valid on and after October 1, 1994 and through September 30, 2015, and any DRG based on MS-DRGs version 25 to version 32. The software may not accurately analyze data collected before October 1, 2007. AHRQ QI ICD-10-CM/PCS definitions reflect ICD-10-CM/PCS codes valid on or after October 1, 2015, and any DRG based on MS-DRG version 33 or later. AHRQ expects significant modifications to ICD-10-CM/PCS codes in the coming years. The technical specifications and software will be continually refined and updated as new ICD-10-CM/PCS codes become available.

3.2.1.1 ICD-10-CM/PCS Diagnosis and Procedure Codes

In practice, ICD-10-CM diagnoses are represented by three- to seven-character codes with explicit decimals. In SAS QI software, ICD-10-CM diagnoses are represented with implicit decimals (no decimals present). Examples are given in Table 16**Error! Reference source not found.**.

Table 16. Examples of ICD-10-CM Diagnosis Codes

CONDITION	ICD-10-CM DIAGNOSIS CODE	ALPHANUMERIC CODE (WITH IMPLICIT DECIMAL)
Reactive arthropathy, unspecified	M02.9	M029
Other reactive arthropathies, multiple sites	M02.89	M0289
Other reactive arthropathies, unspecified ankle and foot	M02.879	M02879

Alphanumeric diagnosis codes must be left-justified so that two spaces follow a five-character diagnosis code and one space follows a six-character diagnosis code (e.g., M02.879 and M02879). Trailing blanks should **never** be zero-padded (filled with zeroes so that all seven characters are filled for codes that should be three or four characters long). For example, A191 should not be changed to A191000.

In practice, ICD-10-PCS procedures are represented as seven-character codes. All seven characters must be specified for the code to be valid. Each character in the seven-character code represents an aspect of the procedure. If a device or qualifier is not used in the procedure, the character location is populated by the letter "Z" in order to ensure that all PCS codes are seven characters. ICD-10-PCS procedure codes do not contain implicit or explicit decimals. Letters "O" and "I" are not used to avoid confusion with numbers "0" and "1." Leading zeroes must be preserved as they are significant. Examples are given in Table 17.

Table 17. Examples of ICD-10-PCS Procedure Codes

PROCEDURE	ICD-10-PCS PROCEDURE CODE	ALPHANUMERIC CODE (WITH IMPLICIT DECIMAL)
Division of Brain, Open Approach	00800ZZ	00800ZZ
Repair Right Thumb Phalanx, Open Approach	0PQR0ZZ	0PQR0ZZ

SAS QI v2021 software packages account for ICD-10-CM/PCS coding effective October 1, 2015; October 1, 2016; October 1, 2017; October 1, 2018; October 1, 2019; and October 1, 2020.

3.2.2 Diagnoses Present on Admission

The present on admission (POA) modifier in hospital administrative data distinguishes medical conditions that are present when patients enter the hospital (i.e., comorbidities or preexisting conditions) from those that first occur during the hospital stay (complications or in-hospital adverse events). Beginning with FY 2008 (October 1, 2007), the UB-04 data specification manual includes a POA indicator (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Coding.html).

POA indicators can be reported with principal and secondary diagnoses, in addition to external cause-of-injury codes. Some diagnoses are exempt from POA reporting. The coding guidelines for POA are available online in Appendix I of the ICD-10-CM Official Guidelines for Coding and Reporting (https://www.cms.gov/files/document/2021-coding-guidelines-updated-12162020.pdf.

The reporting of POA indicators may vary by hospital. For example, CMS considers certain types of hospitals exempt from POA reporting. Some examples include critical access hospitals, children's hospitals, and cancer hospitals. Although these hospitals may be exempt from reporting POA data to CMS, State-specific mandates may require POA reporting. Users should be knowledgeable of the POA reporting requirements and practices of hospitals represented in the input data file. AHRQ has analyzed the completeness of POA coding in ICD-10-CM coded hospital billing data. Reports can be found at https://www.hcup-us.ahrq.gov/reports/methods/methods_topic.jsp.

Version 2021[11] of the PSI and PDI software packages requires the input file to include POA information. The IQI software also requires APR-DRG data elements that take into consideration POA information (see Appendix E for a complete list of variables).[12]

3.2.2.1 When the Input Data File to the SAS QI v2021 Includes POA Information

The ICD-10-CM/PCS Official Guidelines for Coding and Reporting identify some diagnoses that are exempt from POA reporting for one of the following reasons: (1) they represent circumstances regarding the healthcare encounter, (2) they indicate factors influencing health status that do not represent a current disease or injury, or (3) they are always present on admission. Some examples of exempt diagnosis codes include old myocardial infarction, normal delivery, congenital anomalies, "Z" diagnosis codes indicating a history of disease, and external cause-of-injury codes specific to accidents. For the diagnoses that are

[11] In version 4 of the SAS QI software, a Prediction Module (PM) estimated the prevalence of conditions when POA data were missing. Beginning with SAS QI v6.0, the PM is not included and the handling of POA information has been revised.

[12] In the IQI module of v2021 SAS QI software, the APR-DRGs in the risk adjustment models are based on the patient's admission diagnosis and consider POA information.

exempt from POA reporting, the SAS QI v2021 software packages assume that the diagnosis is present on admission and did not occur during the hospital stay.

For diagnoses for which the ICD-10-CM Official Guidelines for Coding and Reporting require POA reporting, the SAS QI v2021 software packages use the following two POA values to indicate that the diagnosis was present on admission: "Y" for present at the time of inpatient admission, and "W" for hospital is unable to clinically determine whether condition was present on admission. A blank or any value other than "Y" or "W" for POA (DXPOAnn) will indicate that the diagnosis was not present on admission.

- Diagnoses exempt from POA reporting are assumed to be present on admission.
- Nonexempt diagnoses are identified as present on admission by one of the following POA values: "Y" for present at the time of inpatient admission and "W" for hospital unable to clinically determine whether condition was present on admission.
- Nonexempt diagnoses are identified as not POA by "N," "U," "E," "1," or "X". Blank values are considered as not present on admission.

3.2.2.2 When the Input Data File to the SAS QI v2021 Does Not Include POA Information

For the diagnoses that are exempt from POA reporting, the SAS QI v2021 software packages assume that the diagnosis is present on admission and did not occur during the hospital stay. When no POA information is present, the SAS QI v2021 assumes the diagnosis was not present on admission for all nonexempt diagnoses. This assumption means that patient safety events identified by some of the PSIs and PDIs will be attributed to the hospital stay when, in fact, they were present on admission, but that information was unavailable.

- Diagnoses exempt from POA reporting are assumed to be POA.
- Nonexempt diagnoses are identified as not POA because the input file does not have the necessary information for someone to know otherwise.

3.3 Coding of MS-DRG, MDC, and APR-DRG

3.3.1 MS-DRGs and MDC

MS-DRGs and MDC are derived from the CMS MS-DRG grouper algorithm, which assigns the MDC based on the principal diagnosis. Different versions of the MS-DRG grouper produce slightly different results with respect to certain high resource intensity MS-DRGs. Specifically, MS-DRGs 001–019 and 981–989 are classified as "preMDC" MS-DRGs, which means that they are associated with such high length of stay and/or cost that they supersede the usual assignment of MS-DRGs within body system or MDC categories. For records assigned to these MS-DRGs, some versions of the grouper software retain the MDC that would be assigned based on the principal diagnosis and procedure codes, whereas other versions of the grouper software overwrite the MDC assignment with a blank, missing, or nonnumeric value such as "PRE."

The grouper algorithm does not take into account pre-MDC classification. For those users who need to construct MDC, please view the documentation and software available here: https://www.cms.gov/files/zip/definition-medicare-code-edits-v381.zip. The software expects that these values in the input file will be consistent with the grouper software (i.e., MDC is based on principal diagnosis) and that the user will be using the MS-DRG effective on the discharge date. The software

accepts data elements of MS-DRG and MDC, accounting for the presence of POA data. Data should be coded accordingly. The software may be modified at the user's option to use other types of DRGs. However, the impact of using other types of DRGs should be evaluated carefully before making such a change. SAS QI v2021 accounts for MS-DRG coding effective through September 30, 2021.

3.3.2 APR-DRG Variables

Users must either use their own grouper software or download and run the Admission APR-DRG grouper[13] on their patient discharge data before running the IQI software package. The APR-DRG grouper is available on the IQI module SAS QI® software download page (see Appendix A). The APR-DRG grouper software provided on the download page is a 64-bit Windows® application. The APR-DRG grouper software requires the Microsoft Visual C++ Redistributable 2017 (or later) runtime library to be installed on the computer and can be download here: https://aka.ms/vs/16/release/vc_redist.x64.exe. If the C++ runtime library is not already installed, the user must run the executable file downloaded from the above location to install the required support files for the software. The file name of the downloaded executable is "vcredist_x64.EXE" (64-bit). Most default Windows installations will already have this application installed and the vcredist_64.EXE file does not need to be run. If users are running a 64-bit version of Windows, they can download and install the corresponding 64-bit components (i.e., APR-DRG grouper, and Visual C++ runtime library).

- The APR-DRG grouper software creates APR-DRG categories and associated risk of mortality data elements. These APR-DRG data elements are used to enhance the risk adjustment of selected IQI hospital indicators.
- APR-DRG grouper software must be downloaded and run separately.
- Download the version of the APR-DRG grouper software in the package.
- Users who wish to use APR-DRG results to risk-adjust the hospital IQI rates should run the APR-DRG grouper software on their patient discharge data before running the IQI SAS programs. The SAS program called APR_DRG_Limited_License_ICD10.sas has been provided for this purpose.
- The APR-DRG software requires the use of POA information.[14]

3.4 Coding of Other Specific Data Elements

3.4.1 ATYPE—Admission Type

Seven of the indicators (PSI 04, PSI 10, PSI 11, PSI 13, PDI 08, PDI 09, and PDI 10) use admission type (ATYPE) to identify elective surgeries. If admission type is not available in the user's data, the user may want to evaluate other data elements in the file to create a proxy to identify elective admission types (e.g., scheduled admission, ASCHED). If users do not have an alternative way to identify elective surgeries, cases will be omitted from the calculation of the rates for the relevant indicators.

Ten of the indicators (NQI 03, PDI 01, PDI 05, PDI 08–PDI 10, PDI 12, PDI 16, PDI 18, and PSI 17) use ATYPE as one way to identify newborns. If ATYPE is not available in the user's data, the software will rely on ICD-10-CM diagnosis codes to identify neonates and newborns.

[13] APR-DRG codes are used in risk adjustment calculations for certain IQI indicators.
[14] In the IQI module of the v2021 SAS QI software, the APR-DRGs in the risk adjustment models are based on the patient's admission diagnosis and considers POA information.

3.4.2 PSTCO—Patient State/County Code

The data element Patient State/County Code (PSTCO) is used to define the geographic area for the area-based QIs. It is named with a starting "P" to emphasize the importance of calculating the area-level indicators by the location of the patient's residence. If the user wants to calculate the area-level indicators that are based on the population of the metropolitan area or county associated with the patient's residence, the values for this variable should be the FIPS state/county code associated with each individual patient's place of residence. The default installation of SAS includes a ZIP Code table that can identify the State and county FIPS codes for patient ZIP Codes. It is available in the sashelp library (link below). If using this file, verify that the file is up to date and review county results to understand how ZIP Codes crossing county boundaries are assigned. Each ZIP Code is assigned to one county even when crossing county lines. The most recent file is available from SAS support: http://support.sas.com/rnd/datavisualization/mapsonline/html/misc.html.

- The software will generate area-level rates for each county included in the PSTCO data field.
- It is possible that some records in the input data file may be missing the patient FIPS code. Users should be aware that any records with missing values for PSTCO are excluded from the calculations of observed, risk-adjusted, and smoothed area-level rates. However, these records will be included in the numerator flags in the output analytic file from the *XXI_TYPE*_MEASURES program and included in overall nationwide rates.
- Users no longer need to use the modified FIPS codes assignment for area denominators. However, that option is still available. In the modified FIPS codes, certain independent cities (e.g., Baltimore City, Carson City, and St. Louis City) and areas within Hawaii and Virginia are assigned to different area groupings in the modified FIPS categories.

If the patient's information is not available or the user wants to calculate the area-level indicators using the population associated with the hospital location as the denominator, the values for this variable should be the individual hospitals' FIPS State/county codes.

- Using the patients' FIPS State/county codes for analysis more accurately reflects the true population at risk. Using a hospital's FIPS State/county code for analysis should be done with caution and by including patients from larger geographic areas to minimize bias due to patients who come from a county that is different from the hospital's location.
- If the hospital's FIPS code is used in PSTCO, users should be aware that rates may be particularly biased for hospitals that serve as regional referral centers. These hospitals are likely to treat patients from outside the metropolitan area, county, or even the State in which the facility is located. If all of the hospital's patients are assigned its PSTCO the rate will include patients traveling from other areas to receive care, but exclude patients using other hospitals. Conversely, rates for residents with the hospital's PSTCO will include those who travel to other hospitals and exclude those traveling to the hospital to receive care.
- If using the hospital's FIPS State/county code for analysis, users are encouraged to limit cases in their input file to patients discharged from a specific geographic area of interest. For example, if a user is using data from the State of Massachusetts and is interested in generating a rate for Massachusetts, the user should remove the cases where the patient's county of residence (FIPS code) is from another State. Otherwise, the total or overall rate will include the population at risk

from the counties outside of Massachusetts. At the same time, unless data from neighboring states is available, rates will exclude patients from Massachusetts treated outside the state.

The software provides the user with the option of producing output by metropolitan area or by county. When metropolitan area is selected, urban areas are always defined by metropolitan areas. When county is selected, urban areas will be defined by county. Rural areas are always defined by county.

- In the SAS programs (*XXI_TYPE* _MEASURES.sas), the MALEVL parameter is set as follows:

  0=County level with U.S. Census FIPS

  1=County level with modified FIPS

  2=Metro area with Office of Management and Budget (OMB) 1999 definition

  3=Metro area with OMB 2003 definition

The metropolitan area definitions are from three different sources:

1. The "modified FIPS" definition is from the Area Health Resource File. The mapping is from county to modified FIPS county (e.g., Baltimore City to Baltimore County).
2. The "1999 OMB" definition is from OMB Circular 99-04 (last revised May 6, 2002). The mapping is from county to Metropolitan Statistical Area (MSA) except in New England, where counties are assigned to New England County Metropolitan Area (NECMA). OMB defines NECMA as a county-based alternative to the city- and town-based New England MSA and Consolidated MSA (CMSA). For example, Hampden and Hampshire Counties in western Massachusetts are assigned to the Springfield, MA, NECMA, even though the town of Holland in Hampden County is part of the Boston MSA.
3. The "2003 OMB" definition is from OMB Circular 03-04 (last revised December 4, 2005). The mapping is from county to either MSA or Micropolitan Statistical Area.

3.5 Treatment of Missing Data

Data can be missing in one of two ways: either the entire data element is missing or the value of the data is missing. As noted above, the software is designed to be run with all data elements present. In some instances, placeholder data elements can be created with no impact on the results (however, the types of reports that can be created will be impacted). In other instances, placeholder data elements will result in errors in the calculation of estimates. Appendix F highlights the critical data elements and the impact on the calculation of results should a placeholder data element be created.

The software is designed to handle missing values in a particular manner; specifically, the software requires confirmation for the assignment of a poor outcome or negative event. For example, in order to be assigned as a death, each case must be coded as a death. Missing data are considered neutral. Missing data for some data elements result in the exclusion of that case from the denominator. For other data elements, the case is retained. Appendix F describes the handling of missing data for the required data elements for each software package.

The SAS QI programs do not distinguish among different types of missing values.

Data files of hospital discharge abstract data may have numeric data elements coded using special SAS missing "dot" values. For example, in addition to the standard SAS value of "." for missing data, there

may also be values of ".A" for invalid data or ".C" for inconsistent data. For numeric variables, the SAS QI software does not distinguish among the different types of missing codes and will consider them all equivalent to a single value of missing data (.). SAS will treat empty sets (".") and blanks (" ") as missing character variables.

3.6 Use of Weights from Complex Surveys

The AHRQ QI software is intended to be used with data that cover an entire patient population (e.g., all discharges from a hospital in a year) or that were sampled from a patient population using simple random sampling. Beginning with Version 4.1, the SAS QI software does not support weighted QI estimates or standard errors for weighted estimates.[15] Thus, analyses using data obtained from a complex sampling design will not produce accurate estimates for the population from which the data were sampled. For a more thorough description of weighted AHRQ QI analyses, see *Guidance on Using the AHRQ QI for Hospital-Level Comparative Reporting*, available on the AHRQ QI website (https://www.qualityindicators.ahrq.gov/Downloads/News/AHRQ_QI_Guide_to_Comparative_Reporting_v10.pdf).

[15] In SAS QI v2021, no reference or weighting variable is used (e.g., the discharge-level weight variable DISCWT). This change ensures that the SAS programs do not account for complex sampling design when calculating QI estimates and standard errors. The SAS QI software versions prior to v4.1 supported weighted analyses with appropriate standard errors using discharge-level weights supplied by the user. In versions 4.1–4.5, which included the PM (Prediction Module) that handles missing POA data, the SAS QI software retained the weighting procedures in the SAS programs but did not account for complex sampling design and weighting in estimates and standard errors without further manipulation of the SAS programs by users.

Chapter 4. Producing Quality Indicator Rates: Processing Steps

The six steps below describe the AHRQ Quality Indicator™ (QI) calculations. The next section of this document provides specific information about each component of the SAS QI® software.

An outcome of interest is the number of cases with the indicator outcome, such as mortality or a procedure. Depending on the indicator, the AHRQ QIs are expressed as a count or rate.

For indicators that are expressed as a rate, the calculation of the observed rate is shown below:

$$\frac{Outcome\ of\ interest}{Population\ at\ risk}$$

{or}

$$\frac{Numerator}{Denominator}$$

A multiplier can be applied to the observed rate. In common practice, observed rates are multiplied by 100,000 to produce the rates per 100,000 for the population at risk or by 1,000 to produce rates per 1,000 discharges. The SAS QI software does not apply multipliers to the observed rates. However, the user is encouraged to transform the rates obtained from the software to a more meaningful unit of measurement.

The QI software produces observed rates, risk-adjusted rates, and smoothed rates, depending on the indicator. In addition, hospital-level composite scores of patient safety can also be produced. The methodology to calculate those rates and scores is described in detail in the *AHRQ QI Empirical Methods* document: https://www.qualityindicators.ahrq.gov/Downloads/Resources/Publications/2021/Empirical_Methods_2021.pdf.

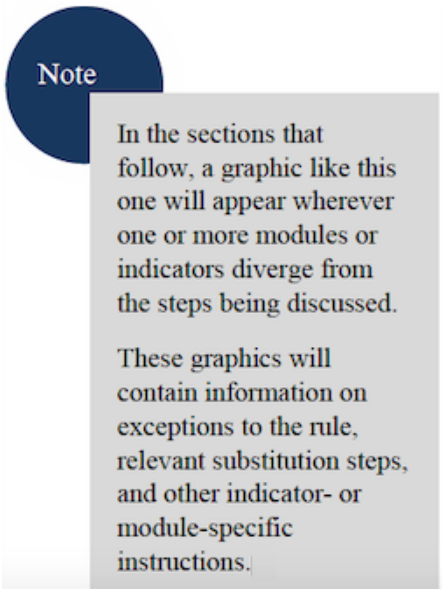
The following instructions describe the steps for identifying and calculating QI rates, including how the software performs each step.

4.1 Step 1. Identify Outcomes in Inpatient Records

Inpatient records are marked to indicate whether they contain the outcome of interest (numerator or "T" for "top") for each of the AHRQ QI indicators.

Records are marked by setting a series of flag variables, each of which corresponds to the numerator for a particular indicator. For example, if the inpatient record meets the conditions for inclusion in the outcome for Inpatient Quality Indicator (IQI) 08, then the outcome variable for IQI 08 (TPIQ08) is set to "1" by the SAS QI software.

This step requires one pass through the discharge-level data and outputs a discharge-level SAS analytic dataset containing the



flag indicator variables for the outcomes for each indicator in its respective module. This dataset also contains the original input variables except for the diagnosis and procedure variables, which have been removed to reduce the size of the file.

4.2 Step 2. Identify Populations at Risk

For the area-level indicators, the populations at risk (the denominators for calculating the indicator rates) are derived from U.S. Census population figures. If *metropolitan area* is selected, urban areas are always defined by metropolitan area. When *county* is selected, urban areas are defined by county. Rural areas are always defined by county.

For hospital-level indicators, the populations at risk (the denominators for calculating the indicator rates, or "pop") are derived from the hospital discharge records.

4.3 Step 3. Calculating Quality Indicator Observed Rates

4.3.1 Calculate Quality Indicator Observed Rates (All Software Packages)

Using the output SAS analytic file from Step 1 and either U.S. Census population or hospital discharge data from Step 2, in Step 3, the quality indicator rates are calculated for user-specified combinations of stratifiers (see Appendix J). These stratifiers include areas (counties), age groups, race/ethnicity categories, and sex for the area-level indicators; and hospitals, age groups, age day groups, race/ethnicity, sex, payer, and birthweight categories for the hospital-level indicators. This step outputs the observed rates for user-specified categories, alone or in combination. For example, observed rates for hospital-level indicators could be output at the hospital level, at the payer level, or at the hospital level by payer.

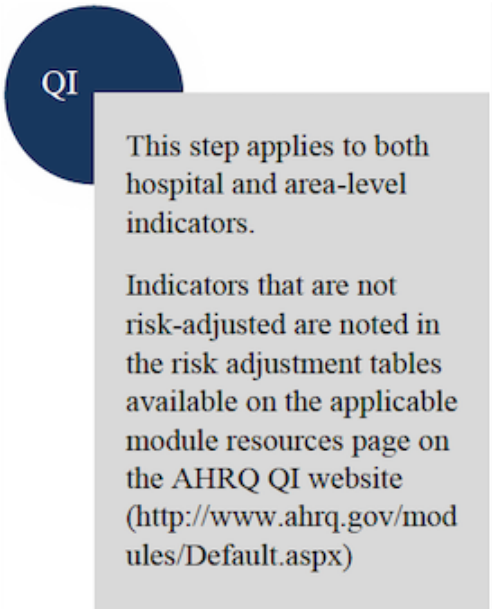
- The software calculates observed rates regardless of the number of cases available. However, rates that are based on only a few cases should be interpreted with caution.

In some performance measurement work, it is recommended that rates be suppressed when fewer than 30 cases are in the denominator. Suppressing these rates when reporting outcomes serves two purposes: it eliminates unstable estimates based on too few cases, and it helps to protect the identities of hospitals and patients.

4.3.2 Calculate Stratified Observed Rates (PDI Software Package Only)

For select hospital Pediatric Quality Indicators (PDIs), observed rates are stratified by measure-specific risk categories. The stratification categories are assigned to all discharges in the population at risk based on coexisting conditions or the surgical procedures performed. The categories vary by measure but assign discharges to clinically relevant low-risk to high-risk groups. The results for PDI 01 Accidental Puncture or Laceration Rate; PDI 08 Postoperative Hemorrhage or Hematoma Rate; PDI 10 Postoperative Sepsis Rate; and PDI 12 Central Venous Catheter-Related Blood Stream Infection Rate are stratified using their respective grouping.

4.4 Step 4. Calculate Quality Indicator Risk-Adjusted Rates



Regression coefficients from a reference (general or standard) population database (reflecting a large proportion of the U.S. population) are applied in the risk adjustment process. These reference population file regression coefficients are provided as part of the SAS QI v2021 software. The code to generate these reference (general or standard) population risk adjustment coefficients is not part of the SAS QI v2021 software released to the public.

The risk-adjusted rates for the area-level indicators will reflect the age and sex distribution in the reference (general or standard) population rather than the distribution for the areas in the user's data. Similarly, the risk-adjusted rates for the hospital-level indicators will reflect the age, sex, condition/severity, and comorbidity distribution in the reference (general or standard) population rather than the distribution for the hospitals in the user's data. This approach will allow risk-adjusted rates produced by various users to be compared directly with each other.

- The software calculates risk-adjusted rates regardless of the number of cases available. However, rates that are based on only a few cases should be interpreted with caution.
- If specified by the user, the IQI, PSI, and PDI software calculates risk-adjusted rates for payer and race strata. Starting in SAS QI v2021, expected rates, risk-adjusted rates, smoothed rates, and composites will be suppressed in certain situations. Because age, gender, age in days, and birthweight are used in risk adjustment models, it is inappropriate to produce risk-adjusted rates for any stratum that includes these variables.

4.5 Step 5. Calculate Smoothed Rates

Shrinkage factors are applied to the risk-adjusted rate for each indicator in a process called multivariate signal extraction. These shrinkage factors were calculated from the reference (general or standard) population. The shrinkage factors are provided as part of the SAS QI v2021 software and do not need to be calculated by users. The code to generate these shrinkage estimates is not part of the SAS QI v2021 software released to the public.

For each indicator, the shrinkage estimate reflects an adjustment unique to that indicator. The less consistent estimates of the indicator (i.e., less reliable or stable) are over time and across areas or hospitals, the more the estimate "shrinks" the indicator toward the overall mean. The resulting rate will appear "smoother" than the observed rate, meaning that the year-to-year fluctuations in performance are likely to be reduced. Smoothed rates are not calculated for the strata composing the overall indicator.[16]

Starting in SAS QI v2021, for hospital level indicators, smoothed rates and variances will be suppressed if user specified, in the CONTROL program, that their data contains COVID cases (COVID_19 is 2 or 3) or that the data does not provide MDC (MDC_PROVIDED is 0) or that the data doesn't provide PRDAY

[16]AHRQ does not recommend that stratified indicators be used to compare hospitals. Due to the small sample size, the stratified indicators are not reliable as independent indicators to support comparisons. However, stratified indicators provide insight into the overall indicators and can be used for quality assessment within hospitals.

(PRDAY is 0) information or user specified stratifications that are not provider or national-level. See Table 19 for more information.

4.6 Step 6. Calculate Hospital-Level Composite Scores

Composite scores are calculated for select hospital measures in the IQI, PSI, and PDI modules; these scores summarize outcomes across multiple measures.[17] Composite scores are calculated by representing the risk-adjusted outcomes for the composite component measures as a ratio to the component reference population rate and adjusted for the reliability of the outcome using variance in the local and reference rates. The composite score is the weighted average of the risk-adjusted ratio and component weights, where the weights are selected based on the intended use of the composite measure. The weights are embedded in the SAS QI v2021 software based on calculations performed as part of software development. The composite calculation also includes the composite standard error, upper and lower confidence intervals, and weighted denominator.

Composite outcomes will still be reported even if the component observed rates contain no discharges in the numerator and the denominator contains three or more cases. When a component rate is "0" and the denominator contains three or more cases, the component weight will be added to the composite total. If the component indicator contains fewer than three denominator cases, then a value of "1.0" is imputed for the observed-to-expected ratio and a weight of 1.0 is added to the composite.

Similar to smoothed rate calculation, starting from AHRQ QI v2021, for hospital level indicators, composites will be suppressed if user specified, in the CONTROL program, that their data contains COVID cases (COVID_19 is 2 or 3) or that the data does not provide MDC (MDC_PROVIDED is 0) or that the data doesn't provide PRDAY (PRDAY is 0) information or user specified stratifications that are not provider or national-level.

[17] Rates for the area-level composite QI are calculated in the same programs that calculate the rates for the component area-level indicators. Thus, no corresponding composite step for area-level indicators exists.

Chapter 5. SAS Program Descriptions

This chapter describes how the programs in the SAS QI software assign, calculate, and print the results (see **Error! Reference source not found.**Appendix E). Each SAS program has a description, a list of input and output files with corresponding data elements (Appendix F and Appendix G:), and an explanation of changes to the program code that may be required by the user. The flow of data through the programs is shown in the flowcharts in Chapter 2. Table 18 summarizes the program names and functions by module, which are also described in more detail below.

- All naming conventions for the programs have been standardized in this manual so that "*XXI*" in a program file name denotes the specific software package. For example, *XXI_TYPE*_FORMATS.sas can be interpreted as PQI_AREA_FORMATS.sas, IQI_HOSP_FORMATS.sas, PSI_HOSP_FORMATS.sas, PSI17_HOSP_FORMATS.sas, or PDI_ALL_FORMATS.sas, depending on which software package is being run (PQI, IQI, PSI, PSI 17, or PDI, respectively).

- One standalone software package is provided for SAS QI: the PSI 17 software package. This package allows users to calculate rates for PSI 17 without the need to run the complete PDI software package. This standalone software package is implemented in the same way as the complete PDI software package (described below).

If a user wishes to create and examine observed rates, then the user will need to update the *XXI_TYPE*_CONTROL.sas file to set appropriate flags to run the *XXI_TYPE*_FORMATS.sas and the *XXI_TYPE*_MEASURES.sas programs, followed by the *XXI*_AREA_OBSERVED.sas (for area-level indicators) and the *XXI*_HOSP_OBSERVED.sas (for hospital-level indicators) programs. If a user also wishes to create risk-adjusted and smoothed rates, then the user will need to update the *XXI_TYPE*_CONTROL.sas to set appropriate flags to run the *XXI*_AREA_RISKADJ.sas (for area-level indicators) and/or *XXI*_HOSP_RISKADJ.sas (for hospital-level indicators) programs. If a user also wishes to create composites for hospital-level indicators, the user will need to update the *XXI_TYPE*_CONTROL.sas to set the appropriate flag to run *XXI*_HOSP_COMPOSITE.sas. Note: Composites for area-level indicators are calculated in the *XXI* _AREA_OBSERVED.sas and *XXI*_AREA_RISKADJ.sas programs.

Table 18. Summary of SAS Programs

FUNCTION	PQI	IQI	PSI	PSI17	PDI
File locations & options	PQI_AREA_CONTROL	IQI_HOSP_CONTROL	PSI_HOSP_CONTROL	PSI17_HOSP_CONTROL	PDI_ALL_CONTROL
Create format file	PQI_AREA_FORMATS	IQI_HOSP_FORMATS	PSI_HOSP_FORMATS	PSI17_HOSP_FORMATS	PDI_ALL_FORMATS
Identify discharges in numerator & denominator	PQI_AREA_MEASURES	IQI_HOSP_MEASURES	PSI_HOSP_MEASURES	PSI17_HOSP_MEASURES	PDI_ALL_MEASURES
Observed rates	PQI_AREA_OBSERVED	--	--	--	PDI_AREA_OBSERVED
Risk-adjusted & smoothed rates	PQI_AREA_RISKADJ	--	--	--	PDI_AREA_RISKADJ
HOSPITAL-LEVEL INDICATORS					
Observed rates	--	IQI_HOSP_OBSERVED	PSI_HOSP_OBSERVED	PSI17_HOSP_OBSERVED	PDI_HOSP_OBSERVED
Stratified risk-observed rates	--	--	--	--	PDI_HOSP_STRATIFIED
Risk-adjusted & smoothed rates	--	IQI_HOSP_RISKADJ	PSI_HOSP_RISKADJ	--	PDI_HOSP_RISKADJ
Composite rates	--	IQI_HOSP_COMPOSITE	PSI_HOSP_COMPOSITE	--	--

NOTE: Dashes (--) indicate the SAS programs are not used in some functions.

5.1 Modify and Save Command Statements in SAS programs

5.1.1 XXI_TYPE_CONTROL.sas Program

The SAS QI v2021 software package executes all the supporting SAS programs from within the XXI_*TYPE*_CONTROL.sas program. This change allows users to run the control file with user-assigned flags to execute multiple programs with a single execution instead of calling them multiple times. Users can still run one program at a time by setting the run flag to "1" for one program and setting the other programs to "0" in the CONTROL program.

The *XXI_TYPE*_CONTROL.sas program contains all of the SAS statements that a user will need to modify in order to run the remaining software programs (Table 19**Error! Reference source not found.**). This SAS program is where a user can specify, for example, the path names of all the input and output datasets.

- The *XXI_TYPE*_CONTROL.sas program is automatically executed by the remaining software programs. A user does not need to run *XXI_TYPE*_CONTROL.sas program separately.
- All of the changes needed for the *XXI_TYPE*_CONTROL.sas program are listed in the following descriptions for the other software programs. Each program description contains a section labeled ***Changes/Confirmations*** that enumerates the modifications for *XXI_TYPE*_CONTROL.sas that are associated with that particular program.
- Lines of SAS code to be modified are identified by the comment "<===USER MUST modify," which means the user must make the change, or by "<===USER MAY modify," which means the modification is optional.

*XXI_TYPE*_CONTROL.sas creates a collection of SAS libraries for accessing input and output datasets from different file paths. For example, "%LET PATHNAME" specifies the location of the folder that includes programs, SAS data, macros, and macro subfolders. The user *must modify* the folder for the PATHNAME. This path name is used to point to the location of the input dataset ("libname INMSR") and to point to the location of the output dataset created by the *XXI_TYPE*_MEASURES.sas program ("libname OUTMSR"). Path names should not exceed 255 characters in length. The user *may modify* path names for INMSR and OUTMSR to provide different paths for each SAS library. **Error! Reference source not found.**lists the statements that can be modified at the discretion of the user.

The MALEVL global parameter in the *XXI_TYPE*_CONTROL.sas program instructs the AREA programs on how to define geographic areas (see Section 3.4.2). By default, this parameter is set to use county for geographic area.

The COVID_19, MDC_PROVIDED and PRDAY global parameters in the *XXI_TYPE*_CONTROL.sas program identifies whether user input data contains COVID cases or contains MDC information or contain PRDAY information. For user data that contains COVID cases, does not contain MDC, or does not provide PRDAY, the software will suppress risk-adjusted rates, smoothed rates, and composites values.

A global PRINT parameter in *XXI_TYPE*_CONTROL.sas may be used to print all of the output summary records at the end of the *XXI*_AREA_OBSERVED.sas; *XXI*_AREA_RISKADJ.sas; *XXI*_HOSP_OBSERVED.sas; PDI_HOSP_STRATIFIED.sas; *XXI*_HOSP_RISKADJ.sas; and *XXI*_HOSP_COMPOSITE.sas programs. These printouts may be quite large if there is a large database with many areas (e.g., counties, metropolitan areas) and/or hospitals and if a user chooses to finely stratify the results. Set PRINT equal to "0" to turn this feature off, and set PRINT equal to "1" to turn this feature on. The feature is turned off by default.

Table 19. User Must or User May Modify Statements in the *XXI_TYPE*_CONTROL.sas Program[1]

SAS STATEMENT	DESCRIPTION
USER MUST modify	
%LET PATHNAME	Specifies the location of the folder that includes the programs, macros, and SAS data folder for the software package.
%LET DISFOLDER	Specifies the folder that contains the discharge data.
%LET DISCHARGE	Specifies the name of the discharge file.
USER MAY modify	
%LET SUFX	Specifies an identifier suffix to be placed on output files (vYYYY, version number; e.g. v2021).
libname LIBRARY	Specifies the location of the folder where formats generated by the *XXI_TYPE*_FORMATS.sas will be saved.
%LET MALEVL=0[1]	Specifies the area definition used by the software for calculation of area-level rates; the default is set to "0" (county-level as defined by the U.S. Census FIPS).
%LET POPYEAR=2018[1]	Specifies the year of the population estimates; user selects the population data for the year that best matches the discharge data. The default is set to 2018.
filename POPFILE[1]	Specifies the location and name of the population file.
%LET PRINT=0	Specifies whether records should be printed in the SAS output at the end of each program. The default is set to "0" (no print).
%LET Calibration_OE_to_ref_pop=1[1]	Specifies whether observed to expected ratio adjustment is from the reference population or the user's data. The default is set to "1" and recommended (use reference population).
Options compress=YES	Add option to compress output. The default is set to "1" ("yes"). This is the recommended option for large files.
%LET NDX=35	Specifies the number of diagnoses on the input dataset. The default is set to 35.
%LET NPR=30	Specifies the number of procedures on the input dataset. The default is set to 30.
%LET COVID_19 = 1[1]	Specifies treatment of COVID diagnosis in discharge data. The default is set to "1" (exclude COVID discharges). COVID_19 = 1 indicates the user can exclude COVID discharges. This is recommended and is therefore the default choice. The software will calculate risk-adjusted rates, smoothed rates, and composites. COVID_19 = 2 indicates the user can include all discharges, with and without COVID. The software will only calculate numerators, denominators, and observed rates. COVID_19 = 3 indicates the user can include only COVID discharges. The software will only calculate numerators, denominators, and observed rates.
%LET MDC_PROVIDED = 1[1]	Specifies whether discharges include MDC. The default is set to "1" (data has MDC from MS-DRG Grouper).
%LET PRDAY=1[1]	Specifies the input dataset and includes information about the number of days from admission to secondary procedures. The default is set to "1" (procedure day is included).
%LET APRDRGFG=1[1]	Specifies whether APR-DRG variables are included in the IQI input dataset. The default is set to "1" (yes).

SAS STATEMENT	DESCRIPTION
%LET APRDRG[1]	Specifies the name of the APR-DRG variable. Default is APR_DRG. Set APRDRGFG to "0" if not available.
%LET MORTAL[1]	Specifies the name of the risk of mortality variable. Default is APRDRG_RISK_MORTALITY. Set APRDRGFG to "0" if not available.
%LET DELFILE	Specifies the name of the permanent dataset that stores records that are not included in the calculations because key data elements have missing values (AGE, MDC, SEX, DX1, DQTR, YEAR).
filename MacLib	Specifies the location of the SAS macro library.
libname INMSR	Specifies the location of the *XXI_TYPE*_MEASURES.sas program input dataset.
libname OUTMSR	Specifies the location of the *XXI_TYPE*_MEASURES.sas program output analytic file.
%LET OUTFILE_MEAS	Specifies the name of the output analytic file from *XXI_TYPE*_MEASURES.sas program.
libname OUTAOBS[1]	Specifies the location of the *XXI*_AREA_OBSERVED.sas program output analytic file.
%LET OUTFILE_AREAOBS[1]	Specifies the name of the analytic file from *XXI*_AREA_OBSERVED.sas program.
%LET TYPELVLA [1]	Specifies the level of summarization in the output (see Appendix J for options). Default is set to "IN (0, 8)" to provide a total across all areas and county or metro area-level totals.
%LET TXTAOBS=0[1]	Specifies whether a comma-delimited file for the area-level observed output should be generated for export into a spreadsheet. The default is set to "0" (no).
filename *XX*TXTAOB[1]	Specifies the location and name of the comma-delimited file for the area-level observed output, if a comma-delimited file is created.
%LET OUTFILE_COMP[1]	Specifies the output file name for the hospital-level composite program.
libname OUTARSK[1]	Specifies the location of the folder for the *XXI*_AREA_RISKADJ.sas program output analytic file.
%LET OUTFILE_AREARISK[1]	Specifies the name of the analytic file from *XXI*_AREA_RISKADJ.sas program.
%LET USE_SES=0[1]	Specifies that poverty will be included in the risk adjustment. The default is "0" (no).
filename COVAR[1]	Specifies the location and the name of the area-level covariate file that does not include poverty as a covariate (.txt).
filename COVARSES[1]	Specifies the location and the name of the area-level covariate file that includes poverty as a covariate (.txt).
%LET TXTARSK=0[1]	Specifies whether a comma-delimited file for the area-level risk-adjusted (and smoothed) rate output should be generated for export into a spreadsheet. The default is set to "0" (no).
filename *XX*TXTARA[1]	Specifies the location and name of the comma-delimited file for the area-level risk-adjusted (and smoothed) rate output, if a comma-delimited file is created.
libname OUTHOBS[1]	Specifies the location of the folder for the *XXI*_HOSP_OBSERVED.sas program output analytic file.
%LET OUTFILE_HOSPOBS[1]	Specifies the name of the analytic file produced from *XXI*_HOSP_OBSERVED.sas program.

SAS STATEMENT	DESCRIPTION
%LET TYPELVLH[1]	Specifies the level of summarization in the hospital-level indicator output (see Appendix J for options). Default is set to "IN (0, 16)" to provide overall and hospital-level IQI and PSI totals and "IN (0, 64)" to provide overall and hospital-level PDI totals.
%LET TXTHOBS=0[1]	Specifies whether a comma-delimited file for the hospital-level observed output should be generated for export into a spreadsheet. The default is set to "0" (no).
filename *XX*TXTHOB[1]	Specifies the location and name of the comma-delimited file for the hospital-level observed output, if a comma-delimited file is created.
libname OUTST[1]	Specifies the location of the folder for the *XXI*_HOSP_STRATIFIED.sas program output analytic file.
%LET OUTFILE_STRAT[1]	Specifies the name of the analytic file produced from the *XXI*_HOSP_STRATIFIED.sas program.
%LET TXTSTRAT=0[1]	Specifies whether a comma-delimited file for the hospital-level observed stratified output should be generated for export into a spreadsheet. The default is set to "0" (no).
filename *XX*TXTSTR[1]	Specifies the location and name of the comma-delimited file for the hospital-level observed stratified output, if a comma-delimited file is created.
libname OUTHRISK[1]	Specifies the location of the folder for the *XXI*_HOSP_RISKADJ.sas program output analytic file.
%LET OUTFILE_HOSPRISK[1]	Specifies the name of the analytic file produced from *XXI*_HOSP_RISKADJ.sas program.
%LET HOSPID_TYP[1]	Specific the length and type of HOSPID on the discharge data. If HOSPID is numeric, set HOSPID_TYP to the length of HOSPID. If HOSPID is alphanumeric, include "$" prior to the length. The default value of HOSPID_TYP is numeric length 5. This is used in risk-adjustment only.
%LET RADIR[1]	Specifies the location of the hospital-level risk adjustment parameters files (CSV files).
%LET TXTHRISK=0[1]	Specifies whether a comma-delimited file for the hospital-level risk-adjusted (and smoothed) rate output should be generated for export into a spreadsheet. The default is set to "0" (no).
filename *XX*TXTHRA[1]	Specifies the location and name of the comma-delimited file for the hospital-level risk-adjusted (and smoothed) rate output, if a comma-delimited file is created.
libname OUTHCOMP[1]	Specifies the location of the folder for the *XXI*_HOSP_COMPOSITE.sas program output analytic file.
%LET *XX*COMPRR[1]	Specifies the macro SAS program that contains the reference population rates, indexing matrix, and variance estimates for use in the hospital-level composite program.
%LET OUTFILE_COMP[1]	Specifies the name of the analytic file from *XXI*_HOSP_COMPOSITE.sas program.
%LET EXE_FMT=0	Specifies if the *XXI_TYPE*_FORMATS.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program. Default value of "0" will create format library if it does not exist. Only set to "1" if recreating library.
%LET EXE_MSR=1	Specifies if the *XXI_TYPE*_MEASURES.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.
%LET EXE_HOBS=1[1]	Specifies if the *XXI*_HOSP_OBSERVED.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.

SAS STATEMENT	DESCRIPTION
%LET EXE_AOBS=1[1]	Specifies if the *XXI*_AREA_OBSERVED.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.
%LET EXE_HRSK=1[1]	Specifies if the *XXI*_HOSP_RISKADJ.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.
%LET EXE_ARSK=1[1]	Specifies if the *XXI*_AREA_RISKADJ.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.
%LET EXE_HSTR=1[1]	Specifies if the *XXI*_HOSP_STRATIFIED.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.
%LET EXE_HCMP=1[1]	Specifies if the *XXI*_HOSP_COMPOSITE.sas program should be run when executing the *XXI_TYPE*_CONTROL.sas program.

[1] Not all *XXI_TYPE*_CONTROL.sas statements are available or relevant for all software packages (e.g., APR-DRG statements are only relevant to the IQI software package).

5.2 *XXI_TYPE*_FORMATS.sas

The *XXI_TYPE*_FORMATS.sas program defines a format library, which contains the formats for the stratified variables and diagnosis and procedure setnames necessary for assigning the outcomes and population of interest (Appendix E). This format library is used by most of the other SAS programs.

The first few formats in this program are for the stratifiers (e.g., age, sex, race/ethnicity, and payer). These are followed by formats that are used for the identification of outcomes of interest in the *XXI_TYPE*_MEASURES.sas program, and by formats that map Federal Information Processing Standards (FIPS) county codes to metropolitan areas in the *XXI_TYPE*_MEASURES.sas, *XXI*_AREA_OBSERVED.sas, and *XXI*_AREA_RISKADJ.sas programs. At the end of the program are formats used to assign age; modified Medicare Severity Diagnosis-Related Groups (MS-DRGs), and comorbidity categories for the risk adjustment process implemented in *XXI*_AREA_RISKADJ.sas and *XXI*_HOSP_RISKADJ.sas; and formats used with APR-DRG categories in IQI_HOSP_RISKADJ.sas. The *XXI_TYPE*_FORMATS.sas program does not need to be rerun once the library is created.

The *XXI_TYPE*_FORMATS.sas program is executed and the format library created when the *XXI_TYPE*_CONTROL.sas program is run using the EXE_FMT macro variable. The default value of "0" will create the library if it does not exist in the LIBRARY libname location. The format library only needs to be created once. If the format library needs to replace an existing library, set the EXE_FMT flag to "1." The EXE_FMT flag should be set to "0" after the format library is recreated.

Input: None.

Output: Permanent SAS format library (FMTLIB).

Changes/Confirmations:

- In *XXI_TYPE*_CONTROL.sas, specify the location (path) of the format library in the "libname LIBRARY" statement.
- In *XXI_TYPE*_CONTROL.sas, the %LET EXE_FMT flag needs to be set. If the flag is set to "0," a new format library will be created if the library does not already exist. If the flag is set to "1," the existing format library will be replaced.

PSI and PDI

In the PDI and PSI modules, the dataset also includes variables identifying POA conditions for hospital-based outcomes of interest (QPPS*xx* and QPPD*xx*, respectively).

5.3 *XXI_TYPE*_MEASURES.sas

The *XXI_TYPE*_MEASURES.sas program processes hospital discharge billing and claims data and flags inpatient records if they contain outcomes of interest.

This program assumes that the input data file (consisting of one observation for each inpatient record) conforms to specific variable names, attributes, and coding conventions (Appendix F). The program outputs an analytic data file that can be used with subsequent programs (Appendix H:).

The *XXI_TYPE*_MEASURES.sas program is executed when the EXE_MSR macro variable is set to "1" and the *XXI_TYPE*_CONTROL.sas program is run.

Input:

1. User-supplied SAS inpatient dataset consisting of administrative hospital billing or claims data. This dataset is a discharge-level file with an array of diagnosis and procedure codes, among other data elements. See Appendix E and Appendix F for a complete list of data elements required on the input dataset for each software package.
2. SAS format library (LIBRARY) created from the *XXI_TYPE*_FORMATS.sas program.
3. SAS macro program(s) (MacLib) with the location as specified in the *XXI_TYPE*_CONTROL.sas program. See Appendix C for a complete list of macro SAS programs for each software package.

Output:

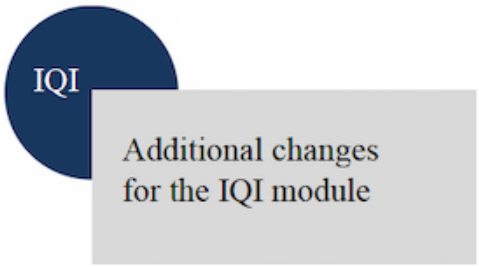
1. SAS dataset containing inpatient records with input variables, stratifiers, comorbidity variables, and flag indicators (TA*XX*nn and TP*XX*nn, where *XX* refers to the QI set and *nn* refers to the indicator number) for the outcomes of interest that will later form the numerators for the QI rates. A few exceptions exist. Currently, the stratifier for SEX variable: SEXCAT, handles different SEX identities, including Male (SEX=1), Female (SEX=2) and other identities (SEX is not 1 or 2). The PSI and PDI *XXI_TYPE*_MEASURES.sas programs include variables identifying present on admission (POA) conditions for hospital-level indicators (QPPS*xx* and QPPD*xx*). The PSI_HOSP_MEASURES.sas program also includes variables for the population for the hospital-level indicators (PPPS*xx*). See Appendix E for a list of data elements in the output file for each software package.
2. PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the numeric variables and a PROC CONTENTS of the output dataset are written to hardcopy.
3. A PROC PRINT of the first 24 observations in the output dataset is written to hardcopy.

Changes/Confirmations:

In the *XXI_TYPE*_CONTROL.sas program:

1. Confirm that the "filename MacLib" statement specifies the correct path to the SAS macro library that contains the SAS macro files used by the *XXI_TYPE*_MEASURES.sas and other programs. These macro files are included with the software.
2. Confirm that the "libname INMSR" and "libname OUTMSR" statements specify the locations (paths) of the input and output files, respectively.
3. Confirm that the "DISCHARGE" and "OUTFILE_MEAS" statements specify the correct names of the input and output files. Note that SAS file references must not include file extensions. The default file name may be used for "OUTFILE_MEAS."
4. To define urban areas by metropolitan area rather than by county, change the MALEVL parameter in *XXI_TYPE*_CONTROL.sas from "0" to "1," "2," or "3." Rural areas will be defined by county, no matter how MALEVL is specified. Refer to Section 3.4.2 for a list of values for the MALEVL parameter.
5. The QI software assumes that the user's starting SAS dataset contains 35 diagnoses and 30 procedures. If these numbers are different in the input inpatient data, then modify the NDX and NPR parameters.

6. Set the %LET EXE_MSR flag. If the flag is set to "1," *XXI_TYPE*_MEASURES will execute. If the flag is set to "0," *XXI_TYPE*_MEASURES will not execute.



Additional changes specific to the IQI software package:

1. If a user wishes to use APR-DRG variables in the later IQI_HOSP_RISKADJ.sas program to risk adjust the hospital-level indicators, then in IQI_HOSP_CONTROL.sas, set the APRDRGFG flag parameter to "1." If the user does not intend to run IQI_HOSP_RISKADJ.sas to risk adjust the hospital-level indicators or if the user does not have the APR-DRG variables available, then set APRDRGFG to "0" (see Table 20).

2. If a user wishes to risk adjust the hospital-level indicators by later running the IQI_HOSP_RISKADJ.sas program, then in IQI_HOSP_CONTROL.sas, set the APRDRG and APRDRG_RISK_MORTALITY parameters to the names of the DRG category variable and the mortality indicators on the input file. The default names are created by APR-DRG Limited License grouper software (see Table 20).

Table 20. How to Set Up IQI Parameters and Data for Using APR-DRG Variables in the IQI v2021 Software Package

	IF USER DOES NOT INTEND TO RISK ADJUST THE HOSPITAL-LEVEL INDICATORS	IF USER INTENDS TO RUN IQI_HOSP_RISKADJ.SAS TO RISK ADJUST THE HOSPITAL-LEVEL INDICATORS	
		IF USER HAS APR-DRG SOFTWARE AVAILABLE	IF THE INPUT FILE ALREADY HAS APR-DRG VARIABLES
Preliminary data processing	None	Run APR-DRG software to create APR-DRGs and mortality indicators.	None.
Setting the APRDRGFG parameter in IQI_HOSP_CONTROL.sas	Set to equal "0."	Set to equal "1."	Set to equal "1."
Setting the APR_DRG, APRDRG_RISK_MORTALITY, and parameters in IQI_HOSP_CONTROL.sas	No action required.	Use the default variable names from the APR-DRG grouper.	Set APR_DRG and APRDRG_RISK_MORTALITY to the corresponding field names on the input file.

5.4 *XXI*_AREA_OBSERVED.sas

The *XXI*_AREA_OBSERVED.sas program calculates the observed rates for the area-level QIs using the data derived in a previous step (*XXI_TYPE*_MEASURES.sas). These observed rates can be stratified by combinations of area, sex, age, and race categories. The program first totals the area indicator flags created by the *XXI_TYPE*_MEASURES.sas program, and then for each of the desired stratifiers, the program divides these totals by the pertinent residential population.

The *XXI*_AREA_OBSERVED.sas program is executed when the EXE_AOBS macro variable is set to "1" and the XXI_*TYPE*_CONTROL.sas program is run.

The inputs, outputs and changes that need to occur in the program are described in the section below. Appendix E, Appendix F: , and Appendix G provide additional details.

Input:

1. The SAS dataset that was created in the *XXI_TYPE*_MEASURES.sas program. This dataset is a discharge-level file that contains inpatient records with input variables, stratifiers, and the new flag indicators for the QI area-level outcomes of interest.
2. A text file with Census area residential population, stratified by area, age, sex, and ethnicity categories. The Population File, 2000-2020_Population_Files_v2021.txt, is currently provided on the AHRQ website as a separate download. The user should set POPYEAR to the year that best matches the user's discharge data file (yyyy).
3. Users do not need to convert the ASCII text file to a SAS dataset for use with the software.
4. SAS format library (LIBRARY) created from the *XXI_TYPE*_FORMATS.sas program.

Output:

1. SAS dataset with summary records that contain observed rates (OA*XX*nn variables, where *XX* refers to the QI module and *nn* refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TA*XX*nn variables), and the residential population totals that formed the denominators of the observed rates (*PAXX*nn variables). The output file has records summarized to the various combinations of stratifiers specified in the TYPELVLA parameter that is described in the *Changes/Confirmations* section below. See Appendix E for a complete list of variables in the output file for each software package.
2. An optional ASCII (comma-delimited) text file that the user can then import into a spreadsheet. This text file contains the same information as the SAS output dataset. The text file will contain the OA*XX*nn observed rates, the TA*XX*nn counts of outcomes that formed the numerators of the rates, and the PA*XX*nn residential population totals. The different records/rows in the text file will correspond to the different TYPELVLA levels of summarization (Appendix J).
3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the area-level summary records that shows statistics for the OA*XX*nn observed rates, the TA*XX*nn counts of outcomes that formed the numerators of the rates, and the PA*XX*nn residential population totals. These means will only be generated if the user included a value of "8" for the TYPELVLA parameter discussed in the *Changes/Confirmations* section below.
4. A PROC CONTENTS of the output SAS summary dataset is generated in the SAS output window/results viewer.
5. A PROC PRINT of the output summary dataset may be generated in the SAS output window/results viewer. This printout may be quite large depending on the number and the levels of summarization that the user requests with the TYPELVLA parameter discussed in the *Changes/Confirmations* section below. If the user does not wish to generate this printout, then the global "PRINT" parameter in *XXI_TYPE*_CONTROL.sas code should be set to "0." See Appendix J for a list of possible summarizations.

Changes/Confirmations:

In the *XXI_TYPE*_CONTROL.sas program:

1. Confirm that the "libname OUTMSR" and "libname OUTAOBS" statements specify the locations (paths) of the input and output SAS files, respectively.
2. Confirm that the "OUTFILE_MEAS" and "OUTFILE_AREAOBS" statements specify the correct names of the input and output files. The name that is specified with OUTFILE_MEAS should be for the file created using the *XXI_TYPE*_MEASURES.sas program. The default file names may be used.
3. Confirm that the "filename POPFILE" statement correctly specifies the path (including the file name) for the ASCII population text file. The file name will be 2000-2020_Population_Files_v2021.txt. The user should set POPYEAR to the year that best matches the user's discharge data file (yyyy).
4. Specify the levels of summarization for the observed rates. This change is done by specifying numbers between "0" and "15" in the "%LET TYPELVLA =" statement. Each number corresponds to a different level or combination of levels. The default values of "0" (overall) and "8" (area) will provide an overall total and the area-level totals. Refer to Appendix J for a list of all levels of summarization.
    - **WARNING:** TYPELVLA must include the values "0" (overall) and "8" (area) if the user wishes subsequently to run the *XXI*_AREA_RISKADJ.sas program for risk-adjusted and smoothed rates.
    - If TYPELVLA includes the value "0" (overall), then the first observation in the output summary data file will contain the overall totals and observed rates for the entire database created with the *XXI_TYPE*_MEASURES.sas program.
    - For example, if using a State inpatient hospital database, the user might specify the following TYPELVLA values for the PQI module:

      0=provides overall rates for the user's entire State

      4=provides overall rates for the user's State, broken down by age groups

      8=provides rates for areas within the user's State

      12=provides rates for age groups within these areas
5. If the user wishes to create an ASCII (comma-delimited) text file that can be imported into a spreadsheet, then the user should specify the path (including the file name) for this ASCII text file in the "filename *XX*TXTAOB" statement and set the TXTAOBS parameter to "1." Otherwise, the default value of "0" for TXTAO will skip the code that would generate this file.
6. Set the %LET EXE_AOBS flag. If the flag is set to "1," *XXI*_AREA_OBSERVED will execute. If the flag is set to "0," *XXI*_AREA_OBSERVED will not execute.

5.5 *XXI*_AREA_RISKADJ.sas

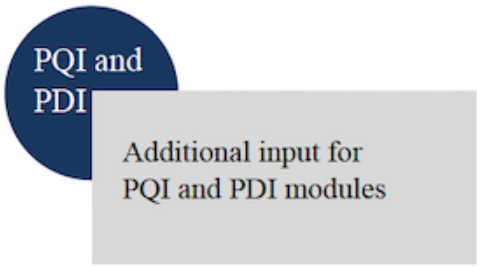
The *XXI*_AREA_RISKADJ.sas program calculates age and sex risk-adjusted rates for each area-level QI (overall rates and rates by area) and then calculates smoothed rates. See Appendix G for a detailed list of risk factors.

The *XXI*_AREA_RISKADJ.sas program is executed when the EXE_ARSK macro variable is set to "1" and the *XXI_TYPE*_CONTROL.sas program is run.

The description below outlines the inputs, outputs, and changes that need to occur in the program. Appendix E, Appendix F, Appendix G, and Appendix H provide additional details.

Input:

1. The discharge-level file that was created with the *XXI_TYPE*_MEASURES.sas program.
2. A text file with Census area residential populations, stratified by area, age, sex, and ethnicity categories. The Population File, 2000-2020_Population_Files_v2021.txt, is currently provided on the AHRQ website as a separate download. The user should set POPYEAR to the year that best matches the user's discharge data file (yyyy).
    - Users do *not* need to convert the ASCII text file to a SAS dataset for use with the software.



1. SAS format library (LIBRARY) created from the *XXI_TYPE*_FORMATS.sas program.
2. SAS macro program(s) library (MacLib) with the location as specified in the *XXI_TYPE*_CONTROL.sas program. See Appendix C for a complete list of macro SAS programs for each software package.
3. Text files contain coefficients from regression models. The files include coefficients for each area-level indicator in the module and are used in the calculation of risk-adjusted rates. One text file includes adjustment for age and sex (*XXI*_Area_Covariates_v2021.txt) and one text file includes adjustment for age, sex, and poverty (*XXI*_Area_Covariates_SES_v2021.txt). The files were created during the development of the area-level QIs and do not need to be manipulated for use with the software.
4. SAS macro programs (*XXI*_Area_Sigvar_Array_v2021.sas and *XXI*_Area_Sigvar_Array_SES_v2021.sas) that contain arrays of signal variance estimates and mean reference population rates for each area-level QI. The macro programs are used in the calculation of smoothed rates. *XXI*_Area_Sigvar_Array_v2021.sas should be used with adjustment only for age and sex. *XXI*_Area_Sigvar_Array_SES_v2021.sas should be used with adjustment for age, sex, and poverty (not available with the IQI or PSI software packages). The programs were created during the development of the area-level QIs and do not need to be manipulated for use with the software.

Output:

1. A SAS dataset with an overall summary record and with area-level summary records that contain the three types of indicator rates, along with the components of the initial raw rates. Specifically, the file contains the observed rates (OA*XX*nn variables), the counts of outcomes that formed the numerators of the observed rates (TA*XX*nn variables), the residential population totals that formed the denominators of the observed rates (PA*XX*nn variables), the expected rates (EA*XX*nn variables), the risk-adjusted rates (RA*XX*nn variables), the smoothed rates (SA*XX*nn variables), and the lower and upper confidence intervals (LA*XX*nn and UA*XX*nn, respectively). When stratifications other than area are selected, the RA*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.

2. An optional ASCII (comma-delimited) text file that the user can then import into a spreadsheet. This text file contains the same information as the SAS output dataset. The text file will contain the OA*XX*nn observed rates and their TA*XX*nn and PA*XX*nn components, the RA*XX*nn risk-adjusted rates, and the SA*XX*nn smoothed rates. Each record or row in the text file will correspond to a different area.

3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the area-level summary records that shows statistics for the OA*XX*nn observed rates and their TA*XX*nn and PA*XX*nn components, the RA*XX*nn risk-adjusted rates, and the SA*XX*nn smoothed rates.

4. A PROC CONTENTS of the output SAS summary dataset is generated in the SAS output window/results viewer.

5. A PROC PRINT of the output summary dataset may be generated in the SAS output window/results viewer. If the user does not wish to generate this printout, then the global "PRINT" parameter in *XXI_TYPE*_CONTROL.sas code should be set to "0."

6. Outputs to hardcopy are PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of risk-adjusted and smoothed rates in two intermediate work files and all of the numeric variables in the final output data file.

Changes/Confirmations:

In *XXI_TYPE*_CONTROL.sas:

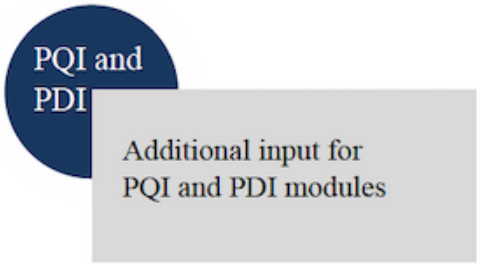
1. Confirm that the "libname OUTMSR," "libname OUTARSK," and "libname OUTFILE_AREARISK" statements specify the correct locations (paths) of the input and output SAS files, respectively.

2. Confirm that the "OUTFILE_MEAS" statement specifies the correct name of the discharge-level analytic file created in the *XXI_TYPE*_MEASURES.sas program. The default file name may be used.

3. Confirm that the "filename MacLib" statement points to the correct path of the SAS macro library that contains the estimates to smooth the indicator rates. Use *XXI*_Area_Sigvar_Array_v2021.sas for age and sex risk adjustment in the PQI and PDI software, and *XXI*_Area_Sigvar_Array_SES_v2021.sas for age, sex, and poverty risk adjustment in the PQI and PDI software.

4. Confirm that "OUTFILE_AREAOBS" statement indicates the correct name of the summary analytic file created with the *XXI*_AREA_OBSERVED.sas program. The default file name can be used.

5. Specify the path (including the file name) for the ASCII population text file in the "filename POPFILE" statement. The Population File name is 2000-2020_Population_Files_v2021.txt. These files are provided along with the software. The year used should be the one that is closest to the year associated with the user's particular data. These files contain Census residential population estimates by area, sex, and discrete age categories.



6. Set the flag USE_SES to "1" to use SES, age, and sex in the risk adjustment and smoothing processes and to "0" to use only age and sex.
7. Confirm that the "filename COVAR" and "filename COVARSES" statements specify the correct location and name of the ASCII text files that contain regression coefficients:
    - *XXI*_Area_Covariates_v2021.txt for the PQI and PDI software and
    - *XXI*_Area_Covariates_SES_v2021.txt for the PQI and PDI software.
8. Confirm that the file name in the "OUTFILE_AREARISK" statement is consistent with the name that the user wishes the output file from the *XXI*_AREA_RISKADJ.sas to have. The default file name may be used.
9. If the user wishes to create an ASCII (comma-delimited) text file that can be imported into a spreadsheet, then the user should specify the path (including the file name) for this ASCII text file in the "filename *XX*TXTARA" statement and set the TXTARSK parameter to "1." Otherwise, the default value of "0" for TXTARSK will skip the code that would generate this file.
10. Set the %LET EXE_ARSK flag. If the flag is set to "1," *XXI*_AREA_RISKADJ will execute. If the flag is set to "0," *XXI*_AREA_RISKADJ will not execute.

5.6 *XXI*_HOSP_OBSERVED.sas

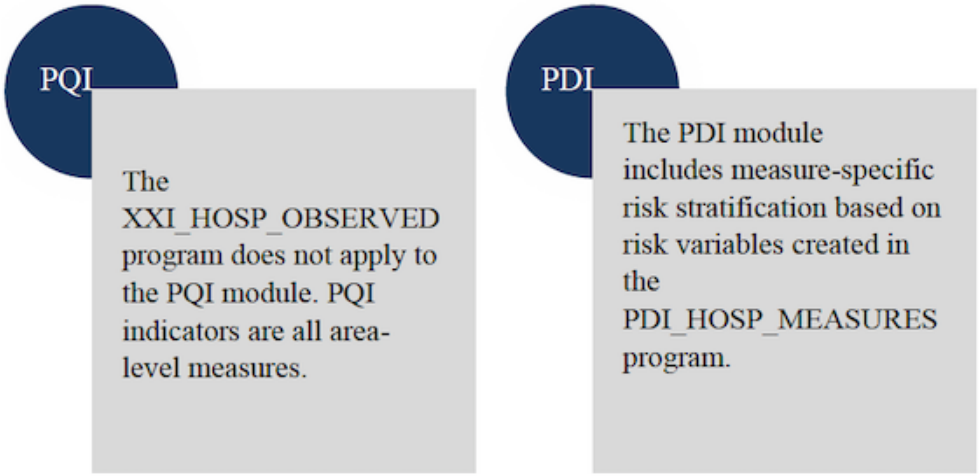
The *XXI*_HOSP_OBSERVED.sas program calculates the observed rates for the hospital-level indicators using the data derived in a previous step (*XXI_TYPE*_MEASURES.sas). These observed rates are stratified by combinations of hospitals, sex, age, race, and payer categories. The program first totals the indicator flags created by the *XXI_TYPE*_MEASURES.sas program and then it divides these totals by the hospital discharges for each of the desired stratifiers in the at-risk population for the indicator.

The *XXI*_HOSP_OBSERVED.sas program is executed when the EXE_HOBS macro variable is set to "1" and the *XXI_TYPE*_CONTROL.sas program is run.

The description below outlines the inputs, outputs, and changes that need to occur in the program. Appendix E, Appendix F, Appendix G, and Appendix H provide additional details.

The *XXI*_HOSP_OBSERVED.sas program does not apply to the PQI module because those indicators are all area-level measures.

Note that an optional stratification program for selected PDIs is available for the PDI software (PDI_HOSP_STRATIFIED.sas).



Input:

1. The SAS dataset that was created in the *XXI_TYPE*_MEASURES.sas. This dataset is a discharge-level file that contains inpatient records with input variables, stratifiers, and the flag indicators for the QI hospital outcomes of interest.
2. SAS format library (LIBRARY) created from the *XXI_TYPE*_FORMATS.sas program.

Output:

1. A SAS dataset with summary records that contains observed rates (OP*XX*nn variables where nn refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TP*XX*nn variables), and the hospital discharge totals that formed the denominators of the observed rates (PP*XX*nn variables). It also includes variables identifying POA conditions for hospital-level outcomes of interest (QP*XX*nn), although given that POA is required, QP*XX*nn is equivalent to TP*XX*nn. The output file has records summarized to the various combinations of stratifiers specified in the TYPELVLH parameter that is described in the ***Changes/Confirmations*** section below. There is an optional ASCII (comma-delimited) text file that the user can then import into a spreadsheet. This text file contains the same information as the SAS output dataset. The text file will contain the OP*XX*nn observed rates, the TP*XX*nn counts of outcomes that formed the numerators of the rates, and the PP*XX*nn counts of outcomes that formed the denominators of the rates. The different records/rows in the text file will correspond to the different TYPELVLH summarizations (Appendix J).
2. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the hospital-level summary records that shows statistics for the *OPXX*nn observed rates, the TP*XX*nn counts of outcomes that formed the numerators of the rates, and the PP*XX*nn counts of outcomes that formed the denominators of the rates. These means will only be generated if the user included a value of "16" for IQI and PSI or "64" for PDI for the TYPELVLH parameter discussed in the ***Changes/Confirmations*** section below.
3. A PROC CONTENTS of the output SAS summary dataset is generated in the SAS output window/results viewer.
4. A PROC PRINT of the output summary dataset may be generated in the SAS output window/results viewer. This printout may be quite large depending on the number and the levels of summarization that the user requests with the TYPELVLH parameter discussed in the

Changes/Confirmations section below. If the user does not wish to generate this printout, then the global "PRINT" parameter in *XXI_TYPE*_CONTROL.sas code should be set to "0."

5. The output summary dataset may be written to a comma-separated values file (CSV file). If the user wishes to create this file, then the global "TEXTP2" parameter *XXI_TYPE*_CONTROL.sas code should be set to "1."

Changes/Confirmations:

In the *XXI_TYPE*_CONTROL.sas program:

1. Confirm that the "libname OUTMSR" and "libname OUTHOBS" statements specify the locations (paths) of the input and output SAS files, respectively.
2. Confirm that the "OUTFILE_MEAS" and "OUTFILE_HOSPOBS" statements specify the correct names of the input and output files. The name that is specified with OUTFILE_MEAS should be for the file that the user created using the *XXI_TYPE*_MEASURES.sas program. The default file names may be used.
3. Specify the levels of summarization for the observed rates. This step is done by specifying numbers between 0 and 31 (for IQI and PSI) or 0 and 127 (for PDI) in the "%LET TYPELVLH =" statement. Each number corresponds to a different level or combination of levels, as shown in Appendix J. The default values of 0 and 16 (for IQI and PSI) or 0 and 64 (for PDI) will provide an overall total and hospital-level totals.
4. If TYPELVLH includes the value "0," then the first observation in the output summary data file will contain the overall totals and observed rates for the entire database created with the *XXI_TYPE*_MEASURES.sas program.

   For example, if using a State inpatient hospital database, the user might specify the following TYPELVLH values for the IQI module:

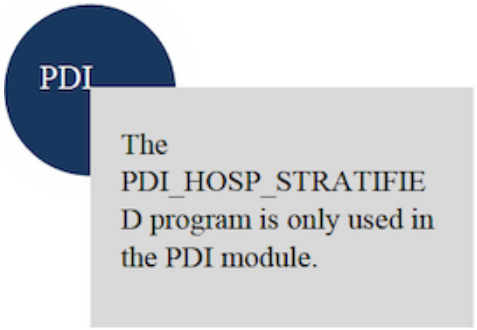
   0=provides overall rates for the user's entire State

   8=provides overall rates for the user's State, broken down by age groups

   16=provides rates for hospitals within the user's State

   24=provides rates for age groups within these hospitals
5. If a user wishes to create an ASCII (comma-delimited) text file that can be imported into a spreadsheet, then the user should specify the path (including the file name) for this ASCII text file in the "filename *XX*TXTHOB" statement, and set the TXTHOBS parameter to "1." Otherwise, the default value of "0" for TXTHOBS will skip the code that would generate this file.
6. Set the %LET EXE_HOBS flag. If the flag is set to "1," *XXI*_HOSP_OBSERVED will execute. If the flag is set to "0," *XXI*_HOSP_OBSERVED will not execute.

5.7 PDI_HOSP_STRATIFIED.sas



The PDI_HOSP_STRATIFIED.sas program calculates the observed rates for the hospital-level PDI using the data derived in a previous step (PDI_ALL_MEASURES.sas). These observed rates are stratified by risk group categories that are specific to each indicator (PDI 01, PDI 08, PDI 10, and PDI 12). The program first totals the indicator flags created by the PDI_ALL_MEASURES.sas program and then it divides this sum by the count of the hospital discharges for each of the risk group stratifiers.

The risk group-specific stratified rates are stored in variables that have a prefix of "G."

The PDI_HOSP_STRATIFIED.sas program is executed when the EXE_HSTR macro variable is set to "1" and the XXI_*TYPE*_CONTROL.sas program is run.

The description below outlines the inputs, outputs, and changes that need to occur in the program. Appendix E, Appendix F, and Appendix G provide additional details.

Input:

1. The SAS dataset that was created in the PDI_ALL_MEASURES.sas. This dataset is a discharge-level file that contains inpatient records with input variables, stratifiers, and the 13 new flag indicators for the PDI hospital outcomes of interest. Only four of these indicators have risk group stratifiers (PDI 01, PDI 08, PDI 10, and PDI 12).
2. SAS format library (LIBRARY) created from the PDI_ALL_FORMATS.sas program.

Output:

1. A SAS dataset with summary records that contains the counts of outcomes that formed the numerators of the rates (TPPDnn variables), the hospital discharge totals that formed the denominators of the observed rates (PPPDnn variables), and the observed rates (OPPDnn variables where *nn* refers to the indicator number). It also includes variables identifying POA conditions for hospital-level outcomes of interest (QPPDnn), although given that POA is required, QPPDnn is equivalent to TPPDnn. The output file has records summarized to the indicator-specific, predefined risk-group stratifiers.
2. An optional ASCII (comma-delimited) text file that the user can then import into a spreadsheet. This text file contains the same information as the SAS output dataset. The text file will contain the TPPDnn numerator counts of outcomes, the PPPDnn denominator counts of outcomes, and the OPPDnn observed rates. The different records/rows in the text file will correspond to the indicator-specific, predefined risk group stratifiers.
3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN and SUM) of the hospital-level summary records that show statistics for the OPPDnn observed rates, the TPPDnn counts of outcomes that formed the numerators of the rates, the QPPDnn POA flags, and the PPPDnn counts of outcomes that formed the denominators of the rates. These means are generated by the indicator-specific, predefined risk-group stratifiers.

4. A PROC CONTENTS of the output SAS summary dataset is generated in the SAS output window/results viewer.
5. A PROC PRINT of the output summary dataset may be generated in the SAS output window/results viewer. If the user does not wish to generate this printout, then the global "PRINT" parameter in PDI_ALL_CONTROL.sas code should be set to "0."

Changes/Confirmations:

In the PDI_ALL_CONTROL.sas program:

1. Confirm that the "libname OUTMSR" and "libname OUTST" statements specify the locations (paths) of the input and output SAS files, respectively.
2. Confirm that the "OUTFILE_MEAS" and "OUTFILE_STRAT" statements specify the correct names of the input and output files. The name specified with OUTFILE_MEAS should be for the file that the user created using the PDI_ALL_MEASURES.sas program. The default file names may be used.
3. If the user wishes to create an ASCII (comma-delimited) text file that can be imported into a spreadsheet, the user should specify the path (including the file name) for this ASCII text file in the "filename PDTXTSTR" statement and set the TXTSTRAT parameter to "1." Otherwise, the default value of "0" for TXTSTRAT will skip the code that would generate this file.
4. Set the %LET EXE_HSTR flag. If the flag is set to "1," PDI_HOSP_STRATIFIED will execute. If the flag is set to "0," PDI_HOSP_STRATIFIED will not execute.

5.8 *XXI*_HOSP_RISKADJ.sas

The *XXI*_HOSP_RISKADJ.SAS program calculates risk-adjusted rates by the patient's age, sex, birth weight (in the PDI module only), modified MS-DRG, Clinical Classifications Software Refined (CCSR) comorbidity, and APR-DRG (in the IQI module only if available) for each QI and then calculates smoothed rates. See Appendix G for a detailed list of risk factors.

The risk-adjusted and smoothed rates are not calculated for the hospital-level indicators in which hospital comparisons are not recommended (IQI 21, IQI 22, IQI 33, PSI 17–PSI 19). The risk-adjusted and smoothed rates are also not calculated for the hospital-level count indicator PSI 05. In addition, as of v2021, the risk-adjusted and smoothed rates are also not calculated for the hospital-level indicators when user data do not exclude COVID cases (COVID_19 is not 1), do not provide MDC (MDC_PROVIDED is not 1) information, do not include procedure days (PRDAY is not 1) for certain PDIs and PSIs, or use stratification levels (age, gender, ageday, birthweight. In particular TYPELVLH is in 4-15 or 20-31 for PSIs and IQIs; 4-63, 68-127 for PDIs). Because age, gender, age in days, and birth weight are used in risk adjustment models, it is inappropriate to produce risk-adjusted rates for any stratum that includes these variables.

The *XXI*_HOSP_RISKADJ.sas program is executed when the EXE_HRSK macro variable is set to "1" and the XXI_*TYPE*_CONTROL.sas program is run.

The description below outlines the inputs, outputs, and changes that need to occur in the program. Appendix E, Appendix F, Appendix G, and Appendix H provide additional details.

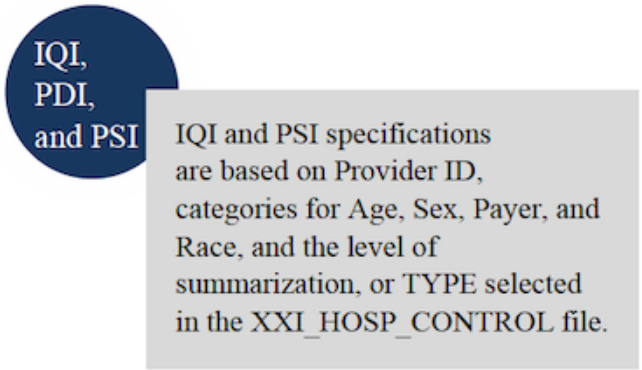
The *XXI*_HOSP_RISKADJ.sas program applies only to the IQI, PSI, and PDI software packages. The PQI software package, which calculates only area-level rates, does not include the *XXI*_HOSP_RISKADJ.sas program.

The *XXI*_HOSP_RISKADJ.sas program calculates risk-adjusted rates for providers that have at least three denominators. Rates based on only a few cases should be interpreted with caution.

Input:

1. SAS format library (FMTLIB) created from the *XXI*_FORMATS program.
2. The discharge-level SAS analytic file that was created with the *XXI_TYPE*_MEASURES program.
3. The SAS analytic file (with summary records) that was created with the *XXI*_HOSP_OBSERVED.sas program.
4. SAS macro program(s) library (MacLib) with the location as specified in the *XXI_TYPE*_CONTROL.sas program. See Appendix C for a complete list of macro SAS programs for each software package.
5. SAS macro program (*XXI*_HOSP_Regvars_v2021.sas) that contains SAS code to create risk adjustment variables. The program was created during the development of the hospital-level QIs and does not need to be manipulated for use with the software. See Appendix G for a list of risk adjustment variables.
6. ASCII files (GEE_*XX*xx_AGE_SEX.csv or Logistic_ *XX*xx_AGE_SEX.csv) contain coefficients for clinical risk models with various adjustments for age and sex. One CSV file exists for each indicator. The files are used in the calculation of risk-adjusted rates. The files were created during the development of the hospital-level QIs and do not need to be manipulated for use with the software.
7. SAS macro program (*XXI*_HOSP_Sigvar_Array_v2021.sas) that contains arrays of signal variance estimates and mean reference population rates for each QI. The macro program is used in the calculation of smoothed rates. The program was created during the development of the hospital-level QIs and does not need to be manipulated for use with the software.

Output:



1. A SAS dataset with an overall summary record and with hospital-level summary records that contain the three types of indicator rates along with the components of the initial raw rates. Depending on the QI module, the file may contain the observed rates (OP*XX*nn variables), the risk-adjusted rates (RP*XX*nn variables), the smoothed rates (SP*XX*nn variables), the counts of outcomes that formed the numerators of the observed rates (TP*XX*nn variables), the hospital discharge totals that formed the denominators of the observed rates (PP*XX*nn variables), the expected rates (EP*XX*nn variables), the variance of the risk-adjusted rate (VP*XX*nn variables), the risk-adjusted rate

confidence intervals (LPPSnn variables for lower bounds and UPPSnn variables for upper bounds), reliability of the risk-adjusted rates (SNP*XX*nn), and the smoothed rate standard errors (XPPSnn). When stratifications other than hospital are selected, the RP*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.

2. An optional ASCII (comma-delimited) text file that the user can import into a spreadsheet. This text file contains the same information as the SAS output dataset (with the exception of the VP*XX*nn variance variables). The text file will contain the OP*XX*nn observed rates and their TP*XX*nn numerator and PP*XX*nn denominator components, the EP*XX*nn expected rates, the RP*XX*nn risk-adjusted rates with upper (UPPSnn) and lower (LPPS*XX*) limits, and the SP*XX*nn smoothed rates with their standard errors (XPPSnn). Each record or row in the text file will correspond to a specification group.
3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the hospital-level summary records that shows statistics for the observed, risk-adjusted, and smoothed rates, and statistics for the counts of outcomes that formed the numerators and denominators of the observed rates. These means will only be generated if the user included a value of 16 (for IQI and PSI) or a value of 64 (for the PDI) for the TYPELVLH parameter of the preceding *XXI*_HOSP_OBSERVED.SAS program (see Appendix J).
4. A PROC CONTENTS of the output SAS summary dataset is generated in the SAS output window/results viewer.
5. A PROC PRINT of the output summary dataset may be generated in the SAS output window/results viewer. This printout may be quite large depending on the number and the levels of summarization that the user requested with the TYPELVLH parameter of the preceding *XXI*_HOSP_OBSERVED.sas program (see Appendix J). If the user does not wish to generate this printout, then the global "PRINT" parameter in *XXI_TYPE*_CONTROL.sas code should be set to "0."

Changes/Confirmations:

In *XXI_TYPE*_CONTROL.sas:

1. Confirm that the "libname OUTMSR," "libname OUTHOBS," and "libname OUTHRISK" statements specify the correct locations (paths) of the input and output SAS files, respectively.
2. Confirm the "OUTFILE_MEAS" statement is the correct name of the discharge-level analytic file created with the *XXI_TYPE*_MEASURES program. The default file name may be used.
3. Confirm that the "filename MacLib" statement points to the correct path to the SAS macro library that contains signal variance arrays and regression variable macros.
4. Confirm the "OUTFILE_HOSPOBS" statement indicates the correct name of the summary analytic file created with the *XXI*_HOSP_OBSERVED.SAS program. The default file name may be used.
5. Confirm that "%LET RADIR" statement indicates the correct name and location of the risk adjustment parameters (e.g. GEE.csv files). These files are provided as part of the software package.

6. Confirm that the "OUTFILE_HOSPRISK" statement indicates the name that the user wishes the output analytic file from *XXI*_HOSP_RISKADJ.sas to have. The default file name may be used.
7. If the user wishes to create an ASCII (comma-delimited) text file that can be imported into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "filename *XX*TXTHRA" statement and set the TXTHRISK parameter to "1." Otherwise, the default value of "0" for TXTHRISK will skip the code that would generate this file.
8. Confirm %LET HOSPID_TYP is set to the appropriate length and data type for the HOSPID data element found on the discharge-level SAS analytic file that was created with the *XXI_TYPE*_MEASURES program. If HOSPID is alphanumeric, include "$" prior to the length. The default value of HOSPID_TYP is numeric length 5. If, for example, a user wishes to use a alphanumeric HOSPID of length 8, the user will specify %LET HOSPID_TYP = $8.
9. Set the %LET EXE_HRSK flag. If the flag is set to "1," *XXI*_HOSP_RISKADJ will execute. If the flag is set to "0," *XXI*_HOSP_RISKADJ will not execute.

5.9 *XXI*_HOSP_COMPOSITE.sas Program[18]

The *XXI*_HOSP_COMPOSITE.sas program calculates the scores for the hospital-level composite QIs using the summary file derived from the *XXI*_HOSP_RISKADJ.sas program and weights supplied within the QI software. For a complete description of the composite methodology and the weights, please refer to the *AHRQ QI Empirical Methods* document: (https://www.qualityindicators.ahrq.gov/Downloads/Resources/Publications/2021/Empirical_Methods_2021.pdf). For each composite, the *XXI*_HOSP_COMPOSITE.sas program computes the composite score, the variance and standard error for the composite rate, the weighted denominator, and a confidence interval for the composite score.

The *XXI*_HOSP_COMPOSITE.sas program is executed when the EXE_HCMP macro variable is set to "1" and the XXI_*TYPE*_CONTROL.sas program is run.

The *XXI*_HOSP_COMPOSITE.sas program applies only to the IQI and PSI software packages. The PQI software package and the PDI area-level software package, which calculate area-level rates only, do not have a separate composite program. In addition, as of v2021, the risk-adjusted and smoothed rates are also not calculated for the hospital-level indicators when user data do not exclude COVID cases (COVID_19 is not 1), do not provide MDC (MDC_PROVIDED is not 1) information, do not include procedure days (PRDAY is not 1) for PSI, or use stratification levels(age, gender, ageday, birthweight) that are used in the risk adjustment models.

Input:

1. The SAS dataset with an overall summary record and hospital-level summary records that were created with the *XXI*_HOSP_RISKADJ.sas program.
2. A SAS program (.sas) that contains arrays of risk-adjusted rates from the reference (general or standard) population, variance squared estimates, and an index for mapping the variances to component indicators.

[18] Rates for the area-level composite QI are calculated in the same programs that calculate the rates for the component area-level indicators. Thus, no corresponding composite program exists for area-level indicators.

Output:

1. A SAS dataset OUTFILE_COMP with one record for each provider (hospital) that contains the composite score (COMPx), the variance (COMPxVAR), the standard error (COMPxSE) for the composite rate, the weighted denominator (COMPxWHT), and a confidence interval (COMPxLB, COMPxUB) for the composite score.
2. A PROC MEANS (with N and MEAN) of the provider (hospital)-level summary records that shows statistics for the composite score, variance of the composite score, standard error of the composite score, and weighted denominator of the composite score.

Changes/Confirmations:

In *XXI*_HOSP_COMPOSITE.sas program:

1. If the user wishes to modify the weights, change the *Wnn* values in the *XXI*_Composite_Wt_v2021.sas macro referenced in the program, where *nn* is the number of the component indicator. Note that the weights provided for a composite must sum to "1."

In the *XXI_TYPE*_CONTROL.sas program:

1. Confirm that "libname OUTHRISK" and "libname OUTHCOMP" statement specifies the locations (path) of the input and output file, respectively.
2. Confirm that the "filename MacLib" statement points to the correct path to the SAS macro library that contains signal variance arrays and regression variable macros.
3. Confirm that the "OUTFILE_HOSPRISK" statement is the correct name of the risk-adjusted analytic file created with the *XXI*_HOSP_RISKADJ program. The default file name may be used.
4. Confirm that the "filename MacLib" statement points to the correct path to the SAS macro library that contains component measure reference rates and variance arrays macro.
5. Confirm that the "XXCOMPRR" statement specifies the correct name of the file containing component measure reference rates and variance arrays.
6. Confirm that the "OUTFILE_COMP" statement indicates the correct name of the summary analytic file created with the *XXI*_HOSP_COMPOSITE.SAS program. The default file name may be used.
7. Set the %LET EXE_HCMP flag. If the flag is set to "1," *XXI*_HOSP_COMPOSITE will execute. If the flag is set to "0," *XXI*_HOSP_COMPOSITE will not execute.

Chapter 6. Reviewing the Printed Output

This chapter contains tips for reviewing some of the printed output from the Quality Indicators (QI) modules. These tips aim to explain the interrelationships between printout items from different programs and to help reveal the nature and structure of the module outputs. See Appendix H for each module's output data dictionary.

Depending on the QI module and whether the user has elected to risk adjust and smooth the data, the final output may be a PROC PRINT from *XXI*_AREA_OBSERVED.sas, *XXI*_AREA_RISKADJ.sas, *XXI*_HOSP_OBSERVED.sas, and/or *XXI*_HOSP_RISKADJ.sas. All interim printouts are for checking and troubleshooting.

6.1 *XXI_TYPE*_MEASURES.sas Program

The initial printout from the *XXI_TYPE*_MEASURES.sas program contains **PROC MEANS** for all of the numeric variables (including the comorbidity indicators) in the output discharge-level dataset. It will contain information for the newly constructed TA*XX*nn and TP*XX*nn flag variables that will later form the numerators for the indicator rates. For each TA*XX*nn and TP*XX*nn flag variable:

- The SUM will contain the total number of observations in the dataset that have the particular outcome of interest.
- For most of the area indicators, the MEAN, MINIMUM, and MAXIMUM usually will be the value "1" because the flag variables have been set either to missing (".") or to a value of "1."

Most of the hospital-level indicators will have a value of "1," "0," or missing (".") For these indicators, a value of "0" was assigned to the TP*XX*nn flag if a particular observation was part of the population at risk for a particular indicator but did not have the particular outcome of interest. For example, TPIQ21=1 indicates a patient who had a Cesarean section (C-section), whereas TPIQ21=0 identifies a patient who had a delivery but not a C-section.

For most of the hospital-level indicators, the MEANS will contain a close approximation of the eventual overall observed indicator rates. The values will change slightly after *XXI*_HOSP_OBSERVED.sas has applied additional parts of the indicator definitions.

N lists the number of observations in the dataset with non-missing values. For the area indicators, *N* for TA*XX*nn will be the same as the SUM. For most of the hospital-level indicators, *N* will contain the denominator for the observed indicator rate.

Differences in the output from *XXI_TYPE*_MEASURES.sas and *XXI*_AREA_OBSERVED.sas and *XXI*_AREA_RISKADJ.sas programs may exist based on missing data. If any cases are missing the Federal Information Processing Standards (FIPS) codes, they will be included in the output from *XXI_TYPE*_MEASURES.sas but will be excluded from the subsequent analyses (the second and third programs).

The *XXI_TYPE*_MEASURES.sas printout also contains a **PROC CONTENTS** that lists all of the variables in the output dataset, including the character variables that are present, and a **PROC PRINT** of the first 24 observations in the output dataset.

6.2 *XXI*_AREA_OBSERVED.sas Program

The purpose of this printout is to provide the observed rates for all area-level indicators. The default printout shows overall results and results by area, but other levels of output also can be specified. Note that risk-adjusted and smoothed rates are shown in the output from the next program.

The printout from the *XXI*_AREA_OBSERVED.SAS program contains **PROC MEANS** for all of the numeric variables in the output summary dataset. It will contain information for the newly constructed TA*XX*nn numerators, the PA*XX*nn denominators, and the OA*XX*nn rates.

The _TYPE_ variable described in the first row of the MEANS table identifies the stratification level for the records in the output dataset. The _TYPE_ variable corresponds to the TYPELVLA parameter values that were specified (see the **Changes** section for the *XXI*_AREA_OBSERVED.SAS program in the software). In this case, _TYPE_ always assumes the value of "8," because only the area-level records are selected.

The *N* statistic for _TYPE_ contains the number of areas in the output summary dataset. A TA*XX*nn numerator variable with a lower value for *N* than _TYPE_ indicates that some of the areas have no outcomes of interest.

The MINIMUM value for the TA*XX*nn numerators will be "1" or higher.

- For the observed rates, the user should **NOT** report the MEANS displayed here but instead should refer to the overall means in the output dataset that are also present in the subsequent PROC PRINT. The MEANS given here are means of the area means (i.e., all areas are given equal weight, regardless of the population in the different areas).

The SUMs for the counter variables TA*XX*nn and PA*XX*nn will contain overall file totals for these data elements. The SUMs for the observed rates have no intuitive meaning.

If the "PRINT" parameter in the *XXI_TYPE*_CONTROL.sas program is set to "1," the subsequent **PROC PRINT** output contains a complete dump of the output summary file. Listed for each record are the stratification values, the PA*XX*nn population denominators for the indicators, the TA*XX*nn outcome numerators for the indicators, and the OA*XX*nn observed rates.

Table 21 lists and describes the column headers shown on the printed output. Each indicator is reported in a separate section, where *XX* refers to the QI module and *nn* corresponds to the two-digit indicator number.

Table 21. Area-Level Print Output

COLUMN HEADING	DESCRIPTION
Obs	Observation 1 is the overall average for the entire dataset (TYPELVLA=0). The remaining observations are individual areas (TYPELVLA=8).
Area	Identifier in the dataset for area.
TA*XX*nn	Number of cases in the numerator.
PA*XX*nn	Number of cases in the denominator (population at risk).
OA*XX*nn	Observed (raw) rate—numerator divided by denominator.

COLUMN HEADING	DESCRIPTION
RA*XX*nn	Risk-adjusted rate—accounts for the difference between the case mix of the reference (general or standard) population and the area's case mix. When stratifications other than area are selected, the RAPDnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
SNA*XX*nn	Reliability of the risk-adjusted rate.
SA*XX*nn	Smoothed rate—rates with removal of fluctuation over time.

Observation 1 (with AREA=*blank*) is the overall average for the entire dataset (TYPELVLA=0). The remaining observations are individual areas (TYPELVLA=8).

The user may wish to express the results in more understandable terms. Multiply the utilization rates by 100,000 to express them as a rate per 100,000 population (e.g., 0.000494*100,000=49.4 pediatric heart surgeries per 100,000 population).

The MEANS table is generated from the permanent area-level output file. The means are provided just for the area-level summary records.

The *N* for all but the TA*XX*nn counter variables should contain the number of different areas (metro areas and counties) in the user's database.

The means, minimums, and maximums have their normal meaning and provide comparisons among the different areas in the user's database. Note: The maximums for the counter variables (the TA*XX*nn and PA*XX*nn variables) are associated with specific areas; these maximums may not match those in the prior *XXI*_AREA_OBSERVED printouts because that run typically will include a record for the entire database.

6.3 *XXI*_AREA_RISKADJ.sas Program

The **PROC PRINT** at the end of this program provides the user's final output. (This printout appears if the "PRINT" parameter in the *XXI_TYPE*_CONTROL.sas program is set to "1.") **Error! Reference source not found.**lists the column headers shown on the printed output and describes each one. Each indicator is reported in a separate section, where *XX* refers to the QI module and *nn* corresponds to the two-digit QI number.

Table 22. Final Area-Level Print Output

COLUMN HEADING	DESCRIPTION
OBS	Observation 1 is the overall average for the entire dataset (TYPELVLA=0). The remaining observations are individual areas (TYPELVLA=8).
AREA	Identifier in the dataset for area.
TA*XX*nn	Number of cases in the numerator.
PA*XX*nn	Number of cases in the denominator (population at risk).
OA*XX*nn	Observed (raw) rate—numerator divided by denominator.
EA*XX*nn	Expected rate—rates the area would have if it performed the same as the reference (general or standard) population given the area's actual case mix (e.g., age, sex, modified Medicare Severity Diagnosis-Related Groups [MS-DRG], and comorbidities).

COLUMN HEADING	DESCRIPTION
RA*XX*nn	Risk-adjusted rate—accounts for the difference between the case mix of the reference (general or standard) population and the provider's (hospital's) case mix. When stratifications other than area are selected, the RA*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
LA*XX*nn	Lower limit of confidence interval of risk-adjusted rate.
UA*XX*nn	Upper limit of confidence interval of risk-adjusted rate.
SNA*XX*nn	Reliability of the risk-adjusted rate.
SA*XX*nn	Smoothed rate—rates with removal of fluctuation over time.
XA*XX*nn	Standard error of smoothed rate.

Observation 1 (with AREA=*blank*) is the overall average for the entire dataset (TYPELVLA=0). The remaining observations are individual areas (TYPELVLA=8).

The user may wish to express the results in more understandable terms. Multiply the utilization rates by 100,000 to express them as a rate per 100,000 population (e.g., 0.000494*100,000=hysterectomies per 100,000 population).

The MEANS table is generated from the permanent area-level output file. The means are provided just for the area-level summary records.

The *N* for all but the TA*XX*nn counter variables should contain the number of different areas (metro areas and counties) in the user's database.

The means, minimums, and maximums have their normal meaning and provide comparisons among the different areas in the user's database. Note: The maximums for the counter variables (the TA*XX*nn and PA*XX*nn variables) are associated with specific areas; these maximums may not match those in the prior *XXI*_AREA_OBSERVED printouts because that run typically will include a record for the entire database.

- For the observed, risk-adjusted, or smoothed rates, the user should **NOT** report the means displayed here; the user instead should refer to the overall means in the output dataset that also are present in the subsequent **PROC PRINT**. The means given here are means of area means (i.e., all areas are given equal weight, regardless of the number of discharges in the different areas).

The sums of the counter variables (the TA*XX*nn and PA*XX*nn variables) yield the overall database totals.

6.4 *XXI*_HOSP_OBSERVED.sas Program

The purpose of this printout is to provide the observed rates for all hospital-level indicators. The default printout shows results by provider (hospital), but other levels of output also can be specified. Note: The risk-adjusted and smoothed rates are shown in the output from the next program.

The printout from the *XXI*_HOSP_OBSERVED.SAS program contains **PROC MEANS** on the hospital-level summary records for all numeric variables in the output summary dataset. It will contain information for the newly constructed specifications, the TP*XX*nn numerators, the PP*XX*nn denominators, and the OP*XX*nn rates.

The _TYPE_ variable described in the MEANS table identifies the stratification level for the records in the output dataset. The _TYPE_ variable corresponds to the TYPELVLH parameter values that were

specified. In this case, _TYPE_ always assumes the value of 16 (for IQI and PSI) or 64 (for PDI) because only the hospital-level records are selected.

The *N* statistic for _TYPE_ contains the number of providers (hospitals) in the output summary dataset. A TP*XX*nn numerator variable with a value for *N* that is lower than the *N* value for _TYPE_ indicates that some of the providers (hospitals) had no outcomes of interest. Similarly, a PP*XX*nn denominator variable with a lower value for *N* than _TYPE_ indicates that for some providers (hospitals), there were no hospital discharges with the outcome of interest.

The MINIMUM value for most of the numerators will usually be "0" because values of "0" were assigned for observations that were part of the population for the rate denominator, but they did not have the particular outcome of interest included in the rate numerator.

- For the observed rates, the user should **NOT** report the MEANS displayed here; instead, the user should refer to the overall means in the output dataset that also are present in the subsequent **PROC PRINT**. The MEANS given here are means of hospital means (i.e., all hospitals are given equal weight, regardless of the number of discharges in the different hospitals).

The SUMs for the counter variables TP*XX*nn and PP*XX*nn will contain overall file totals for these data elements. The SUMs for the observed rates have no intuitive meaning.

If the "PRINT" parameter in the *XXI_TYPE*_CONTROL.sas program is set to "1," the subsequent **PROC PRINT** output contains a complete dump of the output summary file. Listed for each record are the stratification values, the PP*XX*nn population denominators for the hospital-level indicators, the TP*XX*nn outcome numerators for the hospital-level indicators, and the OP*XX*nn observed rates.

6.5 *XXI*_HOSP_RISKADJ.sas Program

The **PROC PRINT** at the end of this program provides the user's **final output**. (This printout appears if the "PRINT" parameter in the *XXI_TYPE*_CONTROL.sas program is set to "1.")

Error! Reference source not found. lists the column headers shown on the printed output and describes each one. Each indicator is reported in a separate section, where *XX* refers to the QI module and *nn* corresponds to the two-digit indicator number.

Table 23. Final Hospital-Level Print Output

COLUMN HEADING	DESCRIPTION
Obs	Observation 1 (with HOSPID=".") is the overall average for the entire dataset (TYPELVLH=0). The remaining observations are individual providers (hospitals) (TYPELVLH=16).
HOSPID	Identifier for each provider (hospital) in the dataset.
AGECAT	Age stratification category—see Appendix J
SEXCAT	Sex stratification category— see Appendix J for TYPELVLH settings.
PAYCAT	Payer stratification category—see Appendix I: and Appendix J for TYPELVLH settings.

COLUMN HEADING	DESCRIPTION
RACECAT	Race stratification category—see Appendix I: and Appendix J for TYPELVLH settings.
TP*XX*nn	Number of cases in the numerator.
PP*XX*nn	Number of cases in the denominator (population at risk).
OP*XX*nn	Observed (raw) rate—numerator divided by denominator.
EP*XX*nn	Expected rate—rates the provider (hospital) would have if the provider (hospital) performed the same as the reference (general or standard) population given the provider's actual case mix (e.g., age, sex, modified MS-DRG, and comorbidities).
RP*XX*nn	Risk-adjusted rate—accounts for the difference between the case mix of the reference population and the provider's (hospital's) case mix. When stratifications other than hospital are selected, the RP*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
LP*XX*nn	Lower limit of confidence interval of risk-adjusted rate.
UP*XX*nn	Upper limit of confidence interval of risk-adjusted rate.
SNP*XX*nn	Reliability of the risk-adjusted rate
SP*XX*nn	Smoothed rate—rates with removal of fluctuation over time.
XP*XX*nn	Standard error of smoothed rate.

Observation 1 (with HOSPID=.) is the overall average for the entire dataset (TYPELVLH=0). The remaining observations are individual providers (hospitals) (TYPELVLH=16). Data will appear under the column headers AGECAT, SEXCAT, PAYCAT, and RACECAT if the user specifies these levels of aggregation.

The user may wish to express the results in more understandable terms:

> Multiply the mortality rates by 1,000 to express them as per 1,000 discharges (e.g., 0.0338*1,000=33.8 deaths per 1,000 discharges).

The MEANS table is generated from the permanent hospital-level output file and is provided for troubleshooting and understanding the user's data but not for reporting. The means are provided only for the hospital-level summary records.

The *N* for all but the TP*XX*nn counter variables should contain the number of hospitals in the user's database.

The means, minimums, and maximums have their normal meaning and provide comparisons among the different providers or hospitals in the user's database.

- For the observed, risk-adjusted, or smoothed rates, the user should **NOT** report the MEANS displayed here but instead refer to the overall means in the output dataset in the **PROC PRINT** labeled "FINAL OUTPUT." The MEANS given here are means of hospital means (i.e., all hospitals are given equal weight, regardless of the number of discharges in the different hospitals).

If the "PRINT" parameter in the *XXI_TYPE*_CONTROL.sas program is set to "1," at the end of the printout is a **PROC PRINT** of the final hospital-level output file. Listed for each level of stratification are

the stratifiers; the numerator and denominator totals for the observed rates; and the observed, risk-adjusted, and smoothed rates.

6.6 *XXI*_HOSP_COMPOSITE.sas Program

The **PROC MEANS** at the end of this program provides the user's **final output**. (This printout appears if the "PRINT" parameter in the *XXI_TYPE*_CONTROL.sas program is set to "1.")

The MEANS table is generated from the permanent hospital-level output file and provides the overall mean of the composite scores for the user's entire sample of hospitals. **Error! Reference source not found.**lists the estimates provided in the MEANS table.

Table 24. Final Hospital-Level Composite Printed Output

COLUMN HEADING	DESCRIPTION
COMPx	Composite score
COMP*x*VAR	Variance for the composite score
COMP*x*SE	Standard error for the composite score
COMPxWHT	Weighted denominator for the composite score

6.7 Comparisons to Benchmark Tables

Users can compare their results to the benchmark data tables provided for each module. The tables provide nationwide comparative rates for the indicators, including numerators, denominators, and observed rates for each indicator overall and stratified by sex, age group, and insurance status. These tables are currently only available for the *International Classification of Diseases, 10th Revision, Clinical Modification/Procedure Classification System* (ICD-10-CM/PCS) coded data in v2021.

Benchmark data tables can be found at the module-specific web pages including:

- PQI: http://www.qualityindicators.ahrq.gov/modules/pqi_resources.aspx
- IQI: http://www.qualityindicators.ahrq.gov/modules/iqi_resources.aspx
- PSI: http://www.qualityindicators.ahrq.gov/modules/psi_resources.aspx
- PDI: http://www.qualityindicators.ahrq.gov/modules/pdi_resources.aspx

Chapter 7. User Support

Technical assistance for the SAS QI software is available through an electronic user support system monitored by the AHRQ QI support team. Users can use the same email address to communicate with AHRQ about suggestions for QI enhancements, general questions, and QI-related comments. AHRQ welcomes users' feedback. The email address for user support and feedback is QISupport@ahrq.hhs.gov.

AHRQ also offers a listserv to keep users informed about the QIs. The listserv is used to announce any QI changes or updates as well as new tools and resources. It also is used to distribute other QI-related information. This is a free service. Follow the process described below to begin receiving important QI information. Users need a computer, internet access, and an email address. The listserv operates like other electronic distribution lists.

To register for the listserv, follow this process:

1. Go to the Email Updates web page: https://subscriptions.ahrq.gov/accounts/USAHRQ/subscriber/new?topic_id=USAHRQ_39
2. On this page, provide a valid email address and click "Submit."
3. On the next page, follow the instructions to complete the subscription.
4. Users will receive a message confirming their enrollment.

If you have any questions about the subscription process, contact AHRQ QI Support by email at QISupport@ahrq.hhs.gov. Users will receive an auto-generated response email message confirming receipt.

Chapter 8. User Feedback for Future Updates

The v2021 SAS QI software was developed and implemented with discharge data available to AHRQ through the Healthcare Cost and Utilization Project (HCUP). The goals of the software were to develop the tools for measurement, illustrate their use, and encourage others to adopt and use the tools for their own applications. As a result, users are encouraged to consider how AHRQ may modify or enhance the software to better serve user's measurement needs and interests.

Modifications to the definitions of outcomes of interest (numerators) or populations at risk (denominators) are possible but not desirable. Maintaining consistent definitions is important. Once definitions are altered, the ability to make comparisons between indicators on the basis of the original definitions is lost. Users are encouraged to identify ways to improve the AHRQ QI methodology and to share their suggestions with AHRQ for future software updates.

Users with suggestions should contact AHRQ QI Support by email at QIsupport@ahrq.hhs.gov. Users will receive an auto-generated response email message confirming receipt.

Appendix A: Additional Resources

The following links may be helpful to users of the AHRQ QIs.

QI resources by module:

- PQI: http://www.qualityindicators.ahrq.gov/Modules/pqi_resources.aspx
- IQI: http://www.qualityindicators.ahrq.gov/Modules/iqi_resources.aspx
- PSI: http://www.qualityindicators.ahrq.gov/Modules/psi_resources.aspx
- PDI: http://www.qualityindicators.ahrq.gov/Modules/pdi_resources.aspx

Other helpful links include:

- SAS QI software: http://www.qualityindicators.ahrq.gov/Software/SAS.aspx
- Frequently Asked Questions: https://www.qualityindicators.ahrq.gov/FAQs_Support/

Table 25. AHRQ Quality Indicators Version 2021 Documentation and Software

DOCUMENTATION AND SOFTWARE	DESCRIPTION
DOCUMENTATION	
• PQI Technical Specifications • IQI Technical Specifications • PSI Technical Specifications • PDI Technical Specifications	Includes a brief description of the measure, numerator inclusion and exclusion criteria, and denominator inclusion and exclusion criteria. ICD-10-CM/PCS coded diagnoses and procedures are listed. Separate specifications are available for each coding system.
• PQI Parameter Estimates • IQI Parameter Estimates • PSI Parameter Estimates • PDI Parameter Estimates	Provides the covariates and coefficients for risk adjustment models and the weights used in the hospital-level composites. The regression coefficients are used to calculate risk-adjusted rates that account for differences in the patient population across areas or hospitals.
• PQI v2021 Benchmark Data Tables • IQI v2021 Benchmark Data Tables • PSI v2021 Benchmark Data Tables • PDI v2021 Benchmark Data Tables	Provides tables of nationwide comparative estimates for each of the indicators, including counts and numerator, denominator, and observed rates stratified by sex, age group, and expected payer. These documents are available only for ICD-10-CM-coded data in v2021.
• Log of Coding Updates and Revisions–PQI • Log of Coding Updates and Revisions–IQI • Log of Coding Updates and Revisions–PSI • Log of Coding Updates and Revisions–PDI	Provides a cumulative summary of all changes to the software, software documentation, and other documents made since the release of version 2.1 of the software in March 2003.
SOFTWARE	
• IQI SAS Software Package • PDI SAS Software Package • PQI SAS Software Package • PSI SAS Software Package	Requires the SAS statistical program distributed by the SAS Institute Inc. The company may be contacted directly regarding the licensing of its products: http://www.sas.com

DOCUMENTATION AND SOFTWARE	DESCRIPTION
• Limited License edition of the 3M™ APR-DRG grouper	Creates APR-DRG variables for use in risk adjustment with the SAS version of IQI software. Instructions for running the software are included in the zip file. The APR-DRG grouper software is available only on the AHRQ QIs website for ICD-10-CM data for use in v2021 QI software.
• AHRQ QI Population File	Includes population data (sex, age, and race by county) that are constructed from public-use Census data and provided for use as a denominator for area-level indicators.
• Listserv Announcement/Release Notes	Announces the release of each version of the AHRQ QI software and documentation and provides a summary of changes and links to relevant pages.

Additional documents may be accessed at the AHRQ QI Resources website: http://www.qualityindicators.ahrq.gov/modules/Default.aspx. Examples of documents available at this link include:

- AHRQ Quality Indicator Empirical Methods v2021
- Improving the AHRQ Quality Indicators (December 2014)
- AHRQ QI Measure Development, Implementation, Maintenance, and Retirement (August 2019)
- List of QI-related publications and presentations

A number of documents are cataloged within the *Archive* section of the AHRQ QI web page for historical purposes: http://www.qualityindicators.ahrq.gov/Archive/default.aspx.

Announcements on the release of new documents and software can be found on the AHRQ QI web page under the *News* section: https://www.qualityindicators.ahrq.gov/News/.

AHRQ provides a free, online query system based on Healthcare Cost and Utilization Project (HCUP) data that provides access to health statistics and information on hospital stays at the national, regional, and State levels. HCUP data are available at: http://hcupnet.ahrq.gov.

Information on the 3M™ APR-DRG system is available at: https://www.3m.com/3M/en_US/health-information-systems-us/drive-value-based-care/patient-classification-methodologies/apr-drgs/.

Appendix B: Lists of Area-Level and Hospital-Level Indicators

Table 26. List of Area-Level Indicators

INDICATOR NAME
PREVENTION QUALITY INDICATORS (PQIs)
PQI 01 Diabetes Short-Term Complications Admission Rate
PQI 03 Diabetes Long-Term Complications Admission Rate
PQI 05 Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate
PQI 07 Hypertension Admission Rate
PQI 08 Heart Failure Admission Rate
PQI 11 Community-Acquired Pneumonia Admission Rate
PQI 12 Urinary Tract Infection Admission Rate
PQI 14 Uncontrolled Diabetes Admission Rate
PQI 15 Asthma in Younger Adults Admission Rate
PQI 16 Lower-Extremity Amputation Among Patients with Diabetes Rate
PQI 90 Prevention Quality Overall Composite
PQI 91 Prevention Quality Acute Composite
PQI 92 Prevention Quality Chronic Composite
PQI 93 Prevention Quality Diabetes Composite
PEDIATRIC QUALITY INDICATORS (PDIs)
PDI 14 Asthma Admission Rate
PDI 15 Diabetes Short-Term Complications Admission Rate
PDI 16 Gastroenteritis Admission Rate
PDI 18 Urinary Tract Infection Admission Rate
PDI 90 Pediatric Quality Overall Composite
PDI 91 Pediatric Quality Acute Composite
PDI 92 Pediatric Quality Chronic Composite

Table 27. List of Hospital-Level Indicators

INDICATOR NAME
INPATIENT QUALITY INDICATORS (IQIs)
IQI 08 Esophageal Resection Mortality Rate
IQI 09 Pancreatic Resection Mortality Rate[1]
IQI 11 Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate[1]
IQI 12 Coronary Artery Bypass Graft (CABG) Mortality Rate
IQI 15 Acute Myocardial Infarction (AMI) Mortality Rate
IQI 16 Heart Failure Mortality Rate
IQI 17 Acute Stroke Mortality Rate[1]
IQI 18 Gastrointestinal Hemorrhage Mortality Rate
IQI 19 Hip Fracture Mortality Rate

INDICATOR NAME
IQI 20 Pneumonia Mortality Rate
IQI 21 Primary Cesarean Delivery Rate, Uncomplicated
IQI 22 Vaginal Birth After Cesarean (VBAC) Delivery Rate, Uncomplicated
IQI 30 Percutaneous Coronary Intervention (PCI) Mortality Rate
IQI 31 Carotid Endarterectomy Mortality Rate
IQI 33 Primary Cesarean Delivery Rate, Uncomplicated
IQI 90 Mortality for Selected Inpatient Procedures
IQI 91 Mortality for Selected Inpatient Conditions
PATIENT SAFETY INDICATORS (PSIs)
PSI 02 Death Rate in Low-Mortality Diagnosis Related Groups (DRGs)
PSI 03 Pressure Ulcer Rate
PSI 04 Death Rate among Surgical Inpatients with Serious Treatable Complications[1]
PSI 05 Retained Surgical Item or Unretrieved Device Fragment Count
PSI 06 Iatrogenic Pneumothorax Rate
PSI 07 Central Venous Catheter-Related Blood Stream Infection Rate
PSI 08 In-Hospital Fall with Hip Fracture Rate[2]
PSI 09 Postoperative Hemorrhage or Hematoma Rate[3]
PSI 10 Postoperative Acute Kidney Injury Requiring Dialysis Rate[4]
PSI 11 Postoperative Respiratory Failure Rate
PSI 12 Perioperative Pulmonary Embolism or Deep Vein Thrombosis (PE/DVT) Rate
PSI 13 Postoperative Sepsis Rate
PSI 14 Postoperative Wound Dehiscence Rate
PSI 15 Abdominopelvic Accidental Puncture or Laceration Rate[5]
PSI 17 Birth Trauma Rate–Injury to Neonate
PSI 18 Obstetric Trauma Rate – Vaginal Delivery with Instrument
PSI 19 Obstetric Trauma Rate – Vaginal Delivery without Instrument
PSI 90 Patient Safety and Adverse Events Composite
PEDIATRIC QUALITY INDICATORS (PDIs)
NQI 03 Neonatal Blood Stream Infection Rate
PDI 01 Accidental Puncture or Laceration Rate
PDI 05 Iatrogenic Pneumothorax Rate
PDI 08 Postoperative Hemorrhage or Hematoma Rate[6]
PDI 09 Postoperative Respiratory Failure Rate
PDI 10 Postoperative Sepsis Rate
PDI 12 Central Venous Catheter-Related Blood Stream Infection Rate

[1] Indicator includes stratum-specific rates.
[2] Previously called "Postoperative Hip Fracture" prior to v6.0.
[3] Previously called "Perioperative Hemorrhage or Hematoma Rate" prior to v2021.
[4] Previously called "Postoperative Physiologic and Metabolic Derangement" prior to v5.0.
[5] Previously called Unrecognized Abdominopelvic Accidental Puncture or Laceration Rate" prior to v2020.
[6] Previously called "Perioperative Hemorrhage or Hematoma Rate" prior to v2021.

Appendix C: AHRQ SAS QI Software Packages

Table 28. List of SAS Programs and Auxiliary Files in Prevention Quality Indicator (PQI) Software Package, v2021

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
SAS PROGRAM			
PQI_AREA_CONTROL.sas	Assigns inputs required by other programs, assigns location of files and programs, designates output features.	User must make modifications and save the program. All subsequent SAS programs are executed in PQI_AREA_CONTROL by setting the individual flag variables; requires the PQI_Dx_Pr_Macros_v*nn*.sas1 program.	1
PQI_AREA_FORMATS.sas	Creates SAS format library used by other programs.	User must set the EXE_FMT flag in the PQI_AREA_CONTROL.sas program to run.	2
PQI_AREA_MEASURES.sas	Assigns numerator flags (TAPQ*xx*).[2]	User must set the EXE_MSR flag in the PQI_AREA_CONTROL.sas program to run.	3
PQI_AREA_OBSERVED.sas	Creates denominators (PAPQ*xx*); calculates observed rates for area-level indicators (OAPQ*xx*).	User must set the EXE_AOBS flag in the PQI_AREA_CONTROL.sas program to run; requires 2000-2020_Population_Files_v2021.txt.	4
PQI_AREA_RISKADJ.sas	Calculates risk-adjusted rates for area-level indicators (PAPQ*xx*, EAPQ*xx*, RAPQ*xx*, LAPQ*xx*, UAPQ*xx*, SAPQ*xx*, and XAPQ*xx*).	User must set the EXE_ARSK flag in the PQI_AREA_CONTROL.sas program to run; requires 2000-2020_Population_Files_v2021.txt, either PQI_Area_Sigvar_Array_v*nn*.sas or PQI_Area_Sigvar_Array_SES_v*nn*.sas, either PQI_Area_Covariates_v*nn*.txt or PQI_Area_Covariates_SES_v*nn*.txt, and either PQI_Area_OE_Array_v*nn*.sas or PQI_Area_OE_SES_Array_v*nn*.sas.	5
AUXILIARY SAS MACRO PROGRAM			
PQI_Dx_Pr_Macros_v*nn*.sas	Contains SAS diagnosis and procedure field macros to be used in PQI_AREA_MEASURES.sas program.	User does not run (but file must be in assigned folder); location of the macro program defined in PQI_AREA_CONTROL.sas and referred to in the same program.	N/A
PQI_Area_Sigvar_Array_v*nn*.sas	Contains array statement of signal variance estimates (adjusting for age and sex but not poverty).	User does not run (but file must be in assigned folder); location of the macro program defined in PQI_AREA_CONTROL.sas; referred to in the PQI_AREA_RISKADJ.sas.	N/A

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
PQI_Area_Sigvar_Array_SES_v*nn*.sas	Contains array statement of signal variance estimates (adjusting for age, sex, and poverty).	User does not run (but file must be in assigned folder); location of the macro program defined in PQI_AREA_CONTROL.sas; referred to in the PQI_AREA_RISKADJ.sas.	N/A
PQI_Area_OE_Array_SES_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population	User does not run (but file must be in assigned folder); location of the macro program defined in PQI_AREA_CONTROL.sas; referred to in the PQI_AREA_RISKADJ.sas.	N/A
PQI_Area_OE_Array_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population	User does not run (but file must be in assigned folder); location of the macro program defined in PQI_AREA_CONTROL.sas; referred to in the PQI_AREA_RISKADJ.sas.	N/A
AUXILIARY ASCII TEXT AND/OR CSV FILE			
2000-2020_Population_Files_v*nn*.txt (download from AHRQ QIs website)	Contains counts by area, sex, age, and race; required for area-level rate calculation.	User does not run (but file must be in assigned folder); location of text file defined in PQI_AREA_CONTROL.sas; referred to in PQI_AREA_OBSERVED.sas and PQI_AREA_RISKADJ.sas.	N/A
PQI_Area_Covariates_v*nn*.txt	Contains regression coefficients for each covariate; risk models adjust for age and sex but do not adjust for poverty; there is one observation per indicator.	User does not run (but file must be in assigned folder); location of text file defined in PQI_AREA_CONTROL.sas; referred to in PQI_AREA_RISKADJ.sas.	N/A
PQI_Area_Covariates_SES_v*nn*.txt	Contains regression coefficients for each covariate; risk models adjust for age, sex, and poverty; there is one observation per indicator.	User does not run (but file must be in assigned folder); location of text file defined in PQI_AREA_CONTROL.sas; referred to in PQI_AREA_RISKADJ.sas.	N/A

[1] *nn* refers to the version year; for example, v2021.
[2] *xx* refers to the quality indicator number.

Table 29. List of SAS Programs and Auxiliary Files in Inpatient Quality Indicators (IQIs) Software Package, v2021

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
SAS PROGRAMS			
IQI_HOSP_CONTROL.sas	Assigns inputs required by other programs; assigns location of files and programs; designates output features.	User must make modifications and save the program. All subsequent SAS programs are executed in IQI_HOSP_CONTROL by setting the individual flag variables; requires the IQI_HOSP_Dx_Pr_Macros_v*nn*.sas[1] program.	1
IQI_HOSP_FORMATS.sas	Creates SAS format library used by other programs.	User must set the EXE_FMT flag in the IQI_HOSP_CONTROL.sas program to run; requires the IQI_HOSP_CCSR_Format_v*nn*.sas program.	2
IQI_HOSP_MEASURES.sas	Assigns numerator flags (TPIQ*xx*).[2]	User must set the EXE_MSR flag in the IQI_HOSP_CONTROL.sas program to run; requires the IQI_HOSP_CCSR_Code_v*nn*.sas program.	3
IQI_HOSP_OBSERVED.sas	Creates denominators (PPIQ*xx*); calculates observed rates for hospital-level indicators (OPIQ*xx*).	User must set the EXE_HOBS flag in the IQI_HOSP_CONTROL.sas program to run.	4
IQI_HOSP_RISKADJ.sas	Calculates risk-adjusted and smoothed rates for hospital-level indicators (EPIQ*xx*, RPIQ*xx*, LPIQ*xx*, UPIQ*xx*, SPIQ*xx*, XPIQ*xx*, and VPIQ*xx*).	User must set the EXE_HRSK flag in the IQI_HOSP_CONTROL.sas program to run; requires IQI_HOSP_Regvars_v*nn*.sas, IQI_HOSP_Sigvar_Array_v*nn*.sas, IQI_HOSP_OE_Array_v*nn*.sas, and CSV auxiliary files.	5
IQI_HOSP_COMPOSITE.sas	Calculates composite scores for IQI 90 and IQI 91 (COMP1, COMP1WHT COMP1VAR, COMP1SE, COMP1LB, COMP1UB, COMP2, COMP2WHT, COMP2VAR, COMP2SE, COMP2LB, and COMP2UB).	User must set the EXE_HCMP flag in the IQI_HOSP_CONTROL.sas program to run; requires IQI_HOSP_Composite_Arrays_v*nn*.sas and IQI_HOSP_Composite_Wt_v*nn*.sas.	6
AUXILIARY SAS MACRO PROGRAMS			
IQI_HOSP_Dx_Pr_Macros_v*nn*.sas	Contains SAS diagnosis and procedure field macros to be used in IQI_HOSP_MEASURES.sas program.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas and referred to in the same program.	N/A

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
IQI_HOSP_CCSR_Format_v*nn*.sas	Contains formats for CCSR variables.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_FORMATS.sas program.	N/A
IQI_HOSP_CCSR_Code_v*nn*.sas	Creates CCSR variables.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_MEASURES.sas program.	N/A
IQI_HOSP_Regvars_v*nn*.sas	Creates risk adjustment variables for use in IQI_HOSP_RISKADJ.sas.	User does not run (but must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_RISKADJ.sas.	N/A
IQI_HOSP_Sigvar_Array_v*nn*.sas	Contains array statements of signal variance and reference rate for each indicator.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_RISKADJ.sas.	N/A
IQI_HOSP_OE_Array_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_RISKADJ.sas.	N/A
IQI_HOSP_Composite_Arrays_v*nn*.sas	Contains array statements of population rate and variance estimates for the component indicators used in IQI 90 and IQI 91 composites.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_COMPOSITE.sas.	N/A
IQI_HOSP_Composite_Wt_v*nn*.sas	Contains composite weights for the component indicators used in IQI 90 and IQI 91 composites.	User does not run (but file must be in assigned folder); location of the macro program defined in IQI_HOSP_CONTROL.sas; referred to in the IQI_HOSP_COMPOSITE.sas.	N/A
AUXILIARY ASCII TEXT AND/OR CSV FILES			
GEE_IQ*xx*_AGE_SEX.csv, LOGISTIC_IQ*xx*_AGE_SEX.csv	Contains regression coefficients for age- and sex-adjusted clinical risk models for identified indicator; one CSV file for each indicator (or stratified indicator).	User does not run (but file must be in assigned folder); location of text file defined in IQI_HOSP_CONTROL.sas; referred to in IQI_HOSP_RISKADJ.sas.	N/A
AUXILIARY PROGRAM			

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
3M™ APR-DRG Limited License grouper (accessed from AHRQ QIs website)	Creates the APR-DRG data elements used in IQI risk adjustment: APR_DRG and APRDRG_RISK_MORTALITY.	APR-DRG variables need to be on user's input data file prior to running the v2021 IQI software; if the APR-DRG variables are not on the input dataset, this stand-alone software can be used to create the variables.	Prior to running IQI software package

[1] *nn* refers to the version year; for example, v2021.
[2] *xx* refers to the quality indicator number.

Table 30. List of SAS Programs and Auxiliary Files in Patient Safety Indicator (PSI) Software Package, v2021[1]

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
SAS PROGRAMS			
PSI_HOSP_CONTROL.sas	Assigns inputs required by other programs; assigns location of files, macro libraries, and programs; designates output features.	User must make modifications and save the program. All subsequent SAS programs are executed in PSI_HOSP_CONTROL by setting the individual flag variables; requires the PSI_HOSP_Dx_Pr_Macros_v*nn*.sas[2] program.	1
PSI_HOSP_FORMATS.sas	Creates SAS format library used by other programs.	User must set the EXE_FMT flag in the PSI_HOSP_CONTROL.sas program to run and confirm that the location of the PSI_Comorb_Format_v*nn*.sas program is correct in the PSI_HOSP_CONTROL.sas program; requires PSI_HOSP_Comorb_Format_v*nn*.sas.	2
PSI_HOSP_MEASURES.sas	Assigns numerator and denominator flags (TPPS*xx*, PPPS*xx*).[3]	User must set the EXE_MSR flag in the PSI_HOSP_CONTROL.sas program to run. Requires the PSI_HOSP_Comorb_Code_v*nn*.sas.	3
PSI_HOSP_OBSERVED.sas	Calculates observed rates for hospital-level indicators (OPPS*xx*).	User must set the EXE_HOBS flag in the PSI_HOSP_CONTROL.sas program to run.	4
PSI_HOSP_RISKADJ.sas	Calculates risk-adjusted rates for hospital-level indicators (PPPS*xx*, EPPS*xx*, RPPS*xx*, LPPS*xx*, UPPS*xx*, SPPS*xx*, XPPS*xx*).	User must set the EXE_HRSK flag in the PSI_HOSP_CONTROL.sas program to run; requires PSI_HOSP_Regvars_v*nn*.sas, PSI_HOSP_OE_Array_v*nn*.sas, PSI_HOSP_Sigvar_v*nn*.sas, and CSV auxiliary files.	5
PSI_HOSP_COMPOSITE.sas	Calculates composite score for PSI 90 (COMP1, COMP1VAR, COMP1SE, COMP1WHT, COMP1LB, COMP1UB).	User must set the EXE_HCMP flag in the PSI_HOSP_CONTROL.sas program to run; requires PSI_HOSP_Composite_Arrays_v*nn*.sas and PSI_HOSP_Composite_Wt_v*nn*.sas.	6

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
AUXILIARY SAS MACRO PROGRAMS			
PSI_HOSP_Dx_Pr_Macros_v*nn*.sas	Contains SAS diagnosis and procedure field macros to be used in PSI_HOSP_MEASURES.sas program.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas and referred to in the same program.	N/A
PSI_HOSP_Comorb_Format_v*nn*.sas	Contains format library macro for comorbidity variables, per Elixhauser comorbidity software refined.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_FORMATS.sas.	N/A
PSI_HOSP_Cormorb_Code_v*nn*.sas	Creates comorbidity variables, using Elixhauser comorbidity software refined.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_MEASURES.sas.	N/A
PSI_HOSP_Regvars_v*nn*.sas	Creates risk adjustment variables for use in PSI_HOSP_RISKADJ.sas.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_RISKADJ.sas.	N/A
PSI_HOSP_Sigvar_Array_v*nn*.sas	Contains array statements of signal variance and reference rate for each indicator.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_RISKADJ.sas.	N/A
PSI_HOSP_OE_Array_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_RISKADJ.sas.	N/A
PSI_HOSP_Composite_Wt_v*nn*.sas	Contains composite weights for the component indicators used in the PSI 90 composite.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_COMPOSITE.sas.	N/A
PSI_HOSP_Composite_Arrays_v*nn*.sas	Contains array statements of population rates and variance estimates for the component indicators used in PSI 90 composite.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI_HOSP_CONTROL.sas; referred to in the PSI_HOSP_COMPOSITE.sas.	N/A
AUXILIARY ASCII TEXT AND/OR CSV FILES			

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
GEE_PS*xx*_AGE_SEX.csv or Logistic_PSxx_AGE_SEX.csv	Contains regression coefficients for age- and sex-adjusted clinical risk models for identified indicator; one CSV file for each indicator (or stratified indicator).	User does not run (but file must be in assigned folder); location of text file defined in PSI_HOSP_CONTROL.sas; referred to in PSI_HOSP_RISKADJ.sas program.	N/A

[1] Includes calculations for all PSIs except PSI 17 Birth Trauma Rate – Injury to Neonates.
[2] *nn* refers to the version year; for example, v2021.
[3] *xx* refers to the quality indicator number.

Table 31. List of SAS Programs and Auxiliary Files in PSI 17 Birth Trauma – Injury to Neonate Rate Software Package, v2021

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
SAS PROGRAMS			
PSI17_HOSP_CONTROL.sas	Assigns inputs required by other programs; assigns location of files and programs; designates output features.	User must make modifications and save the program. All subsequent SAS programs are executed in PSI17_HOSP_CONTROL by setting the individual flag variables; requires the PSI17_HOSP_Dx_Pr_Macros_v*nn*.sas[1] program.	1
PSI17_HOSP_FORMATS.sas	Creates SAS format library used by other programs.	User must set the EXE_FMT flag in the PSI17_HOSP_CONTROL.sas program to run.	2
PSI17_HOSP_MEASURES.sas	Assigns numerator flag for PSI 17 (TPIQ17).	User must set the EXE_MSR flag in the PSI17_HOSP_CONTROL.sas program to run.	3
PSI17_HOSP_OBSERVED.sas	Creates denominator (PPPS17); calculates observed rates for hospital-level indicators (OPPS17).	User must set the EXE_HOBS flag in the PSI17_HOSP_CONTROL.sas program to run.	4
AUXILIARY SAS MACRO PROGRAMS			
PSI17_HOSP_Dx_Pr_Macros_v*nn*.sas	Contains SAS diagnosis and procedure field macros to be used in PSI17_HOSP_MEASURES.sas program.	User does not run (but file must be in assigned folder); location of the macro program defined in PSI17_HOSP_CONTROL.sas and referred to in the same program.	N/A

NOTE: PSI 17 is not risk-adjusted; therefore PSI17_HOSP_RISKADJ.sas does not exist.
[1] *nn* refers to the version year; for example, v2021.

Table 32. List of SAS Programs and Auxiliary Files in Pediatric Quality Indicator (PDI) Software Package,[1] v2021

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
SAS PROGRAMS			
PDI_ALL_CONTROL.sas	Assigns inputs required by other programs; assigns location of files and programs; designates output features.	User must make modifications and save the program. All subsequent SAS programs are executed in PDI_ALL_CONTROL by setting the individual flag variables; requires the PDI_Dx_Pr_Macros_v*nn*.sas[2] program.	1
PDI_ALL_FORMATS.sas	Creates SAS format library used by other programs.	User must set the EXE_FMT flag in the PDI_ALL_CONTROL.sas program to run; requires the PDI_CCSR_Format_v*nn*.sas and PDI_Comorb_Format_vnn.sas programs.	2
PDI_ALL_MEASURES.sas	Assigns numerator flags (TAPD*xx*,[3] TPPD*xx*, TPNQ*xx*, and TPPS17) and risk stratifiers (GPPD01 GPPD02 GPPD08 GPPD11, and GPPD12).	User must set the EXE_MSR flag in the PDI_ALL_CONTROL.sas program to run; requires the PDI_CCSR_Code_v*nn*.sas and PDI_Comorb_Code_vnn.sas programs.	3
PDI_AREA_OBSERVED.sas	Calculates observed rates for area-level indicators (PAPD*xx* and OAPD*xx*).	User must set the EXE_AOBS flag in the PDI_ALL_CONTROL.sas program to run; requires 2000-2020_Population_Files_v2021.txt.	4 Area
PDI_AREA_RISKADJ.sas	Calculates risk-adjusted rates for area-level indicators (EAPD*xx*, RAPD*xx*, LAPD*xx*, UAPD*xx*, SAPD*xx*, and XAPD*xx*).	User must set the EXE_ARSK flag in the PDI_ALL_CONTROL.sas program to run; requires 2000-2020_Population_Files_v2021.txt, either PDI_Area_Sigvar_Array_v*nn*.sas or PDI_Area_Sigvar_Array_SES_v*nn*.sas, either PDI_Area_Covariates_v*nn*.txt or PDI_Area_Covariates_SES_v*nn*.txt, and either PDI_Area_OE_Array_v*nn*.sas or PDI_Area_OE_SES_Array_v*nn*.sas.	5 Area
PDI_HOSP_OBSERVED.sas	Calculates observed rates for hospital-level indicators (OPPD*xx*).	User must set the EXE_HOBS flag in the PDI_ALL_CONTROL.sas program to run.	4 Hospital
PDI_HOSP_STRATIFIED.sas (applies only to PDI 01, PDI 08, PDI 10, and PDI 12)	Calculates observed rates for set of hospital-level PDIs across stratifiers (OPPD08, and OPPD12).	User must set the EXE_HSTR flag in the PDI_ALL_CONTROL.sas program to run.	5 Hospital (optional)

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
PDI_HOSP_RISKADJ.sas	Calculates risk-adjusted rates for hospital-level indicators (EPPD*xx*, RPPD*xx*, LPPD*xx*, UPPD*xx*, SPPD*xx*, SNPPD*xx* and XPPD*xx*).	User must set the EXE_HRSK flag in the PDI_ALL_CONTROL.sas program to run; requires PDI_HOSP_Regvars_v*nn*.sas, PDI_HOSP_OE_Array_v*nn*.sas, PDI_HOSP_Sigvar_v*nn*.sas, and CSV auxiliary files.	6 Hospital
AUXILIARY SAS MACRO PROGRAMS			
PDI_Dx_Pr_Macros_v*nn*.sas	Contains SAS diagnosis and procedure field macros to be used in PDI_ALL_MEASURES.sas program.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas and referred to in the same program.	N/A
PDI_CCSR_Format_v*nn*.sas	Contains formats for CCSR variables.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_ALL_FORMATS.sas program.	N/A
PDI_Comorb_Format_v*nn*.sas	Contains format library macro for comorbidity variables, per Elixhauser comorbidity software refined.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_ALL_FORMATS.sas program.	N/A
PDI_CCSR_Code_v*nn*.sas	Creates CCSR variables.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_ALL_MEASURES.sas program.	N/A
PDI_Comorb_Code_v*nn*.sas	Creates comorbidity variables, using Elixhauser comorbidity software refined.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_ALL_MEASURES.sas program.	N/A
PDI_Area_Sigvar_Array_v*nn*.sas	Contains array statement of signal variance estimates (adjusting for age and sex but not poverty).	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_AREA_RISKADJ.sas.	N/A
PDI_Area_Sigvar_Array_SES_v*nn*.sas	Contains array statement of signal variance estimates (not adjusting for age, sex, and poverty).	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_AREA_RISKADJ.sas program.	N/A

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
PDI_Area_OE_Array_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_AREA_RISKADJ.sas program.	N/A
PDI_Area_OE_Array_SES_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_AREA_RISKADJ.sas program.	N/A
PDI_HOSP_Sigvar_Array_v*nn*.sas	Contains array statements of signal variance and reference rate for each indicator.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_HOSP_RISKADJ.sas program.	N/A
PDI_HOSP_Regvars_Array_v*nn*.sas	Creates risk adjustment variables for use in PDI_HOSP_RISKADJ.sas.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_HOSP_RISKADJ.sas program.	N/A
PDI_HOSP_OE_Array_v*nn*.sas	Contains array statement of the ratio of observed and expected (from the risk adjustment model) national rate for each QI based on the reference population.	User does not run (but file must be in assigned folder); location of the macro program defined in PDI_ALL_CONTROL.sas; referred to in the PDI_HOSP_RISKADJ.sas program.	N/A
AUXILIARY ASCII TEXT AND/OR CSV FILES			
2000-2020_Population_Files_v2021.txt (download from AHRQ QIs website)	Contains counts by area, sex, age, and race; required for area-level rate calculation.	User does not run (but file must be in assigned folder); location of text file defined in PDI_ALL_CONTROL.sas; referred to in PDI_AREA_OBSERVED.sas and PDI_AREA_RISKADJ.sas.	N/A
PDI_Area_Covariates_v*nn*.txt	Contains regression coefficients for risk models for each area-level indicator; risk models do not adjust for SES; one observation per indicator.	User does not run (but file must be in assigned folder); location of text file defined in PDI_ALL_CONTROL.sas; referred to in PDI_AREA_OBSERVED.sas and PDI_AREA_RISKADJ.sas program.	N/A
PDI_Area_Covariates_SES_v*nn*.txt	Contains regression coefficients for risk models for each area-level indicator; risk models adjust for SES; one observation per indicator.	User does not run (but file must be in assigned folder); location of text file defined in PDI_ALL_CONTROL.sas; referred to in PDI_AREA_OBSERVED.sas and PDI_AREA_RISKADJ.sas program.	N/A

SAS PROGRAM/TEXT FILE	PURPOSE/FUNCTION	COMMENTS	ORDER
GEE_PD*xx*_AGE_SEX.csv or GEE_NQ*xx*_AGE_SEX.csv	Contains regression coefficients for age- and sex-, ageday-, birth weight-adjusted clinical risk models for identified indicator; one CSV file for each indicator (or stratified indicator).	User does not run (but file must be in assigned folder); location of text file defined in PDI_HOSP_CONTROL.sas; referred to in PDI_HOSP_RISKADJ.sas program.	N/A

[1] Includes calculations for all PDIs plus PSI 17 Birth Trauma Rate – Injury to Neonates and NQI 03 Neonatal Blood Stream Infection Rate.
[2] *nn* refers to the version year; for example, v2021.
[3] *xx* refers to the quality indicator number.

Appendix D: Complete List of Key Variables Created in the AHRQ SAS QI® Software

Table 33. List of Prevention Quality Indicator (PQI) Variables

ABBREV	PREVENTION QUALITY INDICATOR (PQI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E	R	V	L	U	SN	S	X
PQI 01	TAPQ01	PAPQ01	OAPQ01	EAPQ01	RAPQ01	VAPQ01	LAPQ01	UAPQ01	SNAPQ01	SAPQ01	XAPQ01
PQI 03	TAPQ03	PAPQ03	OAPQ03	EAPQ03	RAPQ03	VAPQ03	LAPQ03	UAPQ03	SNAPQ03	SAPQ03	XAPQ03
PQI 05	TAPQ05	PAPQ05	OAPQ05	EAPQ05	RAPQ05	VAPQ05	LAPQ05	UAPQ05	SNAPQ05	SAPQ05	XAPQ05
PQI 07	TAPQ07	PAPQ07	OAPQ07	EAPQ07	RAPQ07	VAPQ07	LAPQ07	UAPQ07	SNAPQ07	SAPQ07	XAPQ07
PQI 08	TAPQ08	PAPQ08	OAPQ08	EAPQ08	RAPQ08	VAPQ08	LAPQ08	UAPQ08	SNAPQ08	SAPQ08	XAPQ08
PQI 11	TAPQ11	PAPQ11	OAPQ11	EAPQ11	RAPQ11	VAPQ11	LAPQ11	UAPQ11	SNAPQ11	SAPQ11	XAPQ11
PQI 12	TAPQ12	PAPQ12	OAPQ12	EAPQ12	RAPQ12	VAPQ12	LAPQ12	UAPQ12	SNAPQ12	SAPQ12	XAPQ12
PQI 14	TAPQ14	PAPQ14	OAPQ14	EAPQ14	RAPQ14	VAPQ14	LAPQ14	UAPQ14	SNAPQ14	SAPQ14	XAPQ14
PQI 15	TAPQ15	PAPQ15	OAPQ15	EAPQ15	RAPQ15	VAPQ15	LAPQ15	UAPQ15	SNAPQ15	SAPQ15	XAPQ15
PQI 16	TAPQ16	PAPQ16	OAPQ16	EAPQ16	RAPQ16	VAPQ16	LAPQ16	UAPQ16	SNAPQ16	SAPQ16	XAPQ16
PQI 90	TAPQ90	PAPQ90	OAPQ90	EAPQ90	RAPQ90	VAPQ90	LAPQ90	UAPQ90	SNAPQ90	SAPQ90	XAPQ90
PQI 91	TAPQ91	PAPQ91	OAPQ91	EAPQ91	RAPQ91	VAPQ91	LAPQ91	UAPQ91	SNAPQ91	SAPQ91	XAPQ91
PQI 92	TAPQ92	PAPQ92	OAPQ92	EAPQ92	RAPQ92	VAPQ92	LAPQ92	UAPQ92	SNAPQ92	SAPQ92	XAPQ92
PQI 93	TAPQ93	PAPQ93	OAPQ93	EAPQ93	RAPQ93	VAPQ93	LAPQ93	UAPQ93	SNAPQ93	SAPQ93	XAPQ93

Abbreviations: T=numerator (top); P=denominator (pop); O=observed rate; E=expected rate; R=risk-adjusted rate; V=variance of risk-adjusted rate; L=lower limit of confidence interval for risk-adjusted rate; U=upper limit for confidence interval for risk-adjusted rate; SN=reliability of risk-adjusted rate; S=smoothed rate; X=smoothed standard error.

Table 34. List of Inpatient Quality Indicator (IQI) Variables

ABBREV	INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E[1]	R[1]	V[1]	L[1]	U[1]	SN[1]	S[1]	X[1]
IQI 08	TPIQ08	PPIQ08	OPIQ08	EPIQ08	RPIQ08	VPIQ08	LPIQ08	UPIQ08	SNPIQ08	SPIQ08	XPIQ08
IQI 09	TPIQ09	PPIQ09	OPIQ09	EPIQ09	RPIQ09	VPIQ09	LPIQ09	UPIQ09	SNPIQ09	SPIQ09	XPIQ09
IQI 09 WITH CANCER	TPIQ09_WITH CANCER	PPIQ09 WITH CANCER	OPIQ09 WITH CANCER	EPIQ09 WITH CANCER	RPIQ09 WITH CANCER	VPIQ09_WITH_CANCER	LPIQ09_WITH_CANCER	UPIQ09_WITH_CANCER	SNPIQ09_WITH_CANCER	--	--
IQI 09 WITHOUT CANCER	TPIQ09_WITHOUT CANCER	PPIQ09_WITHOUT CANCER	OPIQ09_WITHOUT CANCER	EPIQ09_WITHOUT CANCER	RPIQ09_WITHOUT CANCER	VPIQ09_WITHOUT_CANCER	LPIQ09_WITHOUT_CANCER	UPIQ09_WITHOUT_CANCER	SNPIQ09_WITHOUT_CANCER	--	--
IQI 11	TPIQ11	PPIQ11	OPIQ11	EPIQ11	RPIQ11	VPIQ11	LPIQ11	UPIQ11	SNPIQ11	SPIQ11	XPIQ11
IQI 11 OPEN RUPTURED	TPIQ11_OPEN RUPTURED	PPIQ11_OPEN RUPTURED	OPIQ11_OPEN RUPTURED	EPIQ11_OPEN RUPTURED	RPIQ11_OPEN RUPTURED	VPIQ11_OPEN_RUPTURED	LPIQ11_OPEN_RUPTURED	UPIQ11_OPEN_RUPTURED	SNPIQ11_OPEN_RUPTURED	--	--
IQI 11 OPEN UNRUPTURED	TPIQ11_OPEN UNRUPTURED	PPIQ11_OPEN UNRUPTURED	OPIQ11_OPEN UNRUPTURED	EPIQ11_OPEN UNRUPTURED	RPIQ11_OPEN UNRUPTURED	VPIQ11_OPEN_UNRUPTURED	LPIQ11_OPEN_UNRUPTURED	UPIQ11_OPEN_UNRUPTURED	SNPIQ11_OPEN_UNRUPTURED	--	--
IQI 11 ENDO RUPTURED	TPIQ11_ENDO RUPTURED	PPIQ11_ENDO RUPTURED	OPIQ11_ENDO RUPTURED	EPIQ11_ENDO RUPTURED	RPIQ11_ENDO RUPTURED	VPIQ11_ENDO_RUPTURED	LPIQ11_ENDO_RUPTURED	UPIQ11_ENDO_RUPTURED	SNPIQ11_ENDO_RUPTURED	--	--
IQI 11 ENDO UNRUPTURED	TPIQ11_ENDO UNRUPTURED	PPIQ11_ENDO UNRUPTURED	OPIQ11_ENDO UNRUPTURED	EPIQ11_ENDO UNRUPTURED	RPIQ11_ENDO UNRUPTURED	VPIQ11_ENDO_UNRUPTURED	LPIQ11_ENDO_UNRUPTURED	UPIQ11_ENDO_UNRUPTURED	SNPIQ11_ENDO_UNRUPTURED	--	--
IQI 12	TPIQ12	PPIQ12	OPIQ12	EPIQ12	RPIQ12	VPIQ12	LPIQ12	UPIQ12	SNPIQ12	SPIQ12	XPIQ12

ABBREV	INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E[1]	R[1]	V[1]	L[1]	U[1]	SN[1]	S[1]	X[1]
IQI 15	TPIQ15	PPIQ15	OPIQ15	EPIQ15	RPIQ15	VPIQ15	LPIQ15	UPIQ15	SNPIQ15	SPIQ15	XPIQ15
IQI 16	TPIQ16	PPIQ16	OPIQ16	EPIQ16	RPIQ16	VPIQ16	LPIQ16	UPIQ16	SNPIQ16	SPIQ16	XPIQ16
IQI 17	TPIQ17	PPIQ17	OPIQ17	EPIQ17	RPIQ17	VPIQ17	LPIQ17	UPIQ17	SNPIQ17	SPIQ17	XPIQ17
IQI 17 HEMSTROKE SUBARACH	TPIQ17_HEMSTROKE SUBARACH	PPIQ17_HEMSTROKE SUBARACH	OPIQ17_HEMSTROKE SUBARACH	EPIQ17_HEMSTROKE SUBARACH	RPIQ17_HEMSTROKE SUBARACH	VPIQ17_HEMSTROKE_SUBARACH	LPIQ17_HEMSTROKE_SUBARACH	UPIQ17_HEMSTROKE_SUBARACH	SNPIQ17_HEMSTROKE_SUBARACH	--	--
IQI 17 HEMSTROKE INTRACER	TPIQ17_HEMSTROKE INTRACER	PPIQ17_HEMSTROKE INTRACER	OPIQ17_HEMSTROKE INTRACER	EPIQ17_HEMSTROKE INTRACER	RPIQ17_HEMSTROKE INTRACER	VPIQ17_HEMSTROKE_INTRACER	LPIQ17_HEMSTROKE_INTRACER	UPIQ17_HEMSTROKE_INTRACER	SNPIQ17_HEMSTROKE_INTRACER	--	--
IQI 17 ISCHEMSTROKE	TPIQ17_ISCHEMSTROKE	PPIQ17_ISCHEMSTROKE	OPIQ17_ISCHEMSTROKE	EPIQ17_ISCHEMSTROKE	RPIQ17_ISCHEMSTROKE	VPIQ17_ISCHEMSTROKE	LPIQ17_ISCHEMSTROKE	UPIQ17_ISCHEMSTROKE	SNPIQ17_ISCHEMSTROKE	--	--
IQI 18	TPIQ18	PPIQ18	OPIQ18	EPIQ18	RPIQ18	VPIQ18	LPIQ18	UPIQ18	SNPIQ18	SPIQ18	XPIQ18
IQI 19	TPIQ19	PPIQ19	OPIQ19	EPIQ19	RPIQ19	VPIQ19	LPIQ19	UPIQ19	SNPIQ19	SPIQ19	XPIQ19
IQI 20	TPIQ20	PPIQ20	OPIQ20	EPIQ20	RPIQ20	VPIQ20	LPIQ20	UPIQ20	SNPIQ20	SPIQ20	XPIQ20
IQI 21	TPIQ21	PPIQ21	OPIQ21	--	--	--	--	--	--	--	--
IQI 22	TPIQ22	PPIQ22	OPIQ22	--	--	--	--	--	--	--	--
IQI 30	TPIQ30	PPIQ30	OPIQ30	EPIQ30	RPIQ30	VPIQ30	LPIQ30	UPIQ30	SNPIQ30	SPIQ30	XPIQ30
IQI 31	TPIQ31	PPIQ31	OPIQ31	EPIQ31	RPIQ31	VPIQ31	LPIQ31	UPIQ31	SNPIQ31	SPIQ31	XPIQ31
IQI 33	TPIQ33	PPIQ33	OPIQ33	--	--	--	--	--	--	--	--

ABBREV	INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E[1]	R[1]	V[1]	L[1]	U[1]	SN[1]	S[1]	X[1]
Composite											
IQI 90	COMP1	COMP1WHT	--	--	--	COMP1VAR	COMP1LB	COMP1UB	--	--	COMP1SE
IQI 91	COMP2	COMP2WHT	--	--	--	COMP2VAR	COMP2LB	COMP2UB	--	--	COMP2SE

Abbreviations: T=numerator (top); P=denominator (pop); O=observed rate; R=risk-adjusted rate; E=expected rate; L=lower limit of confidence interval for risk-adjusted rate; SN=reliability of risk-adjusted rate; S=smoothed rate; U=upper limit for confidence interval for risk-adjusted rate; V=variance of risk-adjusted rate; X=smoothed standard error. COMPx=composite score; COMPxLB=lower confidence interval for the composite score; COMPxSE=standard error for the composite score; COMPxUB=upper confidence interval for the composite score; COMPxVAR=variance for the composite score; COMPxWHT=weighted denominator for the composite score;
[1] Dashes (--) indicate the variable is not created in the software.

Table 35. List of Patient Safety Indicator (PSI) Variables[1]

ABBREV	PATIENT SAFETY INDICATOR (PSI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E[2]	R[2]	V[2]	L[2]	U[2]	SN[2]	S[2]	X[2]
PSI 02	TPPS02	PPPS02	OPPS02	EPPS02	RPPS02	VPPS02	LPPS02	UPPS02	SNPPS02	SPPS02	XPPS02
PSI 03	TPPS03	PPPS03	OPPS03	EPPS03	RPPS03	VPPS03	LPPS03	UPPS03	SNPPS03	SPPS03	XPPS03
PSI 04	TPPS04	PPPS04	OPPS04	EPPS04	RPPS04	VPPS04	LPPS04	UPPS04	SNPPS04	SPPS04	XPPS04
PSI 04 DVT PE	TPPS04_DVT_PE	PPPS04_DVT_PE	OPPS04_DVT_PE	EPPS04_DVT_PE	RPPS04_DVT_PE	VPPS04_DVT_PE	LPPS04_DVT_PE	UPPS04_DVT_PE	SNPPS04_DVT_PE	--	--
PSI 04 PNEUMONIA	TPPS04_PNEUMONIA	PPPS04_PNEUMONIA	OPPS04_PNEUMONIA	EPPS04_PNEUMONIA	RPPS04_PNEUMONIA	VPPS04_PNEUMONIA	LPPS04_PNEUMONIA	UPPS04_PNEUMONIA	SNPPS04_PNEUMONIA	--	--
PSI 04 SEPSIS	TPPS04_SEPSIS	PPPS04_SEPSIS	OPPS04_SEPSIS	EPPS04_SEPSIS	RPPS04_SEPSIS	VPPS04_SEPSIS	LPPS04_SEPSIS	UPPS04_SEPSIS	SNPPS04_SEPSIS	--	--

ABBREV	PATIENT SAFETY INDICATOR (PSI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E[2]	R[2]	V[2]	L[2]	U[2]	SN[2]	S[2]	X[2]
PSI 04 SHOCK	TPPS04_SHOCK	PPPS04_SHOCK	OPPS04_SHOCK	EPPS04_SHOCK	RPPS04_SHOCK	VPPS04_SHOCK	LPPS04_SHOCK	UPPS04_SHOCK	SNPPS04_SHOCK	--	--
PSI 04 GIHEMORRHAGE	TPPS04_GIHEMORRHAGE	PPPS04_GIHEMORRHAGE	OPPS04_GIHEMORRHAGE	EPPS04_GIHEMORRHAGE	RPPS04_GIHEMORRHAGE	VPPS04_GIHEMORRHAGE	LPPS04_GIHEMORRHAGE	UPPS04_GIHEMORRHAGE	SNPPS04_GIHEMORRHAGE	--	--
PSI 05	TPPS05	PPPS05	OPPS05	--	--	--	--	--	--	--	--
PSI 06	TPPS06	PPPS06	OPPS06	EPPS06	RPPS06	VPPS06	LPPS06	UPPS06	SNPPS06	SPPS06	XPPS06
PSI 07	TPPSS07	PPPS07	OPPS07	EPPS07	RPPS07	VPPS07	LPPS07	UPPS07	SNPPS07	SPPS07	XPPS07
PSI 08	TPPS08	PPPS08	OPPS08	EPPS08	RPPS08	VPPS08	LPPS08	UPPS08	SNPPS08	SPPS08	XPPS08
PSI 09	TPPS09	PPPS09	OPPS09	EPPS09	RPPS09	VPPS09	LPPS09	UPPS09	SNPPS09	SPPS09	XPPS09
PSI 10	TPPS10	PPPS10	OPPS10	EPPS10	RPPS10	VPPS10	LPPS10	UPPS10	SNPPS10	SPPS10	XPPS10
PSI 11	TPPS11	PPPS11	OPPS11	EPPS11	RPPS11	VPPS11	LPPS11	UPPS11	SNPPS11	SPPS11	XPPS11
PSI 12	TPPS12	PPPS12	OPPS12	EPPS12	RPPS12	VPPS12	LPPS12	UPPS12	SNPPS12	SPPS12	XPPS12
PSI 13	TPPS13	PPPS13	OPPS13	EPPS13	RPPS13	VPPS13	LPPS13	UPPS13	SNPPS13	SPPS13	XPPS13
PSI 14	TPPS14	PPPS14	OPPS14	EPPS14	RPPS14	VPPS14	LPPS14	UPPS14	SNPPS14	SPPS14	XPPS14
PSI 14 OPEN	TPPS14_OPEN	PPPS14_OPEN	OPPS14_OPEN	EPPS14_OPEN	RPPS14_OPEN	VPPS14_OPEN	LPPS14_OPEN	UPPS14_OPEN	SNPPS14_OPEN	--	--
PSI 14 NONOPEN	TPPS14_NONOPEN	PPPS14_NONOPEN	OPPS14_NONOPEN	EPPS14_NONOPEN	RPPS14_NONOPEN	VPPS14_NONOPEN	LPPS14_NONOPEN	UPPS14_NONOPEN	SNPPS14_NONOPEN	--	--
PSI 15	TPPS15	PPPS15	OPPS15	EPPS15	RPPS15	VPPS15	LPPS15	UPPS15	SNPPS15	SPPS15	XPPS15
PSI 17	TPPS17	PPPS17	OPPS17	--	--	--	--	--	--	--	--
PSI 18	TPPS18	PPPS18	OPPS18	--	--	--	--	--	--	--	--
PSI 19	TPPS19	PPPS19	OPPS19	--	--	--	--	--	--	--	--
Composite											

ABBREV	PATIENT SAFETY INDICATOR (PSI) VARIABLE NAMES VARIABLE PREFIX										
	T	P	O	E[2]	R[2]	V[2]	L[2]	U[2]	SN[2]	S[2]	X[2]
PSI 90	COMP1	COMP1WHT	--	--	--	COMP1VAR	COMP1LB	COMP1UB	--	--	COMP1SE

Abbreviations: COMP1=composite score; COMP1LB=lower confidence interval for the composite score; COMP1SE=standard error for the composite score; COMP1UB=upper confidence interval for the composite score; COMP1VAR=variance for the composite score; COMP1WHT=weighted denominator for the composite score; E=expected rate; L=lower limit of confidence interval for risk-adjusted rate; O=observed rate; P=denominator (pop); Q=present on admission flag; R=risk-adjusted rate; SN=reliability of risk-adjusted rate; S=smoothed rate; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; V=variance of risk-adjusted rate; X=smoothed standard error.
[1] All variables created in PSI software package except PSI 17; variables for PSI 17 are created in PSI 17 software package and PDI software package.
[2] Dashes (--) indicate the variable is not created in the software.

Table 36. Complete List of Pediatric Quality Indicator (PDI) Variables[1]

PEDIATRIC QUALITY INDICATOR (PDI) VARIABLE NAMES VARIABLE PREFIX												
ABBREV	T	P	G[2]	O	E	R	V	L	U	SN	S	X
NQI 03	TPNQ03	PPNQ03	--	OPNQ03	EPNQ03	RPNQ03	VPNQ03	LPNQ03	UPNQ03	SNPNQ03	SPNQ03	XPNQ03
PDI 01	TPPD01	PPPD01	GPPD01	OPPD01	EPPD01	RPPD01	VPPD01	LPPD01	UPPD01	SNPPD01	SPPD01	XPPD01
PDI 05	TPPD05	PPPD05	--	OPPD05	EPPD05	RPPD05	VPPD05	LPPD05	UPPD05	SNPPD05	SPPD05	XPPD05
PDI 08	TPPD08	PPPD08	GPPD08	OPPD08	EPPD08	RPPD08	VPPD08	LPPD08	UPPD08	SNPPD08	SPPD08	XPPD08
PDI 09	TPPD09	PPPD09	--	OPPD09	EPPD09	RPPD09	VPPD09	LPPD09	UPPD09	SNPPD09	SPPD09	XPPD09
PDI 10	TPPD10	PPPD10	GPPD10	OPPD10	EPPD10	RPPD10	VPPD10	LPPD10	UPPD10	SNPPD10	SPPD10	XPPD10
PDI 12	TPPD12	PPPD12	GPPD12	OPPD12	EPPD12	RPPD12	VPPD12	LPPD12	UPPD12	SNPPD12	SPPD12	XPPD12
PDI 14	TAPD14	PAPD14	--	OAPD14	EAPD14	RAPD14	VAPD14	LAPD14	UAPD14	SNAPD14	SAPD14	XAPD14
PDI 15	TAPD15	PAPD15	--	OAPD15	EAPD15	RAPD15	VAPD15	LAPD15	UAPD15	SNAPD15	SAPD15	XAPD15
PDI 16	TAPD16	PAPD16	--	OAPD16	EAPD16	RAPD16	VAPD16	LAPD16	UAPD16	SNAPD16	SAPD16	XAPD16
PDI 18	TAPD18	PAPD18	--	OAPD18	EAPD18	RAPD18	VAPD18	LAPD18	UAPD18	SNAPD18	SAPD18	XAPD18
PDI 90	TAPD90	PAPD90	--	OAPD90	EAPD90	RAPD90	VAPD90	LAPD90	UAPD90	SNAPD90	SAPD90	XAPD90
PDI 91	TAPD91	PAPD91	--	OAPD91	EAPD91	RAPD91	VAPD91	LAPD91	UAPD91	SNAPD91	SAPD91	XAPD91

PEDIATRIC QUALITY INDICATOR (PDI) VARIABLE NAMES VARIABLE PREFIX												
ABBREV	**T**	**P**	**G[2]**	**O**	**E**	**R**	**V**	**L**	**U**	**SN**	**S**	**X**
PDI 92	TAPD92	PAPD92	--	OAPD92	EAPD92	RAPD92	VAPD92	LAPD92	UAPD92	SNAPD92	SAPD92	XAPD92

Abbreviations: E=expected rate; G=strata flag; L=lower limit of confidence interval for risk-adjusted rate; O=observed rate; P=denominator (pop); Q=present on admission flag; R=risk-adjusted rate; S=smoothed rate; SN=reliability of risk-adjusted rate; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; V=variance of risk-adjusted rate; X=smoothed standard error.

[1] Variables for PSI 17 are also included in the PDI software package.

[2] Dashes (--) indicate the variable is not created in the software.

Appendix E: SAS Input Data and Output Analytic Files

Table 37. SAS Input and Output Files for the Prevention Quality Indicators (PQI) Software Package

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
PQI_AREA_MEASURES.sas	&DISCHARGE. (user dataset name)	AGE ASOURCE DRG DQTR DX1-DXn KEY MDC PAY1 POINTOFORIGINUB04 PR1-PRn PSTCO RACE SEX YEAR	&OUTFILE_MEAS. PQMSR_&SUFX.[1]	KEY FIPST FIPSTCO DRG MDC YEAR DQTR AGECAT AGECCAT POPCAT RACECAT SEXCAT TAPQ01 TAPQ03 TAPQ05 TAPQ07 TAPQ08 TAPQ11 TAPQ12 TAPQ14-TAPQ16 TAPQ90-TAPQ93
PQI_AREA_OBSERVED.sas	&OUTFILE_MEAS. PQMSR_*&SUFX.*	All variables in file	&OUTFILE_AREAOBS. PQAO_&SUFX.	MAREA AGECAT SEXCAT RACECAT _TYPE_ TAPQ01 TAPQ03 TAPQ05 TAPQ07 TAPQ08 TAPQ11 TAPQ12 TAPQ14-TAPQ16 TAPQ90-TAPQ93 PAPQ01 PAPQ03 PAPQ05 PAPQ07 PAPQ08 PAPQ11 PAPQ12 PAPQ14-PAPQ16 PAPQ90-PAPQ93 OAPQ01 OAPQ03 OAPQ05 OAPQ07 OAPQ08 OAPQ11 OAPQ12 OAPQ14-OAPQ16 OAPQ90-OAPQ93
	POPFILE 2000-2020_Population_Files_V2020.txt	FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2020		
PQI_AREA_RISKADJ.sas	&OUTFILE_MEAS. PQMSR_*&SUFX.*	All variables in file	&OUTFILE_AREARISK. PQARSKADJ_*&SUFX.*	MAREA AGECAT SEXCAT RACECAT _TYPE_ TAPQ01 TAPQ03 TAPQ05 TAPQ07 TAPQ08 TAPQ11 TAPQ12 TAPQ14-TAPQ16 TAPQ90-TAPQ93 PAPQ01 PAPQ03 PAPQ05 PAPQ07 PAPQ08 PAPQ11 PAPQ12 PAPQ14-PAPQ16 PAPQ90-PAPQ93 OAPQ01 OAPQ03 OAPQ05 OAPQ07 OAPQ08 OAPQ11 OAPQ12 OAPQ14-OAPQ16 OAPQ90-OAPQ93 EAPQ01 EAPQ03 EAPQ05 EAPQ07 EAPQ08 EAPQ11 EAPQ12 EAPQ14-EAPQ16 EAPQ90-EAPQ93 RAPQ01 RAPQ03 RAPQ05 RAPQ07 RAPQ08 RAPQ11 RAPQ12 RAPQ14-RAPQ16 RAPQ90-RAPQ93 LAPQ01 LAPQ03 LAPQ05 LAPQ07 LAPQ08 LAPQ11 LAPQ12 LAPQ14-LAPQ16 LAPQ90-LAPQ93 UAPQ01 UAPQ03 UAPQ05 UAPQ07 UAPQ08 UAPQ11 UAPQ12 UAPQ14-UAPQ16 UAPQ90-UAPQ93 SAPQ01 SAPQ03 SAPQ05 SAPQ07 SAPQ08 SAPQ11 SAPQ12 SAPQ14-SAPQ16 SAPQ90-SAPQ93 SNAPQ01 SNAPQ03 SNAPQ05 SNAPQ07 SNAPQ08 SNAPQ11 SNAPQ12 SNAPQ14-SNAPQ16 SNAPQ90-SNAPQ93 VAPQ01 VAPQ03 VAPQ05 VAPQ07 VAPQ08 VAPQ11 VAPQ12 VAPQ14-VAPQ16 VAPQ90-VAPQ93 XAPQ01 XAPQ03 XAPQ05 XAPQ07 XAPQ08 XAPQ11 XAPQ12 XAPQ14-XAPQ16 XAPQ90-XAPQ93
	POPFILE 2000-2020_Population_Files_V2020.txt	FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2020		

NOTE: [1] *&SUFX.* refers to the suffix assigned by the user in the control program (default is v2021).

Table 38. SAS Input and Output Files for the IQI Software Package

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
IQI_HOSP_MEASURES.sas	&DISCHARGE. (user dataset name)	AGE APRDRG[1] APRDRG_RISK_MORTALITY[1] ASOURCE DISP DRG DQTR DX1-DXn DXPOA1-DXPOAn HOSPID KEY MDC PAY1 POINTOFORIGINUB04 PR1-PRn RACE SEX YEAR	&OUTFILE_MEAS. IQMSR_*&SUFX.*[2]	KEY HOSPID DRG MDC SEX AGE YEAR DQTR AGECAT SEXCAT RACECAT PAYCAT APRDRG APRDRG_RISK_MORTALITY COVIDDX D_DXCCSR_: TPIQ08-TPIQ09 TPIQ09_WITH_CANCER TPIQ09_WITHOUT_CANCER TPIQ11 TPIQ11_OPEN_RUPTURED TPIQ11_OPEN_UNRUPTURED TPIQ11_ENDO_RUPTURED TPIQ11_ENDO_UNRUPTURED TPIQ12 TPIQ15-TPIQ17 TPIQ17_HEMSTROKE_SUBARACH TPIQ17_HEMSTROKE_INTRACER TPIQ17_ISCHEMSTROKE TPIQ18-TPIQ20 TPIQ30 TPIQ31 TPIQ33
IQI_HOSP_OBSERVED.sas	&OUTFILE_MEAS. IQMSR_*&SUFX.*	All variables in file	&OUTFILE_HOSPOBS. IQHO_&SUFX.	HOSPID AGECAT SEXCAT RACECAT PAYCAT _TYPE_ TPIQ08 TPIQ09 TPIQ09_WITH_CANCER TPIQ09_WITHOUT_CANCER TPIQ11 TPIQ11_OPEN_RUPTURED TPIQ11_OPEN_UNRUPTURED TPIQ11_ENDO_RUPTURED TPIQ11_ENDO_UNRUPTURED TPIQ12 TPIQ15-TPIQ17 TPIQ17_HEMSTROKE_SUBARACH TPIQ17_HEMSTROKE_INTRACER TPIQ17_ISCHEMSTROKE TPIQ18-TPIQ20 TPIQ30 TPIQ31 TPIQ33 PPIQ08 PPIQ09 PPIQ09_WITH_CANCER PPIQ09_WITHOUT_CANCER PPIQ11 PPIQ11_OPEN_RUPTURED PPIQ11_OPEN_UNRUPTURED PPIQ11_ENDO_RUPTURED PPIQ11_ENDO_UNRUPTURED PPIQ12 PPIQ15-PPIQ17 PPIQ17_HEMSTROKE_SUBARACH PPIQ17_HEMSTROKE_INTRACER PPIQ17_ISCHEMSTROKE PPIQ18-PPIQ20 PPIQ30 PPIQ31 PPIQ33 OPIQ08 OPIQ09 OPIQ09_WITH_CANCER OPIQ09_WITHOUT_CANCER OPIQ11 OPIQ11_OPEN_RUPTURED OPIQ11_OPEN_UNRUPTURED OPIQ11_ENDO_RUPTURED OPIQ11_ENDO_UNRUPTURED OPIQ12 OPIQ15-OPIQ17 OPIQ17_HEMSTROKE_SUBARACH OPIQ17_HEMSTROKE_INTRACER OPIQ17_ISCHEMSTROKE OPIQ18-OPIQ20 OPIQ30 OPIQ31 OPIQ33

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
IQI_HOSP_RISKADJ.sas	&OUTFILE_MEAS. IQMSR_*&SUFX.*	All variables in the file	&OUTFILE_HOSPRISK. IQHRSKADJ_*&SUFX.*	HOSPID AGECAT SEXCAT PAYCAT RACECAT_TYPE_ TPIQ08 TPIQ09 TPIQ09_WITH_CANCER TPIQ09_WITHOUT_CANCER TPIQ11 TPIQ11_OPEN_RUPTURED TPIQ11_OPEN_UNRUPTURED TPIQ11_ENDO_RUPTURED TPIQ11_ENDO_UNRUPTURED TPIQ12 TPIQ15-TPIQ17 TPIQ17_HEMSTROKE_SUBARACH TPIQ17_HEMSTROKE_INTRACER TPIQ17_ISCHEMSTROKE TPIQ18-TPIQ20 TPIQ30 TPIQ31 PPIQ08 PPIQ09 PPIQ09_WITH_CANCER PPIQ09_WITHOUT_CANCER PPIQ11 PPIQ11_OPEN_RUPTURED PPIQ11_OPEN_UNRUPTURED PPIQ11_ENDO_RUPTURED PPIQ11_ENDO_UNRUPTURED PPIQ12 PPIQ15-PPIQ17 PPIQ17_HEMSTROKE_SUBARACH PPIQ17_HEMSTROKE_INTRACER PPIQ17_ISCHEMSTROKE PPIQ18-PPIQ20 PPIQ30 PPIQ31 OPIQ08 OPIQ09 OPIQ09_WITH_CANCER OPIQ09_WITHOUT_CANCER OPIQ11 OPIQ11_OPEN_RUPTURED OPIQ11_OPEN_UNRUPTURED OPIQ11_ENDO_RUPTURED OPIQ11_ENDO_UNRUPTURED OPIQ12 OPIQ15-OPIQ17 OPIQ17_HEMSTROKE_SUBARACH OPIQ17_HEMSTROKE_INTRACER OPIQ17_ISCHEMSTROKE OPIQ18-OPIQ20 OPIQ30 OPIQ31 EPIQ08 EPIQ09 EPIQ09_WITH_CANCER EPIQ09_WITHOUT_CANCER EPIQ11 EPIQ11_EPEN_RUPTURED EPIQ11_EPEN_UNRUPTURED EPIQ11_ENDO_RUPTURED EPIQ11_ENDO_UNRUPTURED EPIQ12 EPIQ15-EPIQ17 EPIQ17_HEMSTROKE_SUBARACH EPIQ17_HEMSTROKE_INTRACER EPIQ17_ISCHEMSTROKE EPIQ18-EPIQ20 EPIQ30 EPIQ31 RPIQ08 RPIQ09 RPIQ09_WITH_CANCER RPIQ09_WITHOUT_CANCER RPIQ11 RPIQ11_RPEN_RUPTURED RPIQ11_RPEN_UNRUPTURED RPIQ11_ENDO_RUPTURED RPIQ11_ENDO_UNRUPTURED RPIQ12 RPIQ15-RPIQ17 RPIQ17_HEMSTROKE_SUBARACH RPIQ17_HEMSTROKE_INTRACER RPIQ17_ISCHEMSTROKE RPIQ18-RPIQ20 RPIQ30 RPIQ31 VPIQ08 VPIQ09 VPIQ09_WITH_CANCER VPIQ09_WITHOUT_CANCER VPIQ11 VPIQ11_VPEN_RUPTURED VPIQ11_VPEN_UNRUPTURED VPIQ11_ENDO_RUPTURED

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
	&OUTFILE_HOSPOBS. IQHO_&SUFX.	All variables in the file		VPIQ11_ENDO_UNRUPTURED VPIQ12 VPIQ15-VPIQ17 VPIQ17_HEMSTROKE_SUBARACH VPIQ17_HEMSTROKE_INTRACER VPIQ17_ISCHEMSTROKE VPIQ18-VPIQ20 VPIQ30 VPIQ31 LPIQ08 LPIQ09 LPIQ09_WITH_CANCER LPIQ09_WITHOUT_CANCER LPIQ11 LPIQ11_LPEN_RUPTURED LPIQ11_LPEN_UNRUPTURED LPIQ11_ENDO_RUPTURED LPIQ11_ENDO_UNRUPTURED LPIQ12 LPIQ15-LPIQ17 LPIQ17_HEMSTROKE_SUBARACH LPIQ17_HEMSTROKE_INTRACER LPIQ17_ISCHEMSTROKE LPIQ18-LPIQ20 LPIQ30 LPIQ31 UPIQ08 UPIQ09 UPIQ09_WITH_CANCER UPIQ09_WITHOUT_CANCER UPIQ11 UPIQ11_UPEN_RUPTURED UPIQ11_UPEN_UNRUPTURED UPIQ11_ENDO_RUPTURED UPIQ11_ENDO_UNRUPTURED UPIQ12 UPIQ15-UPIQ17 UPIQ17_HEMSTROKE_SUBARACH UPIQ17_HEMSTROKE_INTRACER UPIQ17_ISCHEMSTROKE UPIQ18-UPIQ20 UPIQ30 UPIQ31 SNPIQ08 SNPIQ09 SNPIQ09_WITH_CANCER SNPIQ09_WITHOUT_CANCER SNPIQ11 SNPIQ11_SNPEN_RSNPTURED SNPIQ11_SNPEN_UNRSNPTURED SNPIQ11_ENDO_RSNPTURED SNPIQ11_ENDO_UNRSNPTURED SNPIQ12 SNPIQ15-SNPIQ17 SNPIQ17_HEMSTROKE_SUBARACH SNPIQ17_HEMSTROKE_INTRACER SNPIQ17_ISCHEMSTROKE SNPIQ18-SNPIQ20 SNPIQ30 SNPIQ31 SPIQ08 SPIQ09 SPIQ11 SPIQ12 SPIQ15-SPIQ17 SPIQ18-SPIQ20 SPIQ30 SPIQ31 XPIQ08 XPIQ09 XPIQ11 XPIQ12 XPIQ15-XPIQ17 XPIQ18-XPIQ20 XPIQ30 XPIQ31
IQI_HOSP_COMPOSITE.sas	&OUTFILE_HOSPRISK. IQHRSKADJ_*&SUFX.*	All variables in the file	&OUTFILE_COMP. IQCOMP_*&SUFX.*	HOSPID IQC90 IQC90VAR IQC90SE IQC90WHT IQC90LB IQC90UB IQC91 IQC91VAR IQC91SE IQC91WHT IQC91LB IQC91UB

[1] Only if user sets APRDRGFG = 1 in the IQI_HOSP_CONTROL program. [2] *&SUFX.* refers to the suffix assigned by the user in the control program (default is v2021).

Table 39. SAS Input and Output Files for the PSI Software Package

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
PSI_HOSP_MEASURES.sas	&DISCHARGE. (user dataset name)	AGE ASOURCE ATYPE DISP DRG DQTR DX1-DXn DXPOA1-DXPOAn HOSPID KEY LOS MDC PAY1 POINTOFORIGINUB04 PR1-PRn PRDAY1-PRDAYn[1] RACE SEX YEAR	&OUTFILE_MEAS. PSMSR_*&SUFX*.[2]	KEY HOSPID DRG MDC MDRG YEAR DQTR AGECAT SEXCAT RACECAT PAYCAT SEX AGE LOS COVIDDX TRNSFER AIDS ALCOHOL ANEMDEF ARTH BLDLOSS CANCER_LYMPH CANCER_LEUK CANCER_METS CANCER_NSITU CANCER_SOLID CBVD CHF COAG DEMENTIA DEPRESS DIAB_UNCX DIAB_CX DRUG_ABUSE HTN_CX HTN_UNCX LIVER_MLD LIVER_SEV LUNG_CHRONIC NEURO_MOVT NEURO_OTH NEURO_SEIZ OBESE PARALYSIS PERIVASC PSYCHOSES PULMCIRC RENLFL_MOD RENLFL_SEV THYROID_HYPO THYROID_OTH ULCER_PEPTIC VALVE WGHTLOSS DNR MEDICDR TPPS02-TPPS04 TPPS04_DVT_PE TPPS04_PNEUMONIA TPPS04_SEPSIS TPPS04_SHOCK TPPS04_GIHEMORRHAGE TPPS05-TPPS14 TPPS14_OPEN TPPS14_NONOPEN TPPS15 TPPS18 TPPS19 PPPS02-PPPS04 PPPS04_DVT_PE PPPS04_PNEUMONIA PPPS04_SEPSIS PPPS04_SHOCK PPPS04_GIHEMORRHAGE PPPS05-PPPS14 PPPS14_OPEN PPPS14_NONOPEN PPPS15 PPPS18 PPPS19 RegVarPS04_DVT_PE_ANY RegVarPS04_DVT_PE_SEVERE RegVarPS04_PNEUMONIA_ANY RegVarPS04_PNEUMONIA_SEVERE RegVarPS04_SEPSIS_ANY RegVarPS04_SEPSIS_SEVERE RegVarPS04_SHOCK_ANY RegVarPS04_SHOCK_SEVERE RegVarPS04_GIHEMORRHAGE_ANY RegVarPS04_GIHEMORRHAGE_SEVERE
PSI_HOSP_OBSERVED.sas	&OUTFILE_MEAS. PSMSR_*&SUFX*.	All variables in file	&OUTFILE_HOSPOBS. PSHO_&SUFX.	HOSPID AGECAT SEXCAT PAYCAT RACECAT_TYPE_ TPPS02-TPPS04 TPPS04_DVT_PE TPPS04_PNEUMONIA TPPS04_SEPSIS TPPS04_SHOCK TPPS04_GIHEMORRHAGE TPPS05-TPPS14 TPPS14_OPEN TPPS14_NONOPEN TPPS15 TPPS18 TPPS19 PPPS02-PPPS04 PPPS04_DVT_PE PPPS04_PNEUMONIA PPPS04_SEPSIS PPPS04_SHOCK PPPS04_GIHEMORRHAGE PPPS05-PPPS14 PPPS14_OPEN PPPS14_NONOPEN PPPS15 PPPS18 PPPS19 OPPS02-OPPS04 OPPS04_DVT_PE OPPS04_PNEUMONIA OPPS04_SEPSIS OPPS04_SHOCK OPPS04_GIHEMORRHAGE OPPS05-OPPS14 OPPS14_OPEN OPPS14_NONOPEN OPPS15 OPPS18 OPPS19

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
PSI_HOSP_RISKADJ.sas	&OUTFILE_MEAS. PSMSR_&SUFX.	All variables in the file	&OUTFILE_HOSPRISK. PSHRSKADJ_&*SUFX*.	HOSPID _TYPE_ TPPS02-TPPS04 TPPS04_DVT_PE TPPS04_PNEUMONIA TPPS04_SEPSIS TPPS04_SHOCK TPPS04_GIHEMORRHAGE TPPS06-TPPS14 TPPS14_OPEN TPPS14_NONOPEN TPPS15 PPPS02-PPPS04 PPPS04_DVT_PE PPPS04_PNEUMONIA PPPS04_SEPSIS PPPS04_SHOCK PPPS04_GIHEMORRHAGE PPPS06-PPPS14 PPPS14_OPEN PPPS14_NONOPEN PPPS15 OPPS02-OPPS04 OPPS04_DVT_PE OPPS04_PNEUMONIA OPPS04_SEPSIS OPPS04_SHOCK OPPS04_GIHEMORRHAGE OPPS06-OPPS14 OPPS14_OPEN OPPS14_NONOPEN OPPS15 EPPS02-EPPS04 EPPS04_DVT_PE EPPS04_PNEUMONIA EPPS04_SEPSIS EPPS04_SHOCK EPPS04_GIHEMORRHAGE EPPS06-EPPS14 EPPS14_EPEN EPPS14_NONEPEN EPPS15 RPPS02-RPPS04 RPPS04_DVT_PE RPPS04_PNEUMONIA RPPS04_SRPSIS RPPS04_SHOCK RPPS04_GIHEMORRHAGE RPPS06-RPPS14 RPPS14_RPEN RPPS14_NONRPEN RPPS15 LPPS02-LPPS04 LPPS04_DVT_PE LPPS04_PNEUMONIA LPPS04_SLPSIS LPPS04_SHOCK LPPS04_GIHEMORRHAGE LPPS06-LPPS14 LPPS14_LPEN LPPS14_NONLPEN LPPS15 VPPS02-VPPS04 VPPS04_DVT_PE VPPS04_PNEUMONIA VPPS04_SVPSIS VPPS04_SHOCK VPPS04_GIHEMORRHAGE VPPS06-VPPS14 VPPS14_VPEN VPPS14_NONVPEN VPPS15 UPPS02-UPPS04 UPPS04_DVT_PE UPPS04_PNEUMONIA UPPS04_SUPSIS UPPS04_SHOCK UPPS04_GIHEMORRHAGE UPPS06-UPPS14 UPPS14_UPEN UPPS14_NONUPEN UPPS15 SNPPS02-SNPPS04 SNPPS04_DVT_PE SNPPS04_PNEUMONIA SNPPS04_SSNPSIS SNPPS04_SHOCK SNPPS04_GIHEMORRHAGE SNPPS06-SNPPS14 SNPPS14_SNPEN SNPPS14_NONSNPEN SNPPS15 SPPS02-SPPS04 SPPS06-SPPS15 XPPS02-XPPS04 XPPS06-XPPS15
	&OUTFILE_HOSPOBS. PSHO_&SUFX.	All variables in the file		
PSI_HOSP_COMPOSITE.sas	&OUTFILE_HOSPRISK. PSHRSKADJ_&*SUFX*.	All variables in the file	&OUTFILE_COMP. PSCOMP_&*SUFX*.	HOSPID COMP1 COMP1VAR COMP1SE COMP1WHT COMP1LB COMP1UB

[1] Only if user sets PRDAY = 1 in the PSI_HOSP_CONTROL program.
[2] &*SUFX*. refers to the suffix assigned by the user in the control program (default is v2021).

Table 40. SAS Input and Output Files for the PSI 17 Software Package

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
PSI17_HOSP_MEASURES.sas	&DISCHARGE. (user dataset name)	AGE AGEDAY ATYPE DRG DQTR DX1-DXn HOSPID KEY MDC PAY1 POINTOFORIGINUB04 RACE SEX YEAR	&OUTFILE_MEAS. PS17MSR_*&SUFX.*[1]	KEY HOSPID DRG MDC YEAR DQTR PAGECAT AGEDCAT BWHTCAT SEXCAT RACECAT PAYCAT COVIDDX TPPS17
PSI17_HOSP_OBSERVED.sas	&OUTFILE_MEAS. PS17MSR_*&SUFX.*	All variables in the file	&OUTFILE_HOSPOBS. PS17HOBS_*&SUFX.*	HOSPID BWHTCAT AGEDCAT PAGECAT SEXCAT PAYCAT RACECAT _TYPE_ TPPS17 PPPS17 OPPS17

[1] *&SUFX.* refers to the suffix assigned by the user in the control program (default is v2021).

Table 41. SAS Input and Output Files for the PDI Software Package

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
PDI_ALL_MEASURES.sas	&DISCHARGE. (user dataset name)	AGE AGEDAY ASOURCE ATYPE DISP DRG DQTR DX1-DXn DXPOA1-DXPOAn HOSPID KEY LOS MDC PAY1 POINTOFORIGINUB04 PR1-PRn PRDAY1-PRDAYn[1] PSTCO RACE SEX YEAR	&OUTFILE_MEAS. PDMSR_*&SUFX.*[2]	KEY HOSPID FIPSTCO DRG MDC MDRG YEAR DQTR AGE AGEDAY SEX PAGECAT AGEDCAT POPCAT BWHTCAT SEXCAT RACECAT PAYCAT LOS TRNSFER TRNSFER_ALT D_DXCCSR_: ODC903 MEDICDR COVIDDX AIDS ALCOHOL ANEMDEF ARTH BLDLOSS CANCER_LYMPH CANCER_LEUK CANCER_METS CANCER_NSITU CANCER_SOLID CBVD CHF COAG DEMENTIA DEPRESS DIAB_UNCX DIAB_CX DRUG_ABUSE HTN_CX HTN_UNCX LIVER_MLD LIVER_SEV LUNG_CHRONIC NEURO_MOVT NEURO_OTH NEURO_SEIZ OBESE PARALYSIS PERIVASC PSYCHOSES PULMCIRC RENLFL_MOD RENLFL_SEV THYROID_HYPO THYROID_OTH ULCER_PEPTIC VALVE WGHTLOSS TPNQ03 TPPD01 TPPD05 TPPD08-TPPD10 TPPD12 TAPD14-TAPD16 TAPD18 TAPD90-TAPD92 TPPS17 GPPD01 GPPD08 GPPD10 GPPD12 HPPD01 HPPD10
PDI_AREA_OBSERVED.sas	&OUTFILE_MEAS. PDMSR_*&SUFX.*	All variables in the file	&OUTFILE_AREAOBS. PDAO_&SUFX.	MAREA AGECAT SEXCAT RACECAT _TYPE_ TAPD14-TAPD18 TAPD90-TAPD92 PAPD14-PAPD18 PAPD90-PAPD92 OAPD14-OAPD18 OAPD90-OAPD92
	POPFILE 2000-2020_Population_Files_V2021.txt	FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2020		
PDI_AREA_RISKADJ.sas	&OUTFILE_MEAS. PDMSR_&SUFX.	All variables in the file	&OUTFILE_AREARISK. PDARSKADJ_*&SUFX.*	MAREA POPCAT SEXCAT RACECAT _TYPE_ TAPD14-TAPD18 TAPD90-TAPD92

SAS PROGRAM	INPUT DATASET/INPUT ANALYTIC FILE		OUTPUT ANALYTIC FILE	
	FILE NAME	VARIABLES	FILE NAME	VARIABLES
	POPFILE 2000-2020_Population_Files_V2021.txt	FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2020		PAPD14-PAPD18 PAPD90-PAPD92 OAPD14-OAPD18 OAPD90-OAPD92 RAPD14-RAPD18 RAPD90-RAPD92 LAPD14-LAPD18 LAPD90-LAPD92 UAPD14-UAPD18 UAPD90-UAPD92 SAPD14-SAPD18 SAPD90-SAPD92 SNAPD14-SNAPD18 SNAPD90-92 XAPD14-XAPD18 XAPD90-XAPD92
PDI_HOSP_OBSERVED.sas	&OUTFILE_MEAS. PDMSR_&*SUFX*.	All variables in the file	&OUTFILE_HOSPOBS. PDPO_&SUFX.	HOSPID BWHTCAT AGEDCAT PAGECAT SEXCAT PAYCAT RACECAT _TYPE_ TPNQ03 TPPD01 TPPD05 TPPD08- TPPD10 TPPD12 TPPS17 PPNQ03 PPPD01 PPPD05 PPPD08-PPPD10 PPPD12 PPPS17 OPNQ03 OPPD01 OPPD05 OPPD08-OPPD10 OPPD12 OPPS17
PDI_HOSP_STRATIFIED.sas	&OUTFILE_MEAS. PDMSR_&*SUFX*.	All variables in the file	&OUTFILE_STRAT. PDSTRAT_&*SUFX*.	HOSPID _TYPE_ GPPD01 GPPD08 GPPD10 GPPD12 TPPD01 TPPD08 TPPD10 TPPD12 PPPD01 PPPD08 PPPD10 PPPD12 OPPD01 OPPD08 OPPD10 OPPD12
PDI_HOSP_RISKADJ.sas	&OUTFILE_MEAS. PDMSR_&*SUFX*.	All variables in the file	&OUTFILE_HOSPRISK. PDHRSKADJ_&*SUFX*.	HOSPID _TYPE_ TPNQ03 TPPD01 TPPD05 TPPD08- TPPD10 TPPD12 PPNQ03 PPPD01 PPPD05 PPPD08-PPPD10 PPPD12 OPNQ03 OPPD01 OPPD05 OPPD08-OPPD10 OPPD12 EPNQ03 EPPD01 EPPD05 EPPD08-EPPD10 EPPD12 RPNQ03 RPPD01 RPPD05 RPPD08-RPPD10 RPPD12 VPNQ03 VPPD01 VPPD05 VPPD08-VPPD10 VPPD12 LPNQ03 LPPD01 LPPD05 LPPD08- LPPD10 LPPD12 UPNQ03 UPPD01 UPPD05 UPPD08-UPPD10 UPPD12 SNPNQ03 SNPPD01 SNPPD05 SNPPD08-SNPPD10 SNPPD12 SPNQ03 SPPD01 SPPD05 SPPD08-SPPD10 SPPD12 XPNQ03 XPPD01 XPPD05 XPPD08-XPPD10 XPPD12
	&OUTFILE_HOSPOBS. PDMSR_&*SUFX*.	All variables in the file	PDHRSKADJ_&*SUFX*.	
	&OUTFILE_HOSPOBS. PDHO_&SUFX.	All variables in the file		

NOTE: [1] Only if user sets PRDAY = 1 in the PDI_ALL_CONTROL program. [2] &*SUFX*. refers to the suffix assigned by the user in the control program (default is v2021).

Appendix F: Input Data Files

Table 42. Input Variables

VARIABLE NAME	DESCRIPTION	FORMAT	VALUE DESCRIPTION	COMMENTS
AGE	Age in years at admission	Numeric	Age in years	If this data element is missing, the discharge record will be excluded from analysis.
AGEDAY	Age in days (when AGE is less than 1 year)	Numeric	Age in days	Not used in the IQI, PSI, or PQI modules. If not present in the input data file, it is not necessary to create a placeholder variable to run these three modules.
APR_DRG	All Patient Refined DRG	Numeric	3M™ APR-DRG software	Although program options allow the IQI module to operate without these variables, users should run APR-DRG software on their raw data to assign this variable to each case. Not used by the PDI, PQI, or PSI modules. If not present in the input data file, it is not necessary to create a placeholder variable to run these three modules.
APRDRG_Risk_Mortality	All Patient Refined DRG: Risk of Mortality Subclass	Numeric	3M™ APR-DRG software risk-of-mortality score	Although program options allow the IQI module to operate without these variables, users should run APR-DRG software on their raw data to assign this variable to each case. Not used by the PDI, PQI, or PSI programs. If not present in the input data file, it is not necessary to create a placeholder variable to run these three modules.
ASOURCE	Admission source, uniform coding	Numeric	1=emergency room 2=another hospital 3=another facility, including LTC 4=court/law enforcement 5=routine/birth/other	The values “2” and “3” are referenced by the QI code (to identify transfers from another hospital or facility).

VARIABLE NAME	DESCRIPTION	FORMAT	VALUE DESCRIPTION	COMMENTS
ATYPE	Admission type	Numeric	1=emergency 2=urgent 3=elective 4=newborn 5=trauma center 6=other	Not used by the IQI program. The values "3" and "4" are referenced by the PDI and PSI code (to identify elective surgeries and newborn admissions). PDI 08–09, NQI03 and PSI 04, 10, 11, 13, and 17 will be affected if ATYPE values are missing.
DISP	Disposition of patient	Numeric	1=routine 2=transfer to short-term hospital 3=skilled nursing facility 4=intermediate care 5=another type of facility 6=home health care 7=against medical advice 20=died in the hospital	Not used in the PQI module. The values 2 and 20 are referenced by the QI code (to identify transfers to another short-term hospital and patients who died in the hospital). All other non-missing values are considered valid disposition codes. This convention is different from that of the AHRQ QI Windows® application.
DQTR	Discharge quarter	Numeric	1=January–March 2=April–June 3=July–September 4=October–December	If this data element is missing, the discharge record will be excluded from analysis.
DRG	DRG in use on discharge date	Numeric	MS-DRG from Federal (CMS) MS-DRG grouper.	The MS-DRG provided should account for POA data.
DX1-DX35	ICD-10-CM Diagnosis	String	Diagnosis codes	Users with more or fewer secondary diagnoses must modify the number of diagnoses in the parameter "&NDX" in CONTROL_XXI.SAS programs. The software is structured for 35 diagnosis codes but can accept more than 35 diagnosis codes. The number provided here is the default.

VARIABLE NAME	DESCRIPTION	FORMAT	VALUE DESCRIPTION	COMMENTS
DXPOA1-DXPOA35	Diagnosis *n*, present on admission indicator	String	Values "Y" and "W" are considered as diagnosis present at the time of inpatient admission. Values of "N," "U," "E," "1," "X," or blank values are considered as diagnosis not present at the time of inpatient admission.	If POA data are missing, the PSI or PDI indicators that use POA for observed rate calculation will assume that all diagnoses are for conditions that occurred while in the hospital except where exempt from POA reporting. POA data are not necessary for the calculation of observed rates for PQIs or IQIs.
HOSPID	Hospital identification number	Numeric or string	Hospital identification number	Not used in the PQI module. Used by other modules to facilitate data exploration and possible troubleshooting. May also be selected as a stratifier (see Appendix J for hospital-level stratification category settings).
KEY	Sequence number; unique case identifier	Numeric	User-defined unique numeric identifier for each discharge record	Used by the QI modules for sorting discharge records and may facilitate possible exploration; allows user to link the records from the output file back to the original input data file.
LOS	Length of stay, cleaned	Numeric	Number of days from admission to discharge	Not used by the PQI module.
MDC	MDC in effect on discharge date	Numeric	MDC from Federal (CMS) MS-DRG grouper	Not used in the PQI module. If this data element is missing, and the discharge record cannot be mapped to a MDC value between 01 to 25 using CMS MS_DRG Grouper (e.g., it belongs to "preMDC", invalid or ungroupable MS-DRGs), the discharge record will be excluded from analysis in the IQI, PDI, and PSI modules.
NDX	Number of ICD-10-CM diagnoses on this discharge	Numeric	Count of diagnoses (principal and all secondary diagnoses)	Not used by the modules. A dummy variable is not necessary if not present in the input data file.
NPR	Number of ICD-10-CM procedures on this discharge	Numeric	Count of procedures (principal and all secondary procedures)	Not used by the modules. A dummy variable is not necessary if not present in the input data file.

VARIABLE NAME	DESCRIPTION	FORMAT	VALUE DESCRIPTION	COMMENTS
PAY1	Expected primary payer	Numeric	1=Medicare 2=Medicaid 3=private, including HMO 4=self-pay 5=no charge 6=other	The values of 1–6 are used directly in the QI software. All other payer codes are mapped to an "other" category. This data element is used to stratify only the hospital-level IQIs, hospital-level PDIs, and hospital-level PSIs.
PR1-PR30	ICD-10-CM Procedure	String	Procedure code	Users with more or fewer secondary procedures must modify the parameter "&NPR" in CONTROL_*XX*I.SAS to reflect the number of procedures. The modules can accept more than 30 procedure codes. The number provided here is the default.
PRDAY1-PRDAY30	Number of days from admission to procedure n	Numeric	Days from admission to procedure	Not used by the PQI or IQI modules. If not present in the input data file, it is not necessary to create a placeholder variable for this module. These are necessary variables if the user sets the "&PRDAY" parameter in *XXI_TYPE*_CONTROL.SAS (for PDI and PSI) to equal "1." In this case, it is expected that the number of PRDAY variables agree with the number of procedure codes present. These variables are not needed if the user sets the "&PRDAY" parameter in *XXI_TYPE*_CONTROL.SAS to equal "0," indicating that no procedure day information is available. However, regardless of how user sets the "&PRDAY" parameter in *XXI_TYPE*_CONTROL.SAS, input data with missing procedure days (PRDAYn) may have an impact on numerators, denominators, and observed rates for PSI 04, 09, 10, 11, 12, 14,15, PDI 08 and 09.

VARIABLE NAME	DESCRIPTION	FORMAT	VALUE DESCRIPTION	COMMENTS
PSTCO	Patient State/county FIPS code	Numeric	Modified Federal Information Processing Standards State/county code	See Appendix A for link to most recent list of codes. If this data element is missing, the discharge record will be excluded from rate calculations.
PointOfOriginUB04	Point of origin for admission or visit, UB04 standard coding	String	4=Transfer from a hospital 5=For non-newborn admissions (ATYPE ne 4): Transfer from a Skilled Nursing Facility (SNF), Intermediate Care Facility (ICF), Assisted Living Facility (ALF), or other Nursing Facility (NF) 5=For newborn admissions (ATYPE=4): Born inside this hospital 6=For non-newborn admissions (ATYPE ne 4): Transfer from another health care facility 6=For newborn admissions (ATYPE=4): Born outside of this hospital E=Transfer from ambulatory surgery center F=Transfer from a hospice facility	Not used by the IQI program. References by the PDI, PQI, and PSIs will be affected if values are missing.
RACE	Race of the patient	Numeric	1=White 2=Black 3=Hispanic 4=Asian or Pacific Islander 5=Native American 6=other	The values of 1–6 are used directly in the QI software. All other ethnicity codes are mapped to an "other" category.
SEX	Sex of the patient	Numeric	1=male 2=female	If this data element is missing, the discharge record will be excluded from the analysis. In v2021, input values for SEX contain 1, 2, or missing.

Appendix G: List of Risk Factors

Table 43. Risk Factors for Area-Level Modules

DATA ELEMENT	PQI	PDI
AGE	X	X
SEX	X	X
POVERTY	X	X

Table 44. Risk Factors for Hospital-Level Modules

CATEGORY	IQI	PSI	PDI	NQI
Demographics	Sex[a,c]	Sex[a,c]	Sex[a,c]	Sex[a,c]
	Age[a]	Age[a]	Age in days (90 days–1 year)[a] Age in years (1 year+)[a]	Age in days (0 or 1 day)[a]
Severity of Illness	3M APR-DRG ROM[b]			
		Modified MS-DRG[b]	Modified MS-DRG[b]	Modified MS-DRG[b]
	MDCs[b]	MDCs[b]		MDCs[b]
Clinical/Comorbidities	AHRQ Clinical Classification Software Refined		AHRQ Clinical Classification Software Refined	
		AHRQ Elixhauser Comorbidities Refined (with POA)[b]		
		Count categories of AHRQ Comorbidities (using latest guidance on POA requirements[19])	Count categories of AHRQ Comorbidities (using latest guidance on POA requirements[20])	
			Indicator-specific risk stratifiers	
Birthweight				Birth weight (500g groups)
Other	Transfer-in status[b]	Transfer-in status[b]	Transfer-in status[b]	Transfer-in status[b]
Stratified risk groups	Indicator-specific risk stratifiers	Indicator-specific risk stratifiers		

[a] Categories are mutually exclusive and fully saturated with an omitted covariate.
[b] Variable or variable categories are selected into model for some indicators.
[c] In v2021, Sex is 1 (Male) or 0 (not Male).

[19] AHRQ HCUP tool Elixhauser Comorbidity Software Refined Tool, v2021.1: https://www.hcup-us.ahrq.gov/toolssoftware/comorbidityicd10/ElixhauserComorbidity_v2021-1.zip

Appendix H: Output Data Files

Table 45. IQI Module Output

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
OBS	Observation 1 (with HOSPID="." or " ") is the overall average for the entire dataset (TYPELVLH=0). The remaining observation are individual providers, or hospitals (TYPELVLH=16).	Numeric	
HOSPID	Identifier for each hospital in the dataset	Text or numeric	Depends on format of HOSPID in source dataset
AGECAT	Age stratification category	Numeric range	
SEXCAT	Gender stratification category	Numeric	1=male 2=female 0=other
PAYCAT	Payer stratification category	Numeric	1=Medicare 2=Medicaid 3=private, including HMO 4=self-pay 5=no charge 6=other
RACECAT	Race stratification category	Numeric	1=White 2=Black 3=Hispanic 4=Asian or Pacific Islander 5=American Indian 6=other
TPIQnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric	
PPIQnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric	
OPIQnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric	
EPIQnn	Rate calculated by assuming an "average" performance for each patient group based on the reference population but with the hospital's actual case mix	Numeric	

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
RPIQnn	The estimated rate calculated by adjusting to an "average" case mix	Numeric	When stratifications other than hospital or area are selected, e.g, payer, race (TYPELVLH is in 1-3 or 17-19), the RPIQnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31); or COVID_19 is 2 or 3; or PRDAY is 0; or MDC_PROVIDED is 0, then risk adjusted rates are suppressed.
VPIQnn	The variance of the risk-adjusted rate	Numeric	When stratifications other than hospital or area are selected, e.g, payer, race (TYPELVLH is in 1-3 or 17-19), the VPIQnn variables and their confidence intervals are the variances of the observed/expected ratios to avoid confounding with risk adjustment variables. When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31); or COVID_19 is 2 or 3; or PRDAY is 0; or MDC_PROVIDED is 0, then the variance of risk adjusted rates are suppressed.
LPIQnn	The lower confidence bound of the risk-adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender(TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then lower confidence bound of risk adjusted rates are suppressed.
UPIQnn	The upper confidence bound of the risk-adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then upper confidence bound of risk adjusted rates are suppressed.
SPIQnn	The smoothed rate calculated using multivariate signal extraction	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then the smoothed rates are suppressed.

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
SNPIQnn	Reliability of the risk-adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then the reliability are suppressed.
XPIQnn	Standard error of smoothed rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then the standard error of smoothed rate are suppressed.

Table 46. PSI Module Output

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
OBS	Observation 1 (with HOSPID="." or " ") is the overall average for the entire dataset (TYPELVLH=0). The remaining observations are individual providers, or hospitals (TYPELVLH=16).	Numeric	
HOSPID	Identifier for each hospital in the dataset	Text or numeric	Depends on format of HOSPID in source dataset
AGECAT	Age stratification category	Numeric range	
SEXCAT	Gender stratification category	Numeric	1=male 2=female 0=other
PAYCAT	Payer stratification category	Numeric	1=Medicare 2=Medicaid 3=private, including HMO 4=self-pay 5=no charge 6=other
RACECAT	Race stratification category	Numeric	1=White 2=Black 3=Hispanic 4=Asian or Pacific Islander 5=Native American 6=other
TPPSnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric	

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
PPPSnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric	
OPPSnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric	
EPPSnn	Rate calculated by assuming an "average" performance for each patient group based on the reference population but with the hospital's actual case mix	Numeric	
RPPSnn	The estimated rate calculated by adjusting to an "average" case mix	Numeric	When stratifications other than hospital or area are selected, e.g, payer, race (TYPELVLH is in 1-3 or 17-19), the RPPSnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then risk adjusted rates are suppressed.
LPPSnn	The lower confidence bound of the risk- adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then lower confidence bound of risk adjusted rates are suppressed.
UPPSnn	The upper confidence bound of the risk- adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then upper confidence bound of risk adjusted rates are suppressed.
SPPSnn	The smoothed rate calculated using multivariate signal extraction	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then the smoothed rates are suppressed.
SNPPSnn	Reliability of the risk-adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then the reliability are suppressed.

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
XPPSnn	Standard error of smoothed rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender (TYPELVLH is in 4-15 or 20-31), or COVID_19 is 2 or 3, or PRDAY is 0, MDC_PROVIDED is 0, are specified, then the standard error of smoothed rate are suppressed.

Table 47. Hospital-Level PDI Module Output

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
OBS	Observation 1 (with HOSPID="." or " ") is the overall average for the entire dataset (TYPELVLH=0). The remaining observations are individual providers, or hospitals (TYPELVLH=16).	Numeric	
HOSPID	Identifier for each hospital in the dataset	Text or numeric	Depends on format of HOSPID in source dataset
AGEDCAT	Age (in days) stratification category	Numeric range	
PAGECAT	Pediatric age stratification category	Numeric	
BWHTCAT	Birth weight stratification category	Numeric	
SEXCAT	Gender stratification category	Numeric	1=male 2=female 0=other
PAYCAT	Payer stratification category	Numeric	1=Medicare 2=Medicaid 3=private, including HMO 4=self-pay 5=no charge 6=other
RACECAT	Race stratification category	Numeric	1=White 2=Black 3=Hispanic 4=Asian or Pacific Islander 5=Native American 6=other
TPPDnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric	
PPPDnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric	
OPPDnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric	

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
EPPDnn	Rate calculated by assuming an "average" performance for each patient group based on the reference population but with the hospital's actual case mix	Numeric	
RPPDnn	The estimated rate calculated by adjusting to an "average" case mix	Numeric	When stratifications other than hospital or area are selected, e.g, payer or race (TYPELVLH is in 1-3 or 65-67) the RPPDnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. When stratifications are risk adjustment factors, e.g, age, gender, age in days, birthweight (TYPELVLH is in 4-63 or 68-127), or COVID_19 is 2 or 3, or PRDAY is 0, are specified, then risk adjusted rates are suppressed.
LPPDnn	The lower confidence bound of the risk- adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender, age in days, birthweight (TYPELVLH is in 4-63, 68-127), or COVID_19 is 2 or 3, or PRDAY is 0, are specified, then lower confidence bound of risk adjusted rates are suppressed.
UPPDnn	The upper confidence bound of the risk- adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender, age in days, birthweight (TYPELVLH is in 4-63 or 68-127), or COVID_19 is 2 or 3, or PRDAY is 0, are specified, then upper confidence bound of Risk Adjusted rates are suppressed.
SPPDnn	The smoothed rate calculated using multivariate signal extraction	Numeric	When stratifications are risk adjustment factors, e.g, age, gender, age in days, birthweight (TYPELVLH is in 4-63 or 68-127), or COVID_19 is 2 or 3, or PRDAY is 0, are specified, then the smoothed rates are suppressed.
SNPPDnn	Reliability of the risk-adjusted rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender, age in days, birthweight (TYPELVLH is in 4-63 or 68-127), or COVID_19 is 2 or 3, or PRDAY is 0, are specified, then the reliability are suppressed.

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
XPPDnn	Standard error of smoothed rate	Numeric	When stratifications are risk adjustment factors, e.g, age, gender, age in days, birthweight (TYPELVLH is in 4-63 or 68-127), or COVID_19 is 2 or 3, or PRDAY is 0, are specified, then the standard error of smoothed rate are suppressed.

Table 48. Area-Level PDI Module Output

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
OBS	Observation 1 (with MAREA=“ ”) is the overall average for the entire dataset TYPELVLH=0). The remaining observations are individual providers, or hospitals (TYPELVLH=16).	Numeric	
MAREA	Identifier in the dataset for area	Text	
POPCAT	Population age stratification category	Numeric range	
SEXCAT	Gender stratification category	Numeric	1=male 2=female 0=other
RACECAT	Race stratification category	Numeric	1=White 2=Black 3=Hispanic 4=Asian or Pacific Islander 5=Native American 6=other
TAPDnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric	
PAPDnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric	
OAPDnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric	
EAPDnn	Rate calculated by assuming an “average” performance for each patient group based on the reference population but with the hospital‘s actual case mix	Numeric	
RAPDnn	The estimated rate calculated by adjusting to an “average” case mix	Numeric	When stratifications other than hospital or area are selected, the RAPDnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
LAPDnn	The lower confidence bound of the risk-adjusted rate	Numeric	

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
UAPDnn	The upper confidence bound of the risk-adjusted rate	Numeric	
SAPDnn	The smoothed rate calculated as a weighted average of the risk-adjusted and reference population rates	Numeric	
SNAPDnn	Reliability of the risk-adjusted rate	Numeric	
XAPDnn	Variance of risk-adjusted rate	Numeric	

Table 49. PQI Module Output

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
OBS	Observation 1 (with MAREA=“ ”) is the overall average for the entire dataset TYPELVLH=0). The remaining observations are individual providers, or hospitals (TYPELVLH=16).	Numeric	
MAREA	Identifier in the dataset for area	Text	
AGECAT	Age stratification category	Numeric	
SEXCAT	Gender stratification category	Numeric	
RACECAT	Race stratification category	Numeric	
TAPQnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric	
PAPQnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric	
OAPQnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric	
RAPQnn	The estimated rate calculated by adjusting to an “average” case mix	Numeric	When stratifications other than hospital or area are selected, the RAPQnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
LAPQnn	The lower confidence bound of the risk-adjusted rate	Numeric	
UAPQnn	The upper confidence bound of the risk-adjusted rate	Numeric	
SAPQnn	The smoothed rate calculated using multivariate signal extraction	Numeric	
SNAPQnn	Reliability of the risk-adjusted rate	Numeric	
VAPQnn	Standard error of smoothed rate	Numeric	
XAPQnn	Variance of risk-adjusted rate	Numeric	

VARIABLE NAME	DESCRIPTION	FORMAT	COMMENTS
EAPQnn	Rate calculated by assuming an "average" performance for each patient group based on the reference population but with the hospital's actual case mix	Numeric	

Appendix I: Setnames

Table 50. List of Setnames

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
ABDOMI15P	Abdominopelvic surgery, procedure codes	No	No	Yes	No
ABDOMIPOPEN	Abdominopelvic surgery, open approach, procedure codes	No	No	Yes	No
ABDOMIPOTHER	Abdominopelvic surgery, other approach, procedure codes	No	No	Yes	No
ABWALLCD	Disruption of internal operation wound diagnosis codes	No	No	Yes	No
ACBACGD	Bacterial gastroenteritis diagnosis codes	No	Yes	No	No
ACCOPDD	Chronic obstructive pulmonary disorder (excluding acute bronchitis) diagnosis codes	No	No	No	Yes
ACDIALD	Diabetes with long-term complications diagnosis codes	No	No	No	Yes
ACDIASD	Diabetes with short-term complications diagnosis codes	No	Yes	No	Yes
ACDIAUD	Uncontrolled diabetes without mention of a short-term or long-term complication diagnosis codes	No	No	No	Yes
ACGDISD	Gastroenteritis abnormalities diagnosis codes	No	Yes	No	No
ACLEA2D	Traumatic amputation of the lower extremity diagnosis codes	No	No	No	Yes
ACPGASD	Gastroenteritis diagnosis codes	No	Yes	No	No
ACSASTD	Asthma diagnosis codes	No	Yes	No	Yes
ACSBA2D	Sickle cell anemia or HB-S disease diagnosis codes	No	No	No	Yes
ACSBACD	Community acquired pneumonia diagnosis codes	No	No	No	Yes
ACSCARP	Cardiac procedure codes	No	No	No	Yes

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
ACSCYFD	Cystic fibrosis diagnosis codes	No	Yes	No	No
ACSDEHD	Dehydration diagnosis codes	No	Yes	No	No
ACSHY2D	Stage I-IV kidney disease diagnosis codes	No	No	No	Yes
ACSHYPD	Hypertension diagnosis codes	No	No	No	Yes
ACSLEAD	Diabetes diagnosis codes	No	No	No	Yes
ACSLEAP	Lower extremity amputation procedure codes	No	No	No	Yes
ACSUTID	Urinary tract infection diagnosis codes	No	Yes	No	Yes
ACURF2D	Acute respiratory failure diagnosis codes	No	Yes	Yes	No
ACURF3D	Acute respiratory failure diagnosis codes (exclusion only)	No	Yes	Yes	No
AGECAT	Age category	Yes	Yes	Yes	Yes
AGEDCAT	Age in days categories	No	Yes	No	No
AGEFMT	Age stratifiers	No	Yes	No	Yes
ALCHLSM	Alcoholism diagnosis codes	No	No	Yes	No
BIRTHID	Birth trauma diagnosis codes	No	Yes	No	No
BSI2DX	Newborn septicemia or bacteremia diagnosis codes	No	Yes	No	No
BSI3DX	Staphylococcal or Gram-negative bacterial infection diagnosis codes	No	Yes	No	No
BSI4DX	Sepsis or bacteremia diagnosis codes	No	Yes	No	No
BSI5DX	Newborn sepsis diagnosis codes	No	Yes	No	No
BURNDX	Severe burn diagnosis codes	No	No	Yes	No
BWHTCAT	Birth weight categories	No	Yes	No	No
CANCEID	Cancer diagnosis codes	No	No	Yes	No
CANITD	Cancer diagnosis codes without leukemia/lymphoma	No	Yes	No	No
CARDIID	Cardiac arrest diagnosis codes	No	No	Yes	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
CARDRID	Cardiac arrhythmia diagnosis codes	No	No	Yes	No
CARDSIP	Potentially trans-pleural cardiac procedures	No	Yes	Yes	No
COAGDID	Coagulation disorders diagnosis codes	No	Yes	Yes	No
COVIDD	COVID diagnosis codes for use from Q2 2020 on	Yes	Yes	Yes	No
COVIDQ120D	COVID diagnosis code for use during Q1 2020	Yes	Yes	Yes	No
CRANIID	Craniofacial anomalies diagnosis codes	No	Yes	No	No
CRENLFD	Chronic renal failure diagnosis codes	No	No	Yes	No
CTRAUMD	Chest trauma diagnosis codes	No	Yes	Yes	No
DECUBEXD	Pressure ulcer stage diagnosis codes (Denominator Exclusion)	No	No	Yes	No
DECUBVD	Pressure ulcer stage diagnosis codes	No	No	Yes	No
DEEPVIB	Proximal Deep Vein Thrombosis diagnosis codes	No	No	Yes	No
DELOCMD	Outcome of delivery diagnosis codes	Yes	No	Yes	No
DGNEUID	Degenerative neurologic disorder diagnosis codes	No	Yes	Yes	No
DIALY2P	Dialysis access procedure codes	No	No	Yes	Yes
DIALYIP	Dialysis procedure codes	No	No	Yes	No
DNR	Do not resuscitate (DNR) status diagnosis codes	No	No	Yes	No
DRG1C	MS-DRG codes for surgical class 1	No	Yes	No	No
DRG2C	MS-DRG codes for surgical class 2	No	Yes	No	No
DRG3C	MS-DRG codes for surgical class 3	No	Yes	No	No
DRG4C	MS-DRG codes for surgical class 4	No	Yes	No	No
DRG9C	MS-DRG codes for surgical class 9	No	Yes	No	No
DRGF2T	MS-DRG to Modified DRG	No	Yes	Yes	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
DTID	Deep tissue injury diagnosis codes	No	No	Yes	No
ECMOP	Extracorporeal membrane oxygenation (ECMO) procedure codes	No	Yes	Yes	No
EXFOLIATXD	Exfoliative skin disorder diagnosis codes	No	No	Yes	No
FOREIID	Retained surgical item or unretrieved device fragment diagnosis code	No	No	Yes	No
FTR2DXB	Pulmonary embolism or deep vein thrombosis diagnosis codes	No	No	Yes	No
FTR3DX	Bacterial and aspiration pneumonia diagnosis codes	No	No	Yes	No
FTR3EXA	Respiratory complications diagnosis codes	No	No	Yes	No
FTR3EXB	Viral pneumonia or influenza diagnosis codes	No	No	Yes	No
FTR4DX	Sepsis diagnosis codes for PSI 04	No	No	Yes	No
FTR5DX	Shock or cardiac arrest diagnosis codes	No	No	Yes	No
FTR5EX	Abortion-related shock diagnosis codes	No	No	Yes	No
FTR5PR	Shock or cardiac (resuscitation) procedure codes	No	No	Yes	No
FTR6DX	Gastrointestinal hemorrhage or acute ulcer diagnosis codes	No	No	Yes	No
FTR6EX	Anemia diagnosis codes	No	No	Yes	No
FTR6GV	Esophageal varices with bleeding	Yes	No	Yes	No
FTR6QD	Qualifying diagnoses associated with a diagnosis of esophageal varicies with bleeding	Yes	No	Yes	No
GASTRID	Gastrointestinal hemorrhage diagnosis codes for PSI 04	No	No	Yes	No
GESTC1D	Gestational age equal to or less than 23 completed weeks diagnosis codes	No	Yes	No	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
GESTC2D	Gestational age 24 completed weeks diagnosis codes	No	Yes	No	No
GESTC3D	Gestational age between 25 to 26 completed weeks diagnosis codes	No	Yes	No	No
GESTC4D	Gestational age between 27 to 28 completed weeks diagnosis codes	No	Yes	No	No
GESTC5D	Gestational age between 29 to 30 completed weeks diagnosis codes	No	Yes	No	No
GESTC6D	Gestational age between 31 to 32 completed weeks diagnosis codes	No	Yes	No	No
GESTC7D	Gestational age between 33 to 34 completed weeks diagnosis codes	No	Yes	No	No
GESTC8D	Gestational age between 35 to 36 completed weeks diagnosis codes	No	Yes	No	No
HEARTTRP	Heart transplant procedure codes	Yes	No	No	No
HEMOPHD	Hemophilia diagnosis codes	No	Yes	No	No
HEMORID	Hemorrhage diagnosis codes	No	No	Yes	No
HEMOTH2P	Control of hemorrhage and evacuation of hematoma procedures	No	Yes	Yes	No
HEPFA2D	Cirrhosis diagnosis codes	No	Yes	No	No
HEPFA3D	Hepatic failure diagnosis codes	No	Yes	No	No
HIPFXID	Hip fracture diagnosis codes for PSI 08	No	No	Yes	No
IATROID	Iatrogenic pneumothorax diagnosis codes	No	Yes	Yes	No
IDTMC3D	Central venous catheter-related blood stream infection diagnosis code	No	Yes	Yes	No
IMMUITD	Intermediate-risk immunocompromised state diagnosis codes	No	Yes	No	No
IMMUNHD	High-risk immunocompromised state diagnosis codes	No	Yes	No	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
IMMUNID	Immunocompromised state diagnosis codes	No	No	Yes	Yes
IMMUNIP	Immunocompromised state procedure codes	No	No	Yes	Yes
INFECID	Infection diagnosis codes	No	Yes	Yes	No
INSTRIP	Instrument-assisted delivery procedure codes	No	No	Yes	No
KIDNEY	Kidney or urinary tract disorder diagnosis codes	No	Yes	No	Yes
LIVEB2D	Out-of-hospital live birth diagnosis codes	No	Yes	No	No
LIVEBND	In-hospital live birth diagnosis codes	No	Yes	No	No
LIVERTRP	Liver transplant procedure codes	Yes	No	No	No
LOWMODR	Low-mortality (less than 0.5%) MS-DRG codes	No	No	Yes	No
LUNGCIP	Lung cancer procedure codes	No	Yes	Yes	No
LUNGTRANSP	Lung transplant procedure codes	No	Yes	Yes	No
LW1000G	Birth weight less than 1,000 grams diagnosis codes (Category 3)	No	Yes	No	No
LW1250G	Birth weight 1,000 to 1,249 grams diagnosis codes (Category 4)	No	Yes	No	No
LW1500G	Birth weight 1,250 to 1,499 grams diagnosis codes (Category 5)	No	Yes	No	No
LW1750G	Birth weight 1,500 to 1,749 grams diagnosis codes (Category 6)	No	Yes	No	No
LW2000G	Birth weight 1,750 to 1,999 grams diagnosis codes (Category 7)	No	Yes	No	No
LW2500G	Birth weight 2,000 to 2,499 grams diagnosis codes (Category 8)	No	Yes	No	No
LW500G	Birth weight less than 500 grams diagnosis codes (Category 1)	No	Yes	No	No
LW750G	Birth weight 500 to 749 grams diagnosis codes (Category 2)	No	Yes	No	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
M1AREA	County Level with Modified FIPS	No	Yes	No	Yes
M2AREA	OMB 1999 METRO AREA	No	Yes	No	Yes
M3AREA	OMB 2003 METRO AREA	No	Yes	No	Yes
MALHYPD	Malignant Hyperthermia diagnosis codes	No	Yes	Yes	No
MDCF2T	MS-DRG TO MDC	Yes	Yes	Yes	Yes
MECHVCD	Mechanical ventilation procedure codes	No	Yes	No	No
MEDIC2R	Medical discharge MS-DRGs	No	Yes	Yes	No
MRTAMID	Myocardial infarction type one diagnosis codes	Yes	No	No	No
MRTCHFD	Heart failure diagnosis codes	Yes	No	No	Yes
MRTCV2A	Subarachnoid hemorrhage diagnosis codes	Yes	No	No	No
MRTCV3D	Intracerebral hemorrhage diagnosis codes	Yes	No	No	No
MRTCV4D	Ischemic stroke diagnosis codes	Yes	No	No	No
MRTGIHD	Gastrointestinal hemorrhage diagnosis codes for IQI 18	Yes	No	No	No
MTHIP2D	Periprosthetic fracture diagnosis codes	Yes	No	No	No
MTHIPFD	Hip fracture diagnosis codes for IQI 19	Yes	No	No	No
NEUROMD	Neuromuscular disorders diagnosis codes	No	Yes	Yes	No
NEURTRAD	Acute brain or spinal injury diagnosis codes	No	No	Yes	No
NUCRANP	Laryngeal, pharyngeal, nose, mouth and pharynx surgery procedure codes	No	Yes	Yes	No
OBEMBOL	Abortion-related or postpartum obstetric pulmonary embolism diagnosis codes	No	No	Yes	No
OBTRAID	Third and fourth degree obstetric trauma diagnosis codes	No	No	Yes	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
ODC_VEN	Ventilator Dependence (ODC903)	No	Yes	No	No
ORPROC	Operating room procedure codes	No	Yes	Yes	No
OSTEOID	Osteogenesis imperfecta diagnosis codes	No	Yes	No	No
PAGECAT	Pediatric age group categories	No	Yes	No	No
PAYCAT	Primary expected payer categories	Yes	Yes	Yes	No
PHYSIDB	Acute kidney (renal) failure diagnosis codes	No	No	Yes	No
PLEURAD	Pleural effusion diagnosis codes	No	Yes	Yes	No
PNEPHREP	Partial nephrectomy procedure codes	No	No	Yes	No
PNEUMD	Pneumonia diagnosis codes	Yes	No	No	No
POAXMPT_V33FMT	POA Exempt ICD-10-CM diagnosis codes, Version 33 Format	Yes	Yes	Yes	No
POAXMPT_V34FMT	POA Exempt ICD-10-CM diagnosis codes, Version 34 Format	Yes	Yes	Yes	No
POAXMPT_V35FMT	POA Exempt ICD-10-CM diagnosis codes, Version 35 Format	Yes	Yes	Yes	No
POAXMPT_V36FMT	POA Exempt ICD-10-CM diagnosis codes, Version 36 Format	Yes	Yes	Yes	No
POAXMPT_V37FMT	POA Exempt ICD-10-CM diagnosis codes, Version 37 Format	Yes	Yes	Yes	No
POAXMPT_V38FMT	POA Exempt ICD-10-CM diagnosis codes, Version 38 Format	Yes	Yes	Yes	No
POHMRI2D	Postprocedural hemorrhage or hematoma diagnosis codes	No	Yes	Yes	No
POPCAT	Pediatric population categories	No	Yes	No	No
POVCAT	County Poverty Deciles - Based on 2018 Census Data	No	Yes	No	Yes
PR9604P	Intubation procedure codes	No	Yes	Yes	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
PR9671P	Mechanical ventilation for less than 96 hours procedure codes	No	Yes	Yes	No
PR9672P	Mechanical ventilation for 96 consecutive hours or more procedure code	No	Yes	Yes	No
PRAAA2D	Unruptured abdominal aortic aneurysm (AAA) diagnosis codes	Yes	No	No	No
PRAAA2P	Endovascular abdominal aortic aneurysm (AAA) repair procedure codes	Yes	No	No	No
PRAAARD	Ruptured abdominal aortic aneurysm (AAA) diagnosis codes	Yes	No	No	No
PRAAARP	Open abdominal aortic aneurysm (AAA) repair procedure codes	Yes	No	No	No
PRCABGP	Coronary artery bypass graft (CABG) procedure codes	Yes	No	No	No
PRCEATP	Carotid endarterectomy procedure codes	Yes	No	No	No
PRCLASS	ICD-10-PCS Procedure Classes	No	Yes	No	No
PRCSE2P	Hysterotomy procedure codes	Yes	No	No	No
PRCSECD	Abnormal presentation, fetal death, and multiple gestation diagnosis codes	Yes	No	No	No
PRCSECP	Cesarean delivery procedure codes	Yes	No	No	No
PRESO2D	Gastrointestinal-related cancer diagnosis codes	Yes	No	No	No
PRESO2P	Total gastrectomy procedure codes	Yes	No	No	No
PRESOPD	Esophageal cancer diagnosis codes	Yes	No	No	No
PRESOPP	Esophageal resection procedure codes	Yes	Yes	Yes	No
PRETEID	Preterm infant with birth weight less than 2000g diagnosis codes	No	Yes	No	No
PROSFXID	Joint prostheses associated fracture diagnosis codes	No	No	Yes	No
PRPAN2D	Acute pancreatitis diagnosis codes	Yes	No	No	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
PRPAN3P	Partial pancreatic resection procedure codes	Yes	No	No	No
PRPANCD	Pancreatic cancer diagnosis codes	Yes	No	No	No
PRPANCP	Total pancreatic resection procedure codes	Yes	No	No	No
PRPTCAP	Percutaneous coronary intervention (PCI) procedure codes	Yes	No	No	No
PRVBACD	Previous Cesarean delivery diagnosis codes	Yes	No	No	No
PULMOID	Pulmonary embolism diagnosis codes	No	No	Yes	No
RACECAT	Race/ethnicity categories	Yes	Yes	Yes	Yes
RECLOIP	Reclosure of postoperative disruption of the abdominal wall procedure codes	No	No	Yes	No
RESPAN	Cystic fibrosis and anomalies of respiratory system diagnosis codes	No	Yes	No	Yes
SEPPNEUD	Sepsis without severe sepsis diagnosis codes	Yes	No	No	No
SEPTI2D	Sepsis diagnosis codes for PSI 13/PDI 10	No	Yes	Yes	No
SEVDPEDX	Severe pulmonary embolism or deep vein thrombosis diagnosis codes	No	No	Yes	No
SEVGIHDX	Severe gastrointestinal hemorrhage or acute ulcer diagnosis codes	No	No	Yes	No
SEVPNEUDX	Severe pneumonia diagnosis codes	No	No	Yes	No
SEVSCKDX	Severe shock or cardiac arrest diagnosis codes	No	No	Yes	No
SEVSEPD	Severe sepsis diagnosis codes	Yes	No	No	No
SEVSEPDX	Severe sepsis and postprocedural septic shock diagnosis codes	No	No	Yes	No
SEXCAT	Sex categories	Yes	Yes	Yes	Yes
SHOCKID	Shock diagnosis codes	No	No	Yes	No
SOLKIDD	Solitary kidney diagnosis codes	No	No	Yes	No

SETNAME	DESCRIPTION	IQI	PDI	PSI	PQI
SPINEP	Spine surgery procedure codes	No	Yes	No	No
SURGI2R	Surgical discharge MS-DRGs	No	Yes	Yes	No
SURGI2R_PREV	Fiscal Year Dependent Surgical MS-DRGs for prior to FY2021	No	Yes	Yes	No
TECHNI15D	Accidental puncture or laceration during an abdominopelvic procedure diagnosis codes	No	No	Yes	No
TECHNID	Accidental puncture or laceration during a procedure diagnosis codes	No	Yes	No	No
THORAIP	Thoracic surgery procedure codes	No	Yes	Yes	No
THROMP	Pulmonary arterial thrombectomy procedure codes	No	No	Yes	No
TRACHID	Tracheostomy diagnosis codes	No	Yes	Yes	No
TRACHIP	Tracheostomy procedure codes	No	Yes	Yes	No
TRANSPP	High-risk immunocompromised state procedure codes	No	Yes	No	No
TRAUMID	Trauma diagnosis codes	No	No	Yes	No
URINARYOBSID	Urinary tract obstruction diagnosis codes	No	No	Yes	No
VAGDELP	Vaginal delivery procedure codes	Yes	No	Yes	No
VENACIP	Interruption of vena cava procedure codes	No	No	Yes	No

Appendix J: Output and TYPELVLx Values: Levels of Summarization

Table 51. Levels of Summarization for *XXI*_AREA_OBSERVED.sas

TYPELVLA	SUMMARIZATION
0	Overall
1	Race
2	Sex
3	Sex * Race
4	Age
5	Age * Race
6	Age * Sex
7	Age * Sex * Race
8	Area
9	Area * Race
10	Area * Sex
11	Area * Sex * Race
12	Area * Age
13	Area * Age * Race
14	Area * Age * Sex
15	Area * Age * Sex * Race

NOTE: TYPELVLA values of 0 (overall) and 8 (area) are the default values for the levels of summarization provided in the software. The asterisk (*) indicates that these variables are concatenated for the aggregation of data.

Table 52. Levels of Summarization for IQI_HOSP_OBSERVED.sas and PSI_HOSP_OBSERVED.sas

TYPELVLH	SUMMARIZATION
0	Overall
1	Race
2	Payer
3	Payer * Race
4	Sex
5	Sex * Race
6	Sex * Payer
7	Sex * Payer * Race
8	Age
9	Age * Race
10	Age * Payer
11	Age * Payer * Race

TYPELVLH	SUMMARIZATION
12	Age * Sex
13	Age * Sex * Race
14	Age * Sex * Payer
15	Age * Sex * Payer * Race
16	Hospital
17	Hospital * Race
18	Hospital * Payer
19	Hospital * Payer * Race
20	Hospital * Sex
21	Hospital * Sex * Race
22	Hospital * Sex * Payer
23	Hospital * Sex * Payer * Race
24	Hospital * Age
25	Hospital * Age * Race
26	Hospital * Age * Payer
27	Hospital * Age * Payer * Race
28	Hospital * Age * Sex
29	Hospital * Age * Sex * Race
30	Hospital * Age * Sex * Payer
31	Hospital * Age * Sex * Payer * Race

NOTE: TYPELVLH values of 0 (overall) and 16 (hospital) are the default values for the levels of summarization provided in the software. The asterisk (*) indicates that these variables are concatenated for the aggregation of data.

Table 53. Levels of Summarization for PDI_HOSP_OBSERVED.sas

TYPELVLH	SUMMARIZATION
0	Overall
1	Race
2	Payer
3	Payer * Race
4	Sex
5	Sex * Race
6	Sex * Payer
7	Sex * Payer * Race
8	Age
9	Age * Race
10	Age * Payer
11	Age * Payer * Race
12	Age * Sex
13	Age * Sex * Race

TYPELVLH	SUMMARIZATION											
14	Age				*	Sex	*	Payer				
15	Age				*	Sex	*	Payer	*	Race		
16	Ageday											
17	Ageday								*	Race		
18	Ageday						*	Payer				
19	Ageday						*	Payer	*	Race		
20	Ageday				*	Sex						
21	Ageday				*	Sex			*	Race		
22	Ageday				*	Sex	*	Payer				
23	Ageday				*	Sex	*	Payer	*	Race		
24	Ageday		*	Age								
25	Ageday		*	Age					*	Race		
26	Ageday		*	Age			*	Payer				
27	Ageday		*	Age			*	Payer	*	Race		
28	Ageday		*	Age	*	Sex						
29	Ageday		*	Age	*	Sex			*	Race		
30	Ageday		*	Age	*	Sex	*	Payer				
31	Ageday		*	Age	*	Sex	*	Payer	*	Race		
32	Bwht											
33	Bwht								*	Race		
34	Bwht						*	Payer				
35	Bwht						*	Payer	*	Race		
36	Bwht				*	Sex						
37	Bwht				*	Sex			*	Race		
38	Bwht				*	Sex	*	Payer				
39	Bwht				*	Sex	*	Payer	*	Race		
40	Bwht		*	Age								
41	Bwht		*	Age					*	Race		
42	Bwht		*	Age			*	Payer				
43	Bwht		*	Age			*	Payer	*	Race		
44	Bwht		*	Age	*	Sex						
45	Bwht		*	Age	*	Sex			*	Race		
46	Bwht		*	Age	*	Sex	*	Payer				
47	Bwht		*	Age	*	Sex	*	Payer	*	Race		
48	Bwht	* Ageday										
49	Bwht	* Ageday							*	Race		
50	Bwht	* Ageday					*	Payer				
51	Bwht	* Ageday					*	Payer	*	Race		
52	Bwht	* Ageday			*	Sex						
53	Bwht	* Ageday			*	Sex			*	Race		

TYPELVLH	SUMMARIZATION											
54	Bwht	*	Ageday			*	Sex	*	Payer			
55	Bwht	*	Ageday			*	Sex	*	Payer		*	Race
56	Bwht	*	Ageday	*	Age							
57	Bwht		Agegay	*	Age						*	Race
58	Bwht	*	Ageday	*	Age			*	Payer			
59	Bwht	*	Ageday	*	Age			*	Payer		*	Race
60	Bwht	*	Ageday	*	Age	*	Sex					
61	Bwht	*	Ageday	*	Age	*	Sex				*	Race
62	Bwht	*	Ageday	*	Age	*	Sex	*	Payer			
63	Bwht	*	Ageday	*	Age	*	Sex	*	Payer		*	Race
64	Hospital											
65	Hospital										*	Race
66	Hospital							*	Payer			
67	Hospital							*	Payer		*	Race
68	Hospital					*	Sex					
69	Hospital					*	Sex				*	Race
70	Hospital					*	Sex	*	Payer			
71	Hospital					*	Sex	*	Payer		*	Race
72	Hospital			*	Age							
73	Hospital			*	Age						*	Race
74	Hospital			*	Age			*	Payer			
75	Hospital			*	Age			*	Payer		*	Race
76	Hospital			*	Age	*	Sex					
77	Hospital			*	Age	*	Sex				*	Race
78	Hospital			*	Age	*	Sex	*	Payer			
79	Hospital			*	Age	*	Sex	*	Payer		*	Race
80	Hospital	*	Ageday									
81	Hospital	*	Ageday								*	Race
82	Hospital	*	Ageday					*	Payer			
83	Hospital	*	Ageday					*	Payer		*	Race
84	Hospital	*	Ageday			*	Sex					
85	Hospital	*	Ageday			*	Sex				*	Race
86	Hospital	*	Ageday			*	Sex	*	Payer			
87	Hospital	*	Ageday			*	Sex	*	Payer		*	Race
88	Hospital	*	Ageday	*	Age							
89	Hospital	*	Ageday	*	Age						*	Race
90	Hospital	*	Ageday	*	Age			*	Payer			
91	Hospital	*	Ageday	*	Age			*	Payer		*	Race
92	Hospital	*	Ageday	*	Age	*	Sex					
93	Hospital	*	Ageday	*	Age	*	Sex				*	Race

TYPELVLH	SUMMARIZATION											
94	Hospital	*	Ageday		* Age	*	Sex	* Payer				
95	Hospital	*	Ageday		* Age	*	Sex	* Payer	* Race			
96	Hospital	*	Bwht									
97	Hospital	*	Bwht						* Race			
98	Hospital	*	Bwht					* Payer				
99	Hospital	*	Bwht					* Payer	* Race			
100	Hospital	*	Bwht			*	Sex					
101	Hospital	*	Bwht			*	Sex		* Race			
102	Hospital	*	Bwht			*	Sex	* Payer				
103	Hospital	*	Bwht			*	Sex	* Payer	* Race			
104	Hospital	*	Bwht		* Age							
105	Hospital	*	Bwht		* Age				* Race			
106	Hospital	*	Bwht		* Age			* Payer				
107	Hospital	*	Bwht		* Age			* Payer	* Race			
108	Hospital	*	Bwht		* Age	*	Sex					
109	Hospital	*	Bwht		* Age	*	Sex		* Race			
110	Hospital	*	Bwht		* Age	*	Sex	* Payer				
111	Hospital	*	Bwht		* Age	*	Sex	* Payer	* Race			
112	Hospital	*	Bwht		* Ageday							
113	Hospital	*	Bwht		* Ageday				* Race			
114	Hospital	*	Bwht		* Ageday			* Payer				
115	Hospital	*	Bwht		* Ageday			* Payer	* Race			
116	Hospital	*	Bwht		* Ageday	*	Sex					
117	Hospital	*	Bwht		* Ageday	*	Sex		* Race			
118	Hospital	*	Bwht		* Ageday	*	Sex	* Payer				
119	Hospital	*	Bwht		* Ageday	*	Sex	* Payer	* Race			
120	Hospital	*	Bwht	* Age	* Ageday							
121	Hospital	*	Bwht	* Age	* Ageday				* Race			
122	Hospital	*	Bwht	* Age	* Ageday			* Payer				
123	Hospital	*	Bwht	* Age	* Ageday			* Payer	* Race			
124	Hospital	*	Bwht	* Age	* Ageday	*	Sex					
125	Hospital	*	Bwht	* Age	* Ageday	*	Sex		* Race			
126	Hospital	*	Bwht	* Age	* Ageday	*	Sex	* Payer				
127	Hospital	*	Bwht	* Age	* Ageday	*	Sex	* Payer	* Race			

NOTE: TYPELVLH values of 0 (overall) and 64 (hospital) are the default values for the levels of summarization provided in the software. The asterisk (*) indicates that these variables are concatenated for the aggregation of data.