



QUALITY INDICATORS SOFTWARE INSTRUCTIONS AND DATA DICTIONARY, SAS QI[®] v2020

Prepared for:

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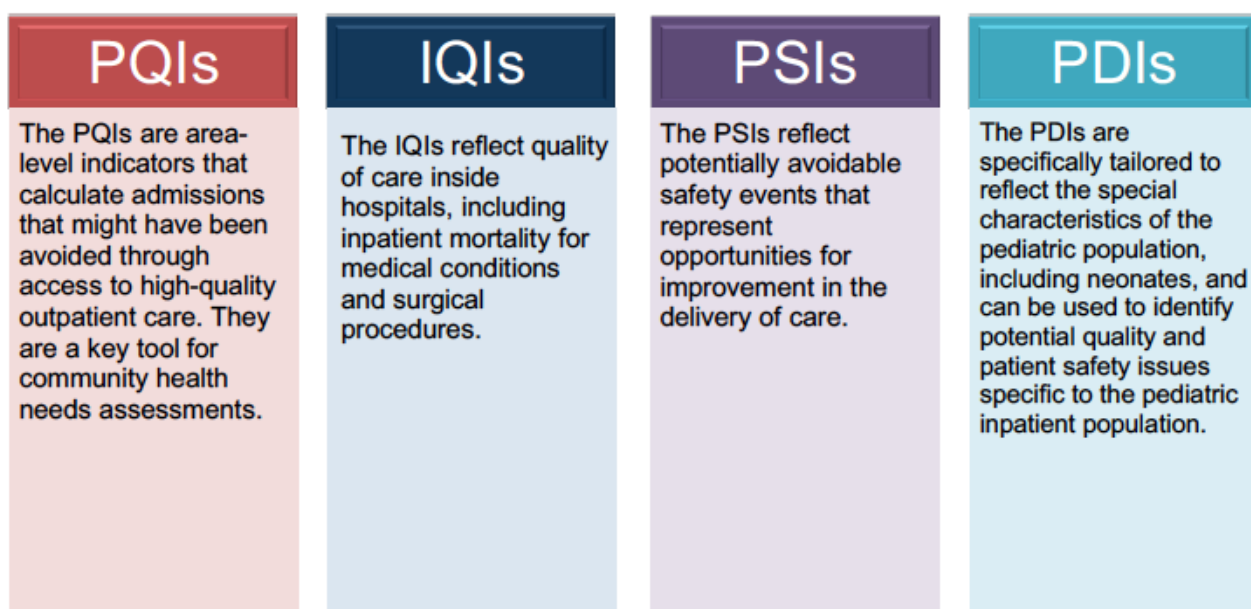
Executive Summary

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 with input from numerous teams of clinical and technical experts in collaboration with AHRQ. 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 version¹ of the AHRQ QI software generates numerators; denominators; and 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 v2020 and WinQI version v2020 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 v2020 and WinQI v2020

| SAS QI VERSION V2020 | WINQI VERSION V2020 |
|--|---|
| 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. |

¹ Early versions of ICD-10-CM/PCS AHRQ QI software generate only numerators, denominators, and observed rates. Software version 2020 can generate expected, risk-adjusted, and smoothed rates, for 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>.

| SAS QI VERSION V2020 | WINQI VERSION V2020 |
|--|---|
| 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, an updated version of the 3M™ All Patient 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 v2020 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

SAS⁴ QI v2020 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 for Visual Studio 2017, or later, to be installed on the computer prior to running. The C++ runtime is available from the Microsoft website at https://aka.ms/vs/16/release/vc_redist.x64.exe. 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.

³ APR-DRG codes are used in risk adjustment calculation for IQI indicators.

⁴ SAS is a statistical software package distributed by the SAS Institute Inc. The company may be contacted directly regarding the licensing of its products. The 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>.

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)^{5,6}
- 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.

⁵ 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.

⁶ 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 [Chapter 3.3.1](#).

Acknowledgments

The AHRQ QI v2020 software program uses the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for 2017 to compile reference (general or standard) population data,⁷ 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
University of **Hawaii**, Hilo Center for Rural Health Science
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

⁷ For further details on the reference population, please see the Empirical Methods document:
<https://www.qualityindicators.ahrq.gov/Modules/>

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 Health Care Authority
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 AHRQ Quality Indicators™ SAS®⁸ QI v2020 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 Quality Indicators (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](#): Output and TYPELVLx Values: Levels of Summarization).

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 v2020 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

⁸ 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>.

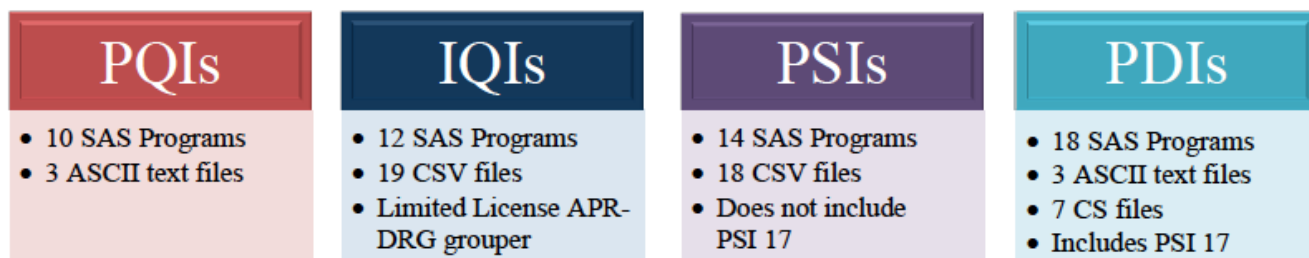
- IQI SAS QI software package calculates all IQIs.
- Pediatric Quality Indicators (PDI) Module
 - PDI SAS software package calculates all PDIs and PSI 17.

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 v2020 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.

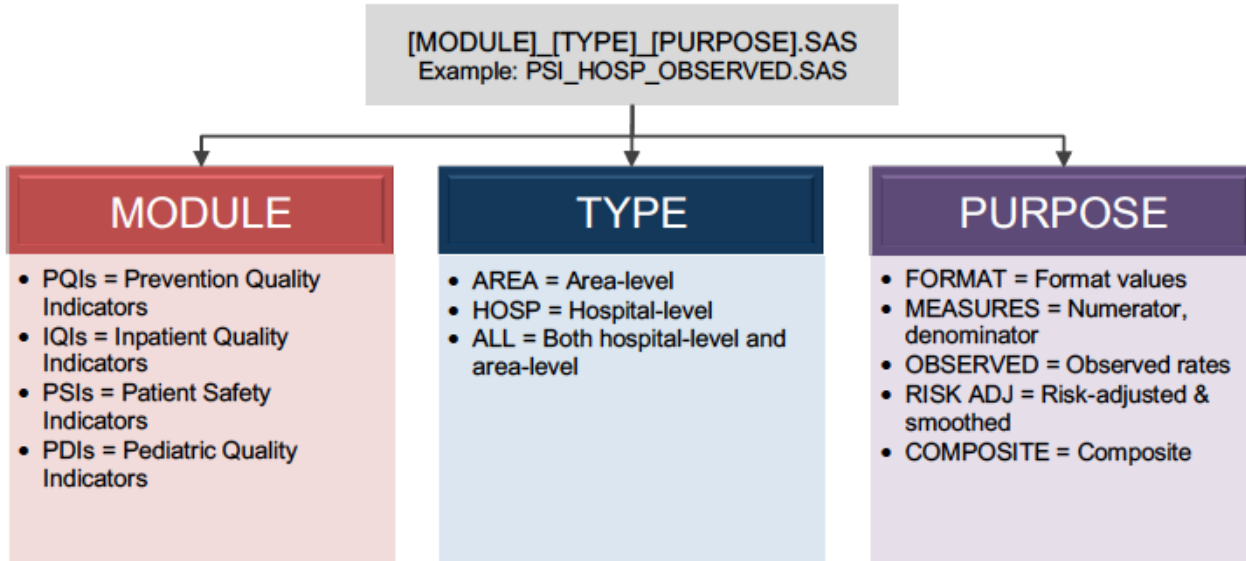
Figure 2. SAS Programs and ASCII Text Files for SAS QI v2020 Software Components



1.3 Naming Conventions of SAS Programs

The AHRQ QI v2020 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 v2020 Software

Users can download the SAS QI v2020 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 v2020 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 v2020, 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 Visual C++ runtime distributable 2008 or later. If users are running a 32-bit version of Microsoft Windows, then they must download and install the corresponding 32-bit Limited License APR-DRG grouper auxiliary file for use with the IQI software package from the AHRQ QIs website. If users are running a 64-bit version of Microsoft Windows, then they must download and install the corresponding 64-bit Limited

License APR-DRG grouper auxiliary file for use with the IQI software package from the AHRQ QIs 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, CCSR, MDC⁹
- 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.

⁹ 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.

[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 2000–2019 Population File, 2000-2019_Population_Files_V2020.txt, is available on the AHRQ QI website as a separate download. The 2000–2019 Population File is an ASCII-based text file that contains 679,320 records with population estimates for 3,145 counties (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 2000–2019 Population File documentation for additional information (https://www.qualityindicators.ahrq.gov/Downloads/Software/SAS/V2020/2000-2019_Population_Files_V2020.zip).

1.7 Software Output

Each version¹⁰ 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.¹¹ 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>).

¹⁰ 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 v2020 can generate expected, risk-adjusted, and smoothed rates for IQIs, PSIs, PQIs and PDIs.

¹¹ 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/>).

- 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 a parameter estimates document that 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 populations across areas or 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 v2020. 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

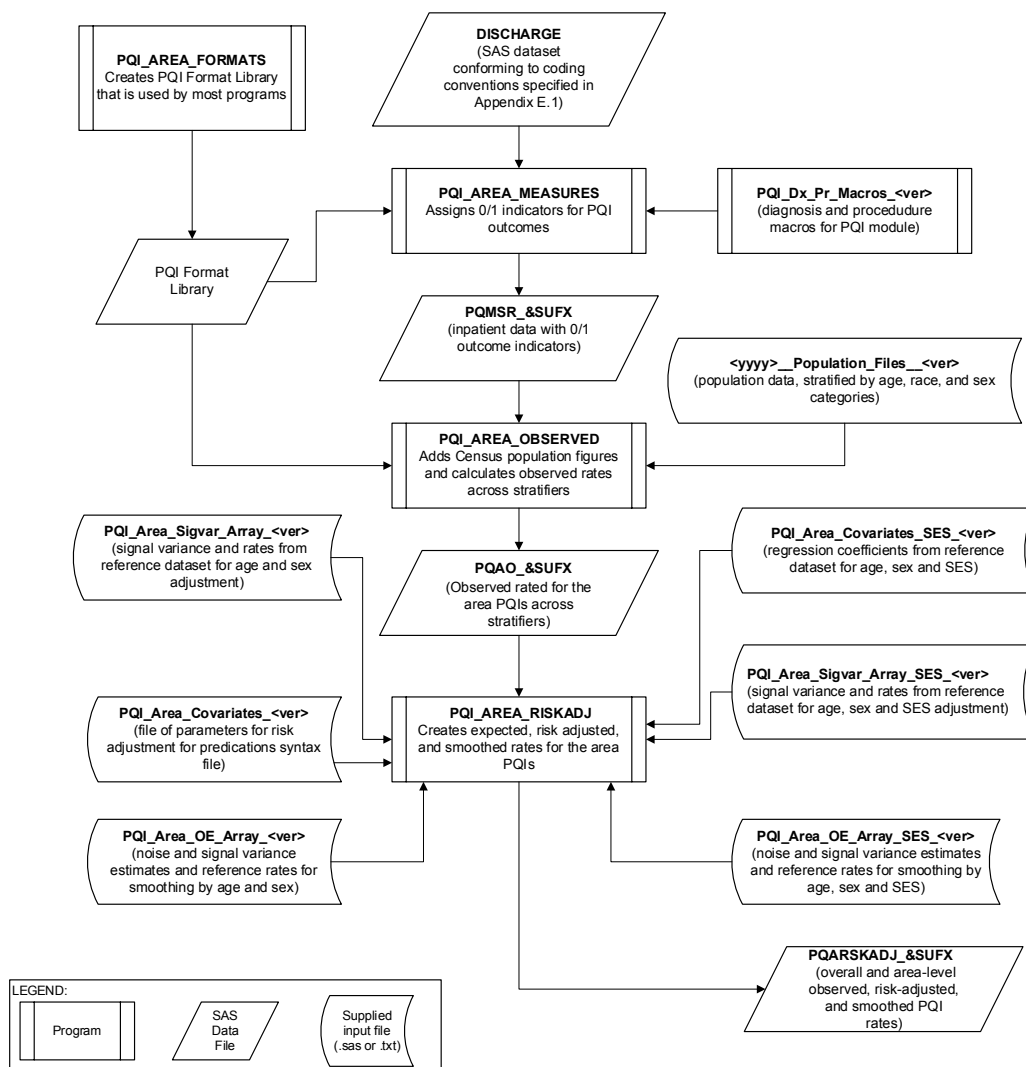
This chapter is intended to serve as a quick reference guide for each software package to assist in reading this documentation and in reviewing the SAS QI® software v2020 outputs. Processing steps are shown first, followed by tables explaining the variable naming convention and the files used in each 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 All PQIs 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 |
|------------------|---|---------------------|
| 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 (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 |

| PREFIX | TYPE OF RESULT | EXAMPLE (PQI 01) |
|--------|---|------------------|
| V | Variance ¹ | VAPQ01 |
| L | Lower limit of confidence interval of risk-adjusted rate ¹ | LAPQ01 |
| U | Upper limit of confidence interval of risk-adjusted rate ¹ | UAPQ01 |
| S | Smoothed rate ¹ | SAPQ01 |
| SN | Reliability of the risk-adjusted rate ¹ | SNAPQ01 |
| X | Standard error of the smoothed rate ¹ | XAPQ01 |

NOTE: 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 2000–2019 Population File, 2000-2019_Population_Files_V2020.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

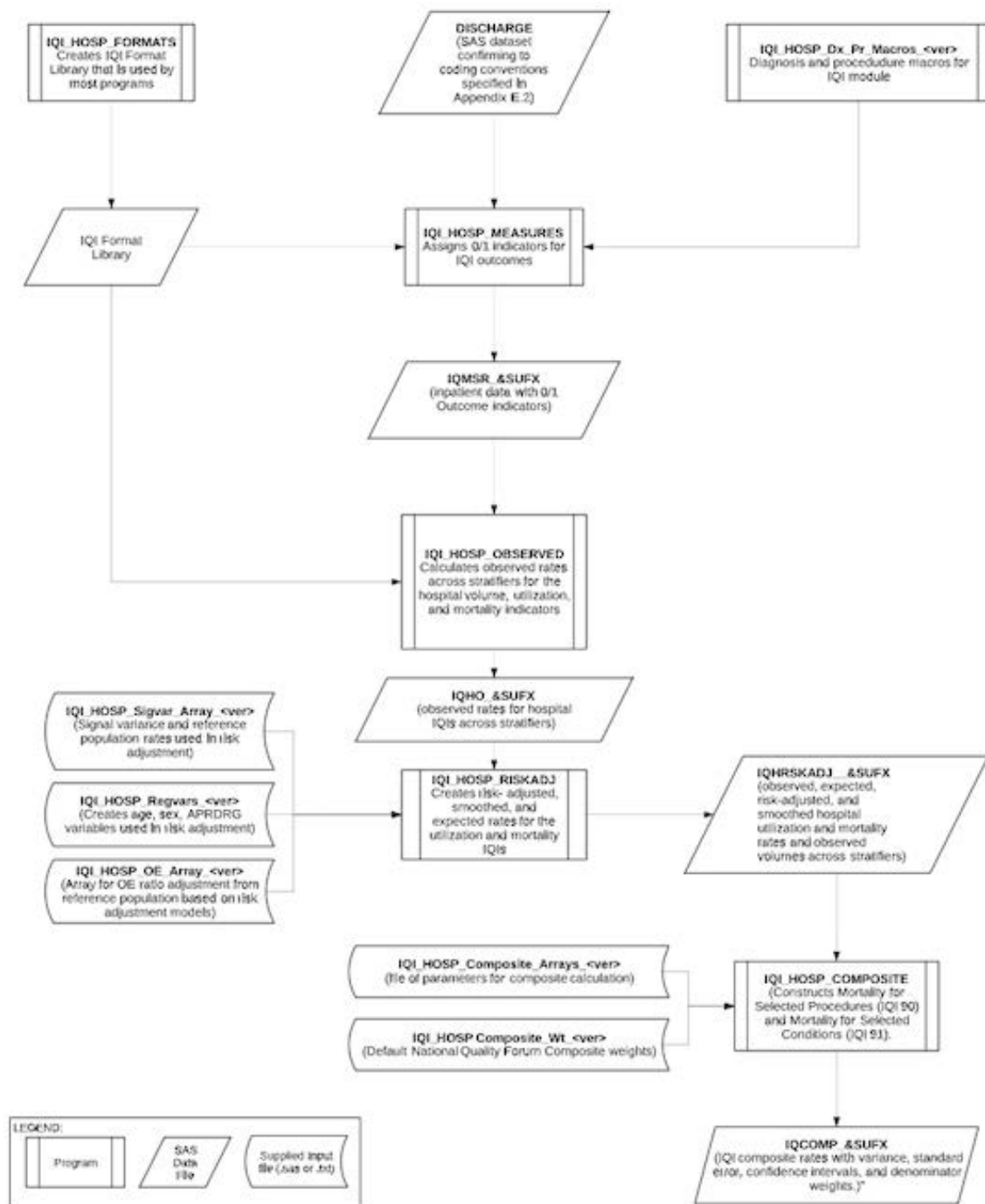
| SAS PROGRAM FILE NAME | REQUIRED AUXILIARY MACRO AND ASCII FILES |
|-----------------------|--|
| PQI_AREA_CONTROL.sas | N/A |
| PQI_AREA_FORMATS.sas | N/A |
| PQI_AREA_MEASURES.sas | PQI_DX_PR_MACROS_V2020.sas |
| PQI_AREA_OBSERVED.sas | 2000-2019_Population_Files_V2020.txt |
| PQI_AREA_RISKADJ.sas | 2000-2019_Population_Files_V2020.txt, PQI_AREA_SIGVAR_ARRAY_V2020.sas or PQI_AREA_SIGVAR_ARRAY_SES_V2020.sas, PQI_AREA_COVARIATES_V2020.txt or PQI_AREA_COVARIATES_SES_V2020.txt, PQI_AREA_OE_Array_V2020.sas or PQI_AREA_OE_Array_SES_V2020.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 09A_WITH_CANCER | Pancreatic Resection Mortality Rate – Stratum A: Presence of Pancreatic Cancer | IQ09A_WITH_CANCER |
| IQI 09B_WITHOUT_CANCER | Pancreatic Resection Mortality Rate – Stratum B: Absence of Pancreatic Cancer | IQ09B_WITHOUT_CANCER |
| IQI 11 | Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate | IQ11 |
| IQI 11_OPEN_RUPTURED | Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate – Stratum_OPEN_RUPTURED: Open Repair of Ruptured AAA | IQ11_OPEN_RUPTURED |
| IQI 11_OPEN_UNRUPTURED | Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate – Stratum_OPEN_UNRUPTURED: Open Repair of Unruptured AAA | IQ11_OPEN_UNRUPTURED |
| IQI 11_ENDO_RUPTURED | Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate – Stratum_ENDO_RUPTURED: Endovascular Repair of Ruptured AAA | IQ11_ENDO_RUPTURED |
| IQI 11_ENDO_UNRUPTURED | Abdominal Aortic Aneurysm (AAA) Repair Mortality Rate – Stratum_ENDO_UNRUPTURED: 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_HEMSTROKE_SUBARACH: Subarachnoid Hemorrhage | IQ17_HEMSTROKE_SUBARACH |
| IQI 17_HEMSTROKE_INTRACER | Acute Stroke Mortality Rate – Stratum_HEMSTROKE_INTRACER: Intracerebral Hemorrhage | IQ17_HEMSTROKE_INTRACER |
| IQI 17_ISCHEMSTROKE | Acute Stroke Mortality Rate – Stratum_ISCHEMSTROKE: 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 32 | Acute Myocardial Infarction (AMI) Mortality Rate, Without Transfer Cases | IQ32 |
| IQI 33 | Primary Cesarean Delivery Rate, Uncomplicated | IQ33 |

| INDICATOR ABBREV | INPATIENT QUALITY INDICATOR | SAS VARIABLE ABBREV |
|------------------|---|---------------------|
| IQI 34 | Vaginal Birth After Cesarean (VBAC) Rate | IQ34 |
| 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 09A_WITH_CANCER, IQI 09B_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, and 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 | EPIQ08 |
| R | Risk-adjusted rate | RPIQ08 |
| V | Variance of the risk-adjusted rate | VPIQ08 |
| L | Lower limit of confidence interval for risk-adjusted | LPIQ08 |
| U | Upper limit of confidence interval for risk-adjusted | UPIQ08 |
| SN | Reliability of the risk-adjusted rate | SNPIQ08 |
| S | Smoothed rate | SPIQ08 |
| X | Standard error of the smoothed rate | XPIQ08 |

NOTE: 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. Files Included in the IQI Software Package

| SAS PROGRAM FILE NAME | REQUIRED AUXILIARY MACRO, ASCII, AND CSV FILES |
|------------------------|--|
| IQI_HOSP_CONTROL.sas | N/A |
| IQI_HOSP_FORMATS.sas | N/A |
| IQI_HOSP_MEASURES.sas | IQI_HOSP_DX_PR_MACROS_V2020.sas |
| IQI_HOSP_OBSERVED.sas | N/A |
| IQI_HOSP_RISKADJ.sas | IQI_HOSP_REGVARS_V2020.sas; IQI_HOSP_SIGVAR_ARRAY_V2020.sas; and auxiliary CSV files |
| IQI_HOSP_COMPOSITE.sas | IQI_HOSP_COMPOSITE_ARRAY_V2020.sas |

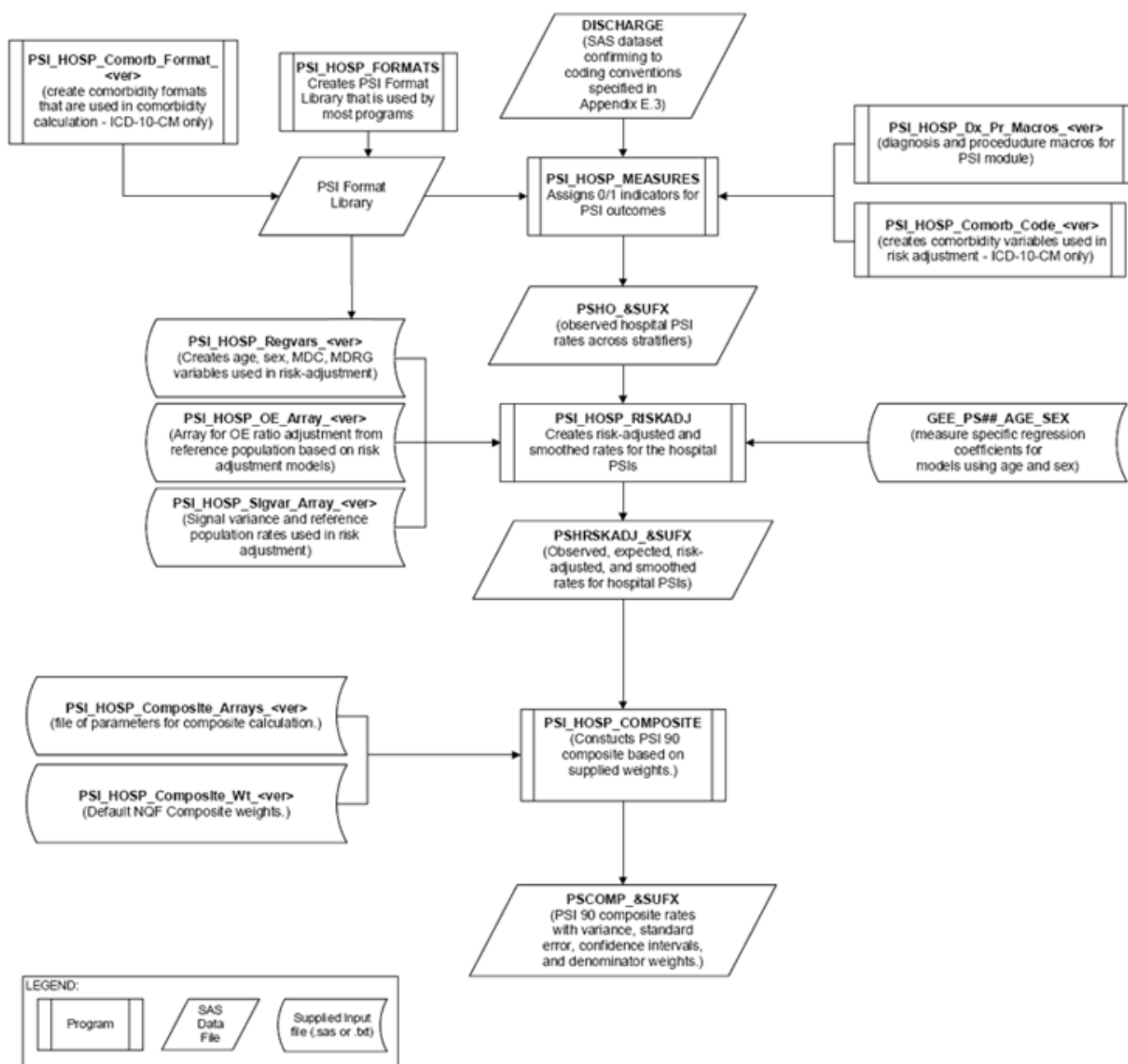
2.3 Patient Safety Indicators (PSIs) Quick Reference

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 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_DVT_PE | Death Rate among Surgical Inpatients with Serious Treatable Complications – Stratum – DVT/PE | PS04_DVT_PE |
| PSI 04_PNEUMONIA | Death Rate among Surgical Inpatients with Serious Treatable Complications – Stratum – Pneumonia | PS04_PNEUMONIA |
| PSI 04_SEPSIS | Death Rate among Surgical Inpatients with Serious Treatable Complications – Stratum – Sepsis | PS04_SEPSIS |
| PSI 04_SHOCK | Death Rate among Surgical Inpatients with Serious Treatable Complications – Stratum – Shock/Cardiac Arrest | PS04_SHOCK |
| PSI 04_GIHEMORRHAGE | Death Rate among Surgical Inpatients with Serious Treatable Complications – Stratum – 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 | Perioperative Hemorrhage or Hematoma Rate | PS09 |
| PSI 10 | Postoperative Acute Kidney Injury Requiring Dialysis Rate ² | PS10 |
| PSI 11 | Postoperative Respiratory Failure Rate | PS11 |
| PSI 12 | Perioperative Pulmonary Embolism or Deep Vein Thrombosis 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: Postoperative Wound Dehiscence Rate | PS14_OPEN |
| PSI 14 Stratum_NONOPEN | Postoperative Wound Dehiscence Rate - Stratum_NONOPEN: Postoperative Wound Dehiscence Rate | PSI14_NONOPEN |
| PSI 15 | Abdominopelvic Accidental Puncture or Laceration Rate ³ | PS15 |
| PSI 17 ⁴ | Birth Trauma Rate—Injury to Neonate | PS17 |
| 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 ⁵ | PS90 |

NOTE: ¹ Previously called “Postoperative Hip Fracture” prior to v6.0. ² Previously called “Postoperative Physiologic and Metabolic Derangement” prior to v5.0. ³ Previously called “[Unrecognized Abdominopelvic Accidental Puncture or Laceration Rate](#)” prior to v2020. ⁴ Calculated in the PSI 17 software package or PSI Module software package. ⁵ 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, and PSI 04_GIHEMORRHAGE. [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 |
| 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 |
| S | Smoothed rate (not reported for stratified indicators) ¹ | SPPS08 |
| SN | Reliability of the risk-adjusted rate ¹ | SNPPS08 |
| X | Standard error of the smoothed rate ¹ | XPPS08 |

NOTE: 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. Files Included in the PSI Software Package

| SAS PROGRAM FILE NAME | REQUIRED AUXILIARY MACRO, ASCII, AND CSV FILES |
|---------------------------|---|
| PSI_HOSP_CONTROL.sas | N/A |
| PSI_HOSP_FORMATS.sas | N/A |
| PSI_HOSP_MEASURES.sas | PSI_HOSP_DX_PR_MACROS_V2020.sas, PSI_HOSP_COMORB_CODE_V2020.sas, PSI_HOSP_COMORB_FORMAT_V2020.sas |
| PSI_HOSP_OBSERVED.SAS.sas | N/A |
| PSI_HOSP_RISKADJ.SAS.sas | PSI_HOSP_REGVARS_V2020.sas, PSI_HOSP_SIGVAR_ARRAY_V2020.sas, PSI_HOSP_OE_ARRAY_V2020.sas, and auxiliary CSV files |
| PSI_HOSP_COMPOSITE.sas | PSI_HOSP_COMPOSITE_ARRAYS_V2020.sas, PSI_HOSP_COMPOSITE_WT_V2020.sas |

2.4 Pediatric Quality Indicators (PDIs) Quick Reference

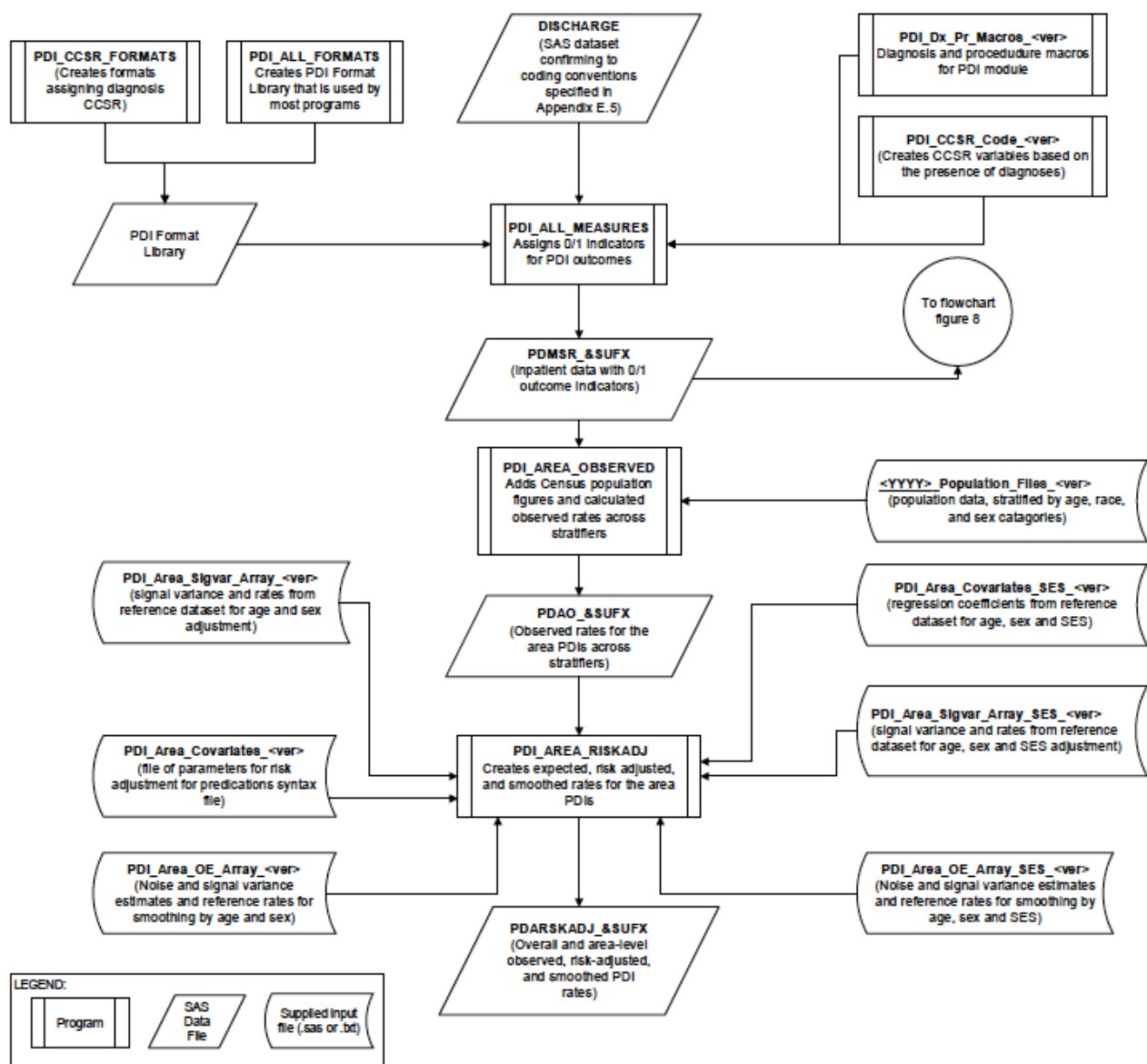
2.4.1 Processing Steps

[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

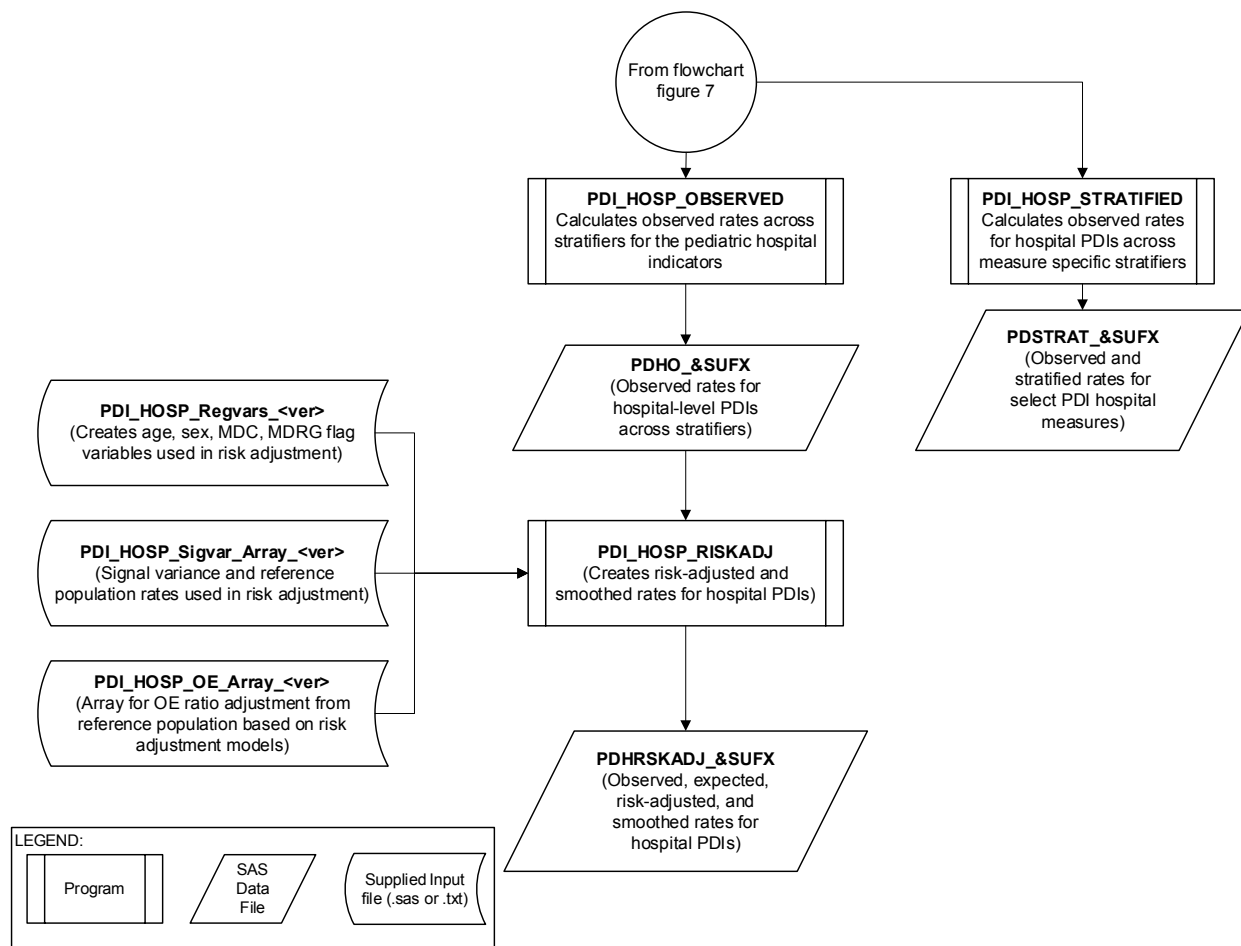
addition, one standalone module was introduced with SAS QI v5.0. The PSI 17 software package calculates this indicator without the need to run the entire PDI software package. This standalone software package is available as a separate download from the AHRQ QI website. The standalone software package 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 | PATIENT SAFETY 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 |

| INDICATOR ABBREV | PATIENT SAFETY INDICATOR | SAS VARIABLE ABBREV |
|----------------------------------|---|---------------------|
| HOSPITAL-LEVEL INDICATORS | | |
| NQI 03 | Neonatal Blood Stream Infection Rate | NQ03 |
| PDI 01 | Accidental Puncture or Laceration Rate | PD01 |
| PDI 05 | Iatrogenic Pneumothorax Rate | PD05 |
| PDI 08 | Perioperative Hemorrhage or Hematoma Rate | 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 |

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: 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 <i>(applies only to PDI 01, PDI 08, PDI 10, and PDI 12)</i> | -- | GPPD10 |
| H | Risk class flag | -- | HPPD10 |
| O | Observed rate | OAPD14 | OPPD10 |
| E | Expected rate | EAPD14 | EPPD10 |
| R | Risk-adjusted rate | RAPD14 | RPPD10 |
| L | Lower limit of confidence interval for risk-adjusted rate | LAPD14 | LPPD10 |

| PREFIX | TYPE OF RESULT | EXAMPLE: AREA LEVEL INDICATOR (PDI 4) | EXAMPLE: HOSPITAL LEVEL INDICATOR (PDI 10) |
|--------|---|---------------------------------------|--|
| U | Upper limit of confidence interval for risk-adjusted rate | UAPD14 | UPPD10 |
| S | Smoothed rate | SAPD14 | SPPD10 |
| SN | Reliability of the risk-adjusted rate | SNAPD14 | SNPPD10 |
| X | Standard error of the smoothed rate | XAPD14 | XPPD10 |

NOTE: i 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](#) 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 2000–2019 Population File, 2000-2019_Population_Files_V2020.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. Files Included in the PDI Software Package

| SAS PROGRAM FILE NAME | REQUIRED AUXILIARY MACRO, ASCII, AND CSV FILES |
|--|---|
| PDI_ALL_CONTROL.sas | N/A |
| PDI_ALL_FORMATS.sas | N/A |
| PDI_ALL_MEASURES.sas | PDI_DX_PR_MACROS_V2020.sas |
| PDI_AREA_OBSERVED.sas | 2000-2019_Population_Files_V2020.txt |
| PDI_AREA_RISKADJ.sas | 2000-2019_Population_Files_V2020.txt, either PDI_AREA_COVARIATES_V2020.txt or PDI_AREA_COVARIATES_SES_V2020.txt and either PDI_AREA_SIGVAR_ARRAY_AREA_V2020.sas or PDI_AREA_SIGVAR_ARRAY_AREA_SES_V2020.sas and either PDI_AREA_OE_ARRAY_V2020.sas or PDI_AREA_OE_ARRAY_SES_V2020.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 |

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 v2020.

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 Quality Indicators™ 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](#).

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

| | | |
|--|---------|--------|
| 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 v2020 software packages account for ICD-10-CM/PCS coding effective October 1, 2015; October 1, 2016; October 1, 2017; October 1, 2018, and October 1, 2019.

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 (http://www.cdc.gov/nchs/data/icd/10cmguidelines_2016_final.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 http://www.hcup-us.ahrq.gov/reports/methods/methods_topic.jsp.

Version 2020¹² 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).¹³

¹² 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.

¹³ In the IQI module of v2020 SAS QI software, the APR-DRGs in the risk adjustment models are based on the patient’s admission diagnosis and consider POA information.

3.2.2.1 When the Input Data File to the SAS QI v2020 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 exempt from POA reporting, the SAS QI v2020 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 v2020 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 v2020 Does Not Include POA Information

For the diagnoses that are exempt from POA reporting, the SAS QI v2020 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 v2020 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 001–017 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://downloads.cms.gov/files/ms-drg-v37-0-r0-mce.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 v2020 accounts for MS-DRG coding effective through September 30, 2020.

3.3.2 APR-DRG Variables

Users must either use their own grouper software or download and run the Admission APR-DRG grouper¹⁴ 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 “vc redistrib_x64.EXE” (64-bit). Most default Windows installations will already have this application installed and the vc redistrib_64.EXE file does not need to be run. If users are running on a 32-bit version of Windows, the APR-DRG version included with the v2020 package does not support the 32-bit version and they will need to use a 64 bit version of Windows. If users are running a 64-bit version of Windows, then they must 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.

¹⁴ APR-DRG codes are used in risk adjustment calculations for IQI 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.sas has been provided for this purpose.
- The APR-DRG software requires the use of POA information.¹⁵

3.4 Coding of Other Specific Data Elements

3.4.1 ATYPE—Admission Type

Six of the indicators (PSI 04, PSI 10, PSI 11, PSI 13, PDI 08, and PDI 09) 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, ASCHEDED). 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.

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/maponline/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.

¹⁵ In the IQI module of version v2020 of the SAS QI software, the APR-DRGs in the risk adjustment models are based on the patient's admission diagnosis and considers POA information.

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_ALL_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.¹⁶ 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).

¹⁶ In SAS QI v2020, 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:

$$\frac{\text{Outcome of interest}}{\text{Population at risk}} \\ \text{\{or\}} \\ \frac{\text{Numerator}}{\text{Denominator}}$$

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 located on the AHRQ QI website: <https://www.qualityindicators.ahrq.gov/Modules/>.

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: Output and TYPELVLx Values: Levels of Summarization). These stratifiers include areas (counties), age groups, race/ethnicity categories, and sex for the area-level indicators; and hospitals, age groups, race/ethnicity, sex, and payer 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.



Note

In the sections that follow, a graphic like this one will appear wherever one or more modules or indicators diverge from the steps being discussed.

These graphics will contain information on exceptions to the rule, relevant substitution steps, and other indicator- or module-specific instructions.

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, “Perioperative 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 v2020 software. The code to generate these reference (general or standard) population risk adjustment coefficients is not part of the SAS QI v2020 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 age, gender, payer, and race strata; however, users should be cautious of results because all risk adjustment models do control for age and gender.



This step applies to both hospital- and area-level indicators.

Indicators that are not risk-adjusted are noted in the risk adjustment tables available on the applicable module resources page on the AHRQ QI™ website (<http://www.ahrq.gov/modules/Default.aspx>)

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 v2020 software and do not need to be calculated by users. The code to generate these shrinkage estimates is not part of the SAS QI v2020 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.¹⁷

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.¹⁸ 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 v2020 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.

¹⁷AHRQ 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.

¹⁸Rates 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 Table and [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](#).

- 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 (Prevention Quality Indicators [PQI], Inpatient Quality Indicators [IQI], Patient Safety Indicators [PSI], PSI 17, or Pediatric Quality Indicators [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 |
| Stratify 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 v2020 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](#)). 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. [Table](#) 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.

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*; *PQI_AREA_CONDITION.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 Program¹

| 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 (Vn or v6). |
| 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=2017 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 2017. |
| 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 nosource compress=YES | Add options to compress output and suppress source code in log. The default is set to “1” (“yes”). This is the recommended option for large files. Note that the ICD-10-CM/PCS codes in the PSI_HOSP_FORMATS file will fill the log local window if Options Source is used. |
| %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 PRDAY=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 APRDIR ¹ | Specifies the location of the All Patient Refined Diagnosis-Related Groups (APRDRG) variables. Use if the input dataset contains APRDRG whether generated by 3M™ software or on user dataset originally. This is only required for IQI_HOSP_CONTROL.sas. |
| %LET APRDRGFG=1 ¹ | Specifies whether APRDRG variables are included in the IQI input dataset. The default is set to “1” (yes). |
| %LET APRDRG=1 ¹ | Specifies the name of the APRDRG variable. Default is APR_DRG. Set APRDRGFG to “0” if not available. |
| %LET MORTAL=1 ¹ | Specifies the name of the risk of mortality variable. Default is APRDRG_RISK_MORTALITY. Set APRDRGFG to “0” if not available. |

| SAS STATEMENT | DESCRIPTION |
|--|---|
| %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 <i>XXI_TYPE_MEASURES</i> input dataset. |
| libname OUTMSR | Specifies the location of the <i>XXI_TYPE_MEASURES</i> output analytic file. |
| %LET OUTFILE_MEAS | Specifies the name of the output analytic file from <i>XXI_TYPE_MEASURES</i> . |
| libname OUTAOBS ¹ | Specifies the location of the <i>XXI_AREA_OBSERVED.sas</i> program output analytic file. |
| %LET OUTFILE_AREAOBS ¹ | Specifies the name of the analytic file from <i>XXI_AREA_OBSERVED.sas</i> program. |
| %LET TYPELVLA=IN (0, 8) ¹ | Specifies the level of summarization in the output (see Appendix I: J for options). Default is set to (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 XXTXAOBS 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 <i>XXI_AREA_RISKADJ.sas</i> program output analytic file. |
| %LET OUTFILE_AREARISK ¹ | Specifies the name of the analytic file from <i>XXI_AREA_RISKADJ.sas</i> 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 XXTXTARA 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 <i>XXI_HOSP_OBSERVED.sas</i> program output analytic file. |
| %LET OUTFILE_HOSPOBS ¹ | Specifies the name of the analytic file produced from <i>XXI_HOSP_OBSERVED.sas</i> program. |
| %LET TYPELVLP=IN (0,16) %LET TYPELVLP=IN (0,64) | Specifies the level of summarization in the hospital-level indicator output (see Appendix I: J for options). Default is set to (0, 16) to provide overall and hospital-level IQI and PSI totals and (0, 64) to provide overall and hospital-level PDI totals. |

| SAS STATEMENT | DESCRIPTION |
|------------------------------------|---|
| %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 XXTXTHOB 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 XXTXTSTR 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 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 XXTXTHRA 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 XXCOMPRR 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. |
| %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. |

NOTE: 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 Run *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 I:). 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 format library will be created when the *XXI_TYPE_CONTROL.sas* program is executed based on 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:

1. In *XXI_TYPE_CONTROL.sas*, specify the location (path) of the format library in the “libname LIBRARY” statement.
2. 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.

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.

PSI
and
PDI

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

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 (TAXXnn and TPXXnn, 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. The PSI and PDI *XXI_TYPE_MEASURES.sas* programs include variables identifying present on admission (POA) conditions for hospital-level indicators (QPPSxx and QPPDxx). The PSI_HOSP_MEASURES.sas program also includes variables for the population for the hospital-level indicators (PPPSxx). 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:

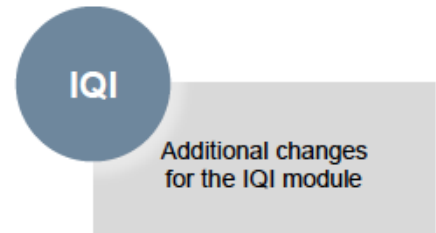
In the *XXI_TYPE_CONTROL.sas* program:

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



2. [Table](#)).
3. 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 v2020 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, 2000-2019_Population_Files_V2020.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.
3. SAS format library (*LIBRARY*) created from the *XXI_TYPE_FORMATS.sas* program.

Output:

1. SAS dataset with summary records that contain observed rates (OAXXnn 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 (TAXXnn variables), and the residential population totals that formed the denominators of the observed rates (PAXXnn 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 OAXXnn observed rates, the TAXXnn counts of outcomes that formed the numerators of the rates, and the PAXXnn residential population totals. The different records/rows in the text file will correspond to the different TYPELVLA levels of summarization ([Appendix J](#): Output and TYPELVLx Values: Levels of Summarization).
3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the area-level summary records that shows statistics for the OAXXnn observed rates, the TAXXnn counts of outcomes that formed the numerators of the rates, and the PAXXnn 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](#): Output and TYPELVLx Values: Levels of Summarization 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 2000-2019_Population_Files_V2020.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: Output and TYPELVLx Values: Levels of Summarization](#) 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 XXTXTAOB” 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

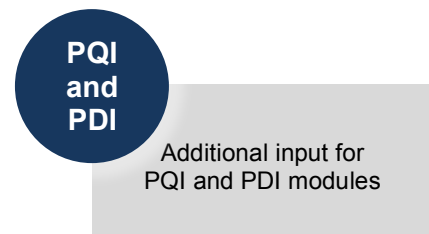
The *XXI_AREA_RISKADJ*.sas program calculates age and sex risk-adjusted rates for each area-level QI (overall rates and rates by area) and then calculates smoothed rates. See Appendix G: for a detailed list of risk factors.

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, 2000-2019_Population_Files_V2020.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.
3. SAS format library (LIBRARY) created from the *XXI_TYPE_FORMATS.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. 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_V2020.txt*) and one text file includes adjustment for age, sex, and poverty (*XXI_AREA_COVARIATES_SES_V2020.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.
6. SAS macro programs (*XXI_AREA_SIGVAR_ARRAY_V2020.sas* and *XXI_AREA_SIGVAR_ARRAY_SES_V2020.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_V2020.sas* should be used with adjustment only for age and sex. *XXI_AREA_SIGVAR_ARRAY_SES_V2020.sas* should be used with adjustment for age, sex, and poverty (not available with the IQI software package). 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 (OAXXnn variables), the counts of outcomes that formed the numerators of the observed rates (TAXXnn variables), the

residential population totals that formed the denominators of the observed rates (PAXXnn variables), the expected rates (EAXXnn variables), the risk-adjusted rates (RAXXnn variables), the smoothed rates (SAXXnn variables), and the lower and upper confidence intervals (LAXXnn and UAXXnn, respectively). When stratifications other than area are selected, the RAXXnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.

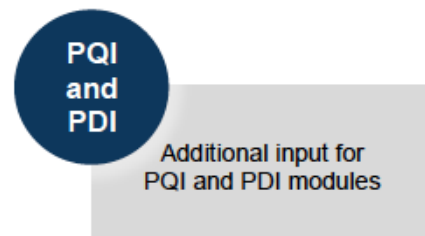
2. An optional ASCII (comma-delimited) text file that the user can then import into a spreadsheet. This text file contains the same information as the SAS output dataset. The text file will contain the OAXXnn observed rates and their TAXXnn and PAXXnn components, the RAXXnn risk-adjusted rates, and the SAXXnn 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 OAXXnn observed rates and their TAXXnn and PAXXnn components, the RAXXnn risk-adjusted rates, and the SAXXnn 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_V2020*.sas for age and sex risk adjustment in the PQI and PDI software, and *XXI_AREA_SIGVAR_ARRAY_SES_V2020*.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 2000-2019_Population_Files_V2020.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_V2020.txt* for the PQI and PDI software and
 - *XXI_AREA_COVARIATES_SES_V2020.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 XXTXTARA” 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*

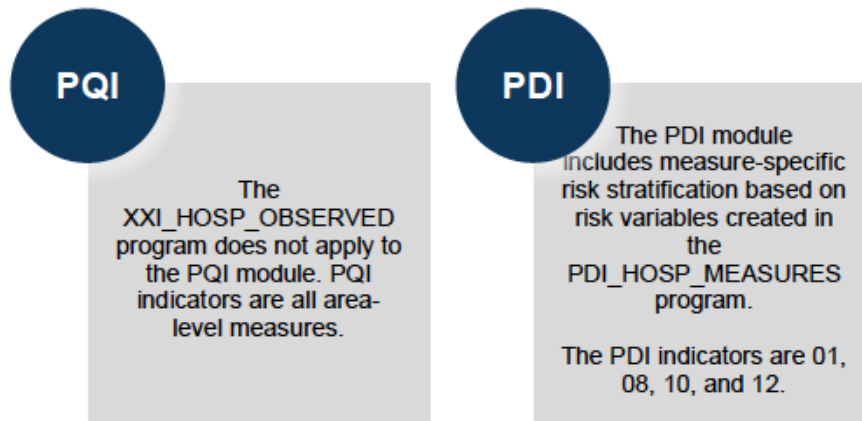
The *XXI_HOSP_OBSERVED.sas* program calculates the observed rates for the hospital-level indicators using the data derived in a previous step (*XXI_TYPE_MEASURES.sas*). These observed rates are stratified by combinations of hospitals, sex, age, race, and payer categories. The program first totals the 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 (OPXXnn variables where nn refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TPXXnn variables), and the hospital discharge totals that formed the denominators of the observed rates (PPXXnn variables). It also includes variables identifying POA conditions for hospital-level outcomes of interest (QPXXnn), although given that POA is required, QPXXnn is equivalent to TPXXnn. The output file has records summarized to the various combinations of stratifiers specified in the TYPELVLP 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 OPXXnn observed rates, the TPXXnn counts of outcomes that formed the numerators of the rates, and the PPXXnn counts of outcomes that formed the denominators of the rates. The different records/rows in the text file will correspond to the

different TYPELVLP summarizations ([Appendix J: Output and TYPELVLx Values: Levels of Summarization](#)).

2. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the hospital-level summary records that shows statistics for the *OPXXnn* observed rates, the *TPXXnn* counts of outcomes that formed the numerators of the rates, and the *PPXXnn* 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 TYPELVLP 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 TYPELVLP 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 “TEXTTP2” parameter *XXI_TYPE_CONTROL.sas* code should be set to “1.”

Changes/Confirmations:

In the *XXI_TYPE_CONTROL.sas* program:

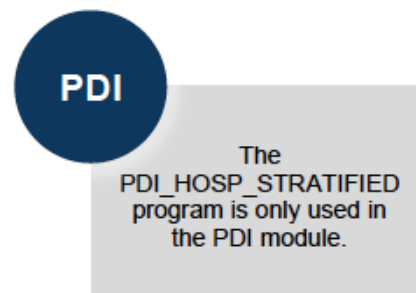
1. Confirm that the “libname OUTMSR” and “libname OUTHOBS” statements specify the locations (paths) of the input and output SAS files, respectively.
2. Confirm that the “OUTFILE_MEAS” and “OUTFILE_HOSPOBS” statements specify the correct names of the input and output files. The name that is specified 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 TYPELVLP =” statement. Each number corresponds to a different level or combination of levels, as shown in [Appendix J: Output and TYPELVLx Values: Levels of Summarization](#). 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.
 - If TYPELVLP 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 TYPELVLP 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
4. 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 *XXTXTHOB*" 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.

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, IQI 34, PSI 17–PSI 19). The risk-adjusted and smoothed rates are also not calculated for the hospital-level count indicator PSI 05.

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 regardless of the number of cases available. However, 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_V2020.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_XXxx_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_V2020.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 (OPXXnn variables), the risk-adjusted rates (RPXXnn variables), the smoothed rate (SPXXnn variables), the counts of outcome that formed the numerators of the observed rates (TPXXnn variables), the hospital discharge totals that formed the denominators of the observed rates (PPXXnn variables), the expected rates (EPXXnn variables), the variance of the risk-adjusted rate (VPXXnn variables), the risk-adjusted rate confidence intervals (LPPSnn variables for lower bounds and UPPSnn variables for upper bounds), reliability of the risk-adjusted rates (SNPXXnn), and the smoothed rate standard errors (XPPSnn). When stratifications other than hospital are selected, the RPXXnn 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 VPXXnn variance variables). The text file will contain the OPXXnn observed rates and their TPXXnn numerator and PPXXnn denominator components, the EPXXnn expected rates, the RPXXnn risk-adjusted rates with upper (UPPSnn) and lower (LPPSXX) limits, and the SPXXnn 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, NMIS, 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 TYPELVLP parameter of the preceding *XXI_HOSP_OBSERVED.SAS* program (see [Appendix J: Output and TYPELVLx Values: Levels of Summarization](#)).



IQI, PDI, and PSI

IQI and PSI specifications are based on Provider ID, categories for Age, Sex, Payer, and Race, and the level of summarization, or TYPE selected in the *XXI_HOSP_CONTROL* file.

PDI specification includes birth weight and pediatric age categories.

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 TYPELVL parameter of the preceding *XXI_HOSP_OBSERVED.sas* program (see [Appendix J](#): Output and TYPELVLx Values: Levels of Summarization). 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 OUTPOBS,” and “libname OUTPRISK” 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 “filename RACOEFFS” “&.\GEE_PS&PS._&MODEL_.csv” statement indicates the correct name and location of the risk adjustment parameters (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 XXTXTPRISK” statement and set the TXTPRA parameter to “1.” Otherwise, the default value of “0” for TXTPRA will skip the code that would generate this file.
8. 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 Program¹⁹

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 available on the AHRQ QIs website

(https://www.qualityindicators.ahrq.gov/Downloads/Resources/Publications/2020/Empirical_Methods_2020.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.

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.

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:

¹⁹ 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.

1. If the user wishes to modify the weights, change the W_{nn} values in the `XXI_Composite_Wt_v2020.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 TAXXnn and TPXXnn flag variables that will later form the numerators for the indicator rates. For each TAXXnn and TPXXnn 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 TPXXnn 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 TAXXnn 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 *TAXXnn* numerators, the *PAXXnn* denominators, and the *OAXXnn* 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 *TAXXnn* 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 *TAXXnn* 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 *TAXXnn* and *PAXXnn* 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 *PAXXnn* population denominators for the indicators, the *TAXXnn* outcome numerators for the indicators, and the *OAXXnn* observed rates.

[Table](#) 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. |
| TAXXnn | Number of cases in the numerator. |
| PAXXnn | Number of cases in the denominator (population at risk). |
| OAXXnn | Observed (raw) rate—numerator divided by denominator. |
| RAXXnn | 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. |
| SNAXXnn | Reliability of the risk-adjusted rate. |
| SAXXnn | 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 TAXXnn 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 TAXXnn and PAXXnn 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.”) [Table](#) 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. |
| TAXXnn | Number of cases in the numerator. |
| PAXXnn | Number of cases in the denominator (population at risk). |
| OAXXnn | Observed (raw) rate—numerator divided by denominator. |
| EAXXnn | 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). |
| RAXXnn | 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 RAXXnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. |
| LAXXnn | Lower limit of confidence interval of risk-adjusted rate. |
| UAXXnn | Upper limit of confidence interval of risk-adjusted rate. |
| SNAXXnn | Reliability of the risk-adjusted rate. |
| SAXXnn | Smoothed rate—rates with removal of fluctuation over time. |
| XAXXnn | 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., $0.000494 * 100,000 = \text{hysterectomies per } 100,000 \text{ population}$).

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 TAXXnn 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 TAXXnn and PAXXnn 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 TAXXnn and PAXXnn 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 TPXXnn numerators, the PPXXnn denominators, and the OPXXnn 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 TYPELVLP 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 TPXXnn 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 PPXXnn 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 TPXXnn and PPXXnn 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 *PPXXnn* population denominators for the hospital-level indicators, the *TPXXnn* outcome numerators for the hospital-level indicators, and the *OPXXnn* 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.”)

[Table](#) 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. (TYPELVLP=0). The remaining observations are individual providers (hospitals) (TYPELVLP= 6). |
| HOSPID | Identifier for each provider (hospital) in the dataset. |
| AGECAT | Age stratification category—see Appendix J : Output and TYPELVLP Values: Levels of Summarization for TYPELVLP settings. |
| SEXCAT | Sex stratification category—see Appendix J : Output and TYPELVLP Values: Levels of Summarization for TYPELVLP settings. |
| PAYCAT | Payer stratification category—see Appendix I : and Appendix J for TYPELVLP settings. |
| RACECAT | Race stratification category—see Appendix I : and Appendix J for TYPELVLP settings. |
| TPXXnn | Number of cases in the numerator. |
| PPXXnn | Number of cases in the denominator (population at risk). |
| OPXXnn | Observed (raw) rate—numerator divided by denominator. |
| EPXXnn | 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). |
| RPXXnn | 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 RPXXnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. |
| LPXXnn | Lower limit of confidence interval of risk-adjusted rate. |
| UPXXnn | Upper limit of confidence interval of risk-adjusted rate. |
| SNPXXnn | Reliability of the risk-adjusted rate |
| SPXXnn | Smoothed rate—rates with removal of fluctuation over time. |
| XPXXnn | Standard error of smoothed rate. |

Observation 1 (with HOSPID=.) is the overall average for the entire dataset (TYPELVLP=0). The remaining observations are individual providers (hospitals) (TYPELVLP=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 TPXXnn 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. [Table](#) lists the estimates provided in the MEANS table.

Table 24. Final Hospital-Level Composite Printed Output

| COLUMN HEADING | DESCRIPTION |
|----------------|--|
| COMPx | Composite score |
| COMPxVAR | Variance for the composite score |
| COMPxSE | 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 v2020.

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

- For PQIs: http://www.qualityindicators.ahrq.gov/modules/pqi_resources.aspx
- For IQIs: http://www.qualityindicators.ahrq.gov/modules/iqi_resources.aspx
- For PSIs: http://www.qualityindicators.ahrq.gov/modules/psi_resources.aspx
- For PDIs: 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 v2020 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 Quality Indicators™ (QIs):

QI resources by module:

- Prevention Quality Indicators (PQIs):
http://www.qualityindicators.ahrq.gov/Modules/pqi_resources.aspx
- Inpatient Quality Indicators (IQIs):
http://www.qualityindicators.ahrq.gov/Modules/iqi_resources.aspx
- Patient Safety Indicators (PSIs):
http://www.qualityindicators.ahrq.gov/Modules/psi_resources.aspx
- Pediatric Quality Indicators (PDIs):
http://www.qualityindicators.ahrq.gov/Modules/pdi_resources.aspx

SAS QI® software: <http://www.qualityindicators.ahrq.gov/Software/SAS.aspx>

Frequently Asked Questions: https://www.qualityindicators.ahrq.gov/FAQs_Support/

Table A.1. AHRQ Quality Indicators Version 2020 Documentation and Software

| DOCUMENTATION AND SOFTWARE | DESCRIPTION |
|--|--|
| DOCUMENTATION | |
| <ul style="list-style-type: none"> • 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. |
| <ul style="list-style-type: none"> • 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. |
| <ul style="list-style-type: none"> • PQI v2020 Benchmark Data Tables • IQI v2020 Benchmark Data Tables • PSI v2020 Benchmark Data Tables • PDI v2020 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 v2020. |
| <ul style="list-style-type: none"> • 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 | |
| <ul style="list-style-type: none"> • 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 |
|--|--|
| <ul style="list-style-type: none"> Limited License edition of the 3M™ APR-DRG grouper | Creates All Patient Refined Diagnosis-Related Group (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 v2020 QI software. |
| <ul style="list-style-type: none"> 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. |
| <ul style="list-style-type: none"> 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

Additional documents may be accessed at the AHRQ Quality Indicator Resources web page: <http://www.qualityindicators.ahrq.gov/modules/Default.aspx>

Examples of documents available at this link include:

- AHRQ Quality Indicator Empirical Methods v2020
- 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/company-us/all-3m-products/~/3M-APR-DRG-Software/?N=5002385+3290603192&rt=rud.

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

Table B.1. 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 B.2. 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 |
| IQI 20 Pneumonia Mortality Rate |
| IQI 21 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 32 Acute Myocardial Infarction (AMI) Mortality Rate, Without Transfer Cases |
| IQI 33 Primary Cesarean Delivery Rate, Uncomplicated |
| IQI 34 Vaginal Birth After Cesarean (VBAC) Rate, All |
| 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 Perioperative Hemorrhage or Hematoma Rate |
| PSI 10 Postoperative Acute Kidney Injury Requiring Dialysis Rate ³ |
| PSI 11 Postoperative Respiratory Failure Rate |
| PSI 12 Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate |
| PSI 13 Postoperative Sepsis Rate |
| PSI 14 Postoperative Wound Dehiscence Rate |
| PSI 15 Abdominopelvic Accidental Puncture or Laceration Rate ⁴ |
| 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 |

| INDICATOR NAME |
|--|
| 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 Perioperative Hemorrhage or Hematoma Rate |
| PDI 09 Postoperative Respiratory Failure Rate |
| PDI 10 Postoperative Sepsis Rate |
| PDI 12 Central Venous Catheter-Related Blood Stream Infection Rate |

NOTE: ¹ Indicator includes stratum-specific rates. ² Previously called “Postoperative Hip Fracture” prior to v6.0. 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.

Appendix C: AHRQ SAS QI® Software Packages

Table C.1. List of SAS Programs and Auxiliary Files in Prevention Quality Indicator (PQI) Software Package, Beginning with Version 2020

| 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 now executed in PQI_AREA_CONTROL by setting the individual flag variables. | 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 (TAPQxx). ¹ | User must set the EXE_MSR flag in the PQI_AREA_CONTROL.sas program to run; requires the PQI_AREA_DX_PX_MACROS_Vnn.sas ² program. | 3 |
| PQI_AREA_OBSERVED.sas | Creates denominators (PAPQxx); calculates observed rates for area-level indicators (OAPQxx). | User must set the EXE_AOBS flag in the PQI_AREA_CONTROL.sas program to run; requires 2000-2019_Population_Files_V2020.txt. | 4 |
| PQI_AREA_RISKADJ.sas | Calculates risk-adjusted rates for area-level indicators (PAPQxx, EAPQxx, RAPQxx, LAPQxx, UAPQxx, SAPQxx, and XAPQxx). | User must set the EXE_ARSK flag in the PQI_AREA_CONTROL.sas program to run; requires 2000-2019_Population_Files_V2020.txt, either PQI_AREA_SIGVAR_ARRAY_Vnn.sas or PQI_AREA_SIGVAR_ARRAY_SES_Vnn.sas, either PQI_AREA_COVARIATES_Vnn.txt or PQI_AREA_COVARIATES_SES_Vnn.txt, and either PQI_AREA_OE_ARRAY_Vnn.sas or PQI_AREA_OE_SES_ARRAY_Vnn.sas. | 5 |
| AUXILIARY SAS MACRO PROGRAM | | | |
| PQI_DX_PR_MACROS_Vnn.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; referred to in the PQI_AREA_MEASURES.sas. | N/A |
| PQI_AREA_SIGVAR_ARRAY_Vnn.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 |

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| SAS PROGRAM/TEXT FILE | PURPOSE/FUNCTION | COMMENTS | ORDER |
|--|--|--|-------|
| PQI_AREA_SIGVAR_ARRAY_SES_Vnn.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_Vnn.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_Vnn.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 | | | |
| 2000-2019_Population_Files_V2020.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_Vnn.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_Vnn.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 |

NOTE: ¹ xx refers to the quality indicator number. ² nn refers to the version year; for example, v2020.

Table C.2. List of SAS Programs and Auxiliary Files in Inpatient Quality Indicators (IQIs) Software Package, Beginning with Version 2020

| 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. | 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. | 2 |
| IQI_HOSP_MEASURES.sas | Assigns numerator flags (TPIQxx). ¹ | User must set the EXE_MSR flag in the IQI_HOSP_CONTROL.sas program to run; requires the IQI_HOSP_DX_PR_MACROS_Vnn.sas ² program. | 3 |
| IQI_HOSP_OBSERVED.sas | Creates denominators (PPIQxx); calculates observed rates for hospital-level indicators (OPIQxx). | 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 (EPIQxx, RPIQxx, LPIQxx, UPIQxx, SPIQxx, XPIQxx, and VPIQxx). | User must set the EXE_HRSK flag in the IQI_HOSP_CONTROL.sas program to run; requires IQI_HOSP_REGVARS_Vnn.sas, IQI_HOSP_SIGVAR_ARRAY_Vnn.sas, IQI_HOSP_OE_ARRAY_Vnn.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_Vnn.sas. | 6 |
| AUXILIARY SAS MACRO PROGRAMS | | | |
| IQI_HOSP_DX_PR_MACROS_Vnn.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; referred to in the IQI_HOSP_MEASURES.sas. | N/A |
| IQI_HOSP_REGVARS_Vnn.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 |

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| SAS PROGRAM/TEXT FILE | PURPOSE/FUNCTION | COMMENTS | ORDER |
|--|--|---|---------------------------------------|
| IQI_HOSP_SIGVAR_ARRAY_Vnn.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_Vnn.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_Vnn.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_Vnn.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_IQxx_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 | | | |
| 3M™ APR-DRG Limited License grouper (accessed from AHRQ QIs website) | Creates three APR-DRG data elements: APR_DRG, APRDRG_RISK_MORTALITY, and SEVERITY. | APR-DRG variables need to be on user's input data file prior to running the v2020 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 |

NOTE: ¹ xx refers to the quality indicator number. ² nn refers to the version year; for example, v2020.

Table C.3. List of SAS Programs and Auxiliary Files in Patient Safety Indicator (PSI) Software Package, Beginning with Version v2020¹

| 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. | 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_Vnn.sas ³ program is correct in the PSI_HOSP_CONTROL.sas program; requires PSI_HOSP_COMORB_FORMAT_Vnn.sas. | 2 |
| PSI_HOSP_MEASURES.sas | Assigns numerator and denominator flags (TPPSxx, PPPSxx). ² | User must set the EXE_MSR flag in the PSI_HOSP_CONTROL.sas program to run. Requires the PSI_HOSP_DX_PR_MACROS_Vnn.sas program and PSI_HOSP_COMORB_CODE_Vnn.sas. | 3 |
| PSI_HOSP_OBSERVED.sas | Calculates observed rates for hospital-level indicators (OPPSxx). | 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 (PPPSxx, EPPSxx, RPPSxx, LPPSxx, UPPSxx, SPPSxx, XPPSxx). | User must set the EXE_HRSK flag in the PSI_HOSP_CONTROL.sas program to run; requires PSI_HOSP_REGVARS_Vnn.sas, PSI_HOSP_OE_ARRAY_Vnn.sas, PSI_HOSP_SIGVAR_Vnn.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_Vnn.sas. | 6 |
| AUXILIARY SAS MACRO PROGRAMS | | | |
| PSI_HOSP_DX_PR_MACROS_Vnn.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; referred to in the PSI_HOSP_MEASURES.sas. | N/A |
| PSI_HOSP_COMORB_FORMAT_Vnn.sas | Contains format library macro for comorbidity variables, per Elixhauser comorbidity software. | 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 |

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| SAS PROGRAM/TEXT FILE | PURPOSE/FUNCTION | COMMENTS | ORDER |
|--|--|--|-------|
| PSI_HOSP_COMORB_CODE_Vnn.sas | Creates comorbidity variables, using Elixhauser comorbidity software. | 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_Vnn.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_Vnn.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_Vnn.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_Vnn.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_Vnn.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 | | | |
| GEE_PSxx_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 |

NOTE: ¹ Includes calculations for all PSIs except PSI 17 Birth Trauma Rat –Injury to Neonates. ² xx refers to the quality indicator number. ³ nn refers to the version year; for example, v2020.

Table C.4. List of SAS Programs and Auxiliary Files in PSI 17–Birth Trauma–Injury to Neonate Rate Software Package, Beginning with Version v2020

| 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. | 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 |

NOTE: PSI 17 is not risk-adjusted; therefore PSI17_HOSP_RISKADJ.sas does not exist.

Table C.5. List of SAS Programs and Auxiliary Files in Pediatric Quality Indicator (PDI) Software Package,¹ Beginning with Version v2020

| 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. | 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_Vnn.sas ² program. | 2 |
| PDI_ALL_MEASURES.sas | Assigns numerator flags (TAPDxx, ³ TPPDxx, TPNQxx, 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_DX_PR_MACROS_Vnn.sas ³ and PDI_CCSR_CODE_Vnn.sas programs. | 3 |
| PDI_AREA_OBSERVED.sas | Calculates observed rates for area-level indicators (PAPDxx and OAPDxx). | User must set the EXE_AOBS flag in the PDI_ALL_CONTROL.sas program to run; requires 2000-2019_Population_Files_V2020.txt. | 4 Area |
| PDI_AREA_RISKADJ.sas | Calculates risk-adjusted rates for area-level indicators (EAPDxx, RAPDxx, LAPDxx, UAPDxx, SAPDxx, and XAPDxx). | User must set the EXE_ARSK flag in the PDI_ALL_CONTROL.sas program to run; requires 2000-2019_Population_Files_V2020.txt, either PDI_AREA_SIGVAR_ARRAY_Vnn.sas or PDI_AREA_SIGVAR_ARRAY_SES_Vnn.sas, either PDI_AREA_COVARIATES_Vnn.txt or PDI_AREA_COVARIATES_SES_Vnn.txt, and either PDI_AREA_OE_ARRAY_Vnn.sas or PDI_AREA_OE_SES_ARRAY_Vnn.sas. | 5 Area |
| PDI_HOSP_OBSERVED.sas | Calculates observed rates for hospital-level indicators (OPPDxx). | User must set the EXE_HOBS flag in the PDI_ALL_CONTROL.sas program to run. | 4 Hospital |
| PDI_HOSP_STRATIFIED.sas <i>(applies only to PDI 01, PDI 08, PDI 10, and PDI 12)</i> | 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 (EAPDxx, RAPDxx, LAPDxx, UAPDxx, SAPDxx, and XAPDxx). | User must set the EXE_HRSK flag in the PDI_ALL_CONTROL.sas program to run; requires PDI_HOSP_REGVARS_Vnn.sas, PDI_HOSP_OE_ARRAY_Vnn.sas, PDI_HOSP_SIGVAR_Vnn.sas, and CSV auxiliary files. | 6 Hospital |
| AUXILIARY SAS MACRO PROGRAMS | | | |
| PDI_CCSR_Format_Vnn.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_CCSR_Code_Vnn.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_DX_PR_MACROS_Vnn.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; referred to in the PDI_ALL_MEASURES.sas program. | N/A |
| PDI_AREA_SIGVAR_ARRAY_Vnn.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_Vnn.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 |
| PDI_AREA_OE_ARRAY_Vnn.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_Vnn.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_Vnn.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_Vnn.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 |

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| SAS PROGRAM/TEXT FILE | PURPOSE/FUNCTION | COMMENTS | ORDER |
|--|--|---|-------|
| PDI_HOSP_OE_ARRAY_Vnn.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 | | | |
| 2000-2019_Population_Files_V2020.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_Vnn.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_Vnn.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 |

NOTE: 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, v2020. ³ *xx* refers to the quality indicator number.

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

Table D.1. Complete List of Prevention Quality Indicator (PQI) Variables

| INDICATOR ABBREV | VARIABLE PREFIX | | | | | | | | | |
|---------------------|-----------------|--------|--------|---------|----------------|----------------|----------------|----------------|----------------|----------------|
| | T | P | O | SN | E ¹ | R ¹ | L ¹ | U ¹ | S ¹ | X ¹ |
| PQI 01 | TAPQ01 | PAPQ01 | OAPQ01 | SNAPQ01 | EAPQ01 | RAPQ01 | LAPQ01 | UAPQ01 | SAPQ01 | XAPQ01 |
| PQI 03 | TAPQ03 | PAPQ03 | OAPQ03 | SNAPQ03 | EAPQ03 | RAPQ03 | LAPQ03 | UAPQ03 | SAPQ03 | XAPQ03 |
| PQI 05 | TAPQ05 | PAPQ05 | OAPQ05 | SNAPQ05 | EAPQ05 | RAPQ05 | LAPQ05 | UAPQ05 | SAPQ05 | XAPQ05 |
| PQI 07 | TAPQ07 | PAPQ07 | OAPQ07 | SNAPQ07 | EAPQ07 | RAPQ07 | LAPQ07 | UAPQ07 | SAPQ07 | XAPQ07 |
| PQI 08 | TAPQ08 | PAPQ08 | OAPQ08 | SNAPQ08 | EAPQ08 | RAPQ08 | LAPQ08 | UAPQ08 | SAPQ08 | XAPQ08 |
| PQI 11 | TAPQ11 | PAPQ11 | OAPQ11 | SNAPQ11 | EAPQ11 | RAPQ11 | LAPQ11 | UAPQ11 | SAPQ11 | XAPQ11 |
| PQI 12 | TAPQ12 | PAPQ12 | OAPQ12 | SNAPQ12 | EAPQ12 | RAPQ12 | LAPQ12 | UAPQ12 | SAPQ12 | XAPQ12 |
| PQI 14 | TAPQ14 | PAPQ14 | OAPQ14 | SNAPQ14 | EAPQ14 | RAPQ14 | LAPQ14 | UAPQ14 | SAPQ14 | XAPQ14 |
| PQI 15 | TAPQ15 | PAPQ15 | OAPQ15 | SNAPQ15 | EAPQ15 | RAPQ15 | LAPQ15 | UAPQ15 | SAPQ15 | XAPQ15 |
| PQI 16 | TAPQ16 | PAPQ16 | OAPQ16 | SNAPQ16 | EAPQ16 | RAPQ16 | LAPQ16 | UAPQ16 | SAPQ16 | XAPQ16 |
| PQI 90 | TAPQ90 | PAPQ90 | OAPQ90 | SNAPQ90 | EAPQ90 | RAPQ90 | LAPQ90 | UAPQ90 | SAPQ90 | XAPQ90 |
| PQI 91 | TAPQ91 | PAPQ91 | OAPQ91 | SNAPQ91 | EAPQ91 | RAPQ91 | LAPQ91 | UAPQ91 | SAPQ91 | XAPQ91 |
| PQI 92 | TAPQ92 | PAPQ92 | OAPQ92 | SNAPQ92 | EAPQ92 | RAPQ92 | LAPQ92 | UAPQ92 | SAPQ92 | XAPQ92 |
| PQI 93 | TAPQ93 | PAPQ93 | OAPQ93 | SNAPQ93 | EAPQ93 | RAPQ93 | LAPQ93 | UAPQ93 | SAPQ93 | XAPQ93 |

NOTE: C=condition-specific observed rate; E=expected rate; L=lower limit of confidence interval for risk-adjusted rate; O=observed rate; P=denominator (pop); R=risk-adjusted rate; S=smoothed rate; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; X=smoothed standard error. Dashes (--) indicate the variable is not created in the software.

Table D.2. List of Inpatient Quality Indicator (IQI) Variables

| INDICATOR ABBREV | INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES | | | | |
|------------------------------|--|------------------------------|------------------------------|------------------------------|------------------------------|
| | VARIABLE PREFIX | | | | |
| | T | P | O | E ¹ | R ¹ |
| IQI 08 | TPIQ08 | PPIQ08 | OPIQ08 | EPIQ08 | RPIQ08 |
| IQI 09 | TPIQ09 | PPIQ09 | OPIQ09 | EPIQ09 | RPIQ09 |
| IQI 09A WITH CANCER | TPIQ09_WITH CANCER | PPIQ09 WITH CANCER | OPIQ09 WITH CANCER | EPIQ09 WITH CANCER | RPIQ09 WITH CANCER |
| IQI 09B WITHOUT CANCER | TPIQ09_WITHOUT CANCER | PPIQ09_WITHOUT CANCER | OPIQ09_WITHOUT CANCER | EPIQ09_WITHOUT CANCER | RPIQ09_WITHOUT CANCER |
| IQI 11 | TPIQ11 | PPIQ11 | OPIQ11 | EPIQ11 | RPIQ11 |
| IQI 11 OPEN RUPTURED | TPIQ11_OPEN RUPTURED | PPIQ11_OPEN RUPTURED | OPIQ11_OPEN RUPTURED | EPIQ11_OPEN RUPTURED | RPIQ11_OPEN RUPTURED |
| IQI 11 OPEN UNRUPTURED | TPIQ11_OPEN UNRUPTURED | PPIQ11_OPEN UNRUPTURED | OPIQ11_OPEN UNRUPTURED | EPIQ11_OPEN UNRUPTURED | RPIQ11_OPEN UNRUPTURED |
| IQI 11 ENDO RUPTURED | TPIQ11_ENDO RUPTURED | PPIQ11_ENDO RUPTURED | OPIQ11_ENDO RUPTURED | EPIQ11_ENDO RUPTURED | RPIQ11_ENDO RUPTURED |
| IQI 11 ENDO UNRUPTURED | TPIQ11_ENDO UNRUPTURED | PPIQ11_ENDO UNRUPTURED | OPIQ11_ENDO UNRUPTURED | EPIQ11_ENDO UNRUPTURED | RPIQ11_ENDO UNRUPTURED |
| IQI 12 | TPIQ12 | PPIQ12 | OPIQ12 | EPIQ12 | RPIQ12 |
| IQI 15 | TPIQ15 | PPIQ15 | OPIQ15 | EPIQ15 | RPIQ15 |
| IQI 16 | TPIQ16 | PPIQ16 | OPIQ16 | EPIQ16 | RPIQ16 |
| IQI 17 | TPIQ17 | PPIQ17 | OPIQ17 | EPIQ17 | RPIQ17 |
| IQI 17 HEMSTROKE SUBARACH | TPIQ17_HEMSTROKE SUBARACH | PPIQ17_HEMSTROKE SUBARACH | OPIQ17_HEMSTROKE SUBARACH | EPIQ17_HEMSTROKE SUBARACH | RPIQ17_HEMSTROKE SUBARACH |
| IQI 17 HEMSTROKE INTRACER | TPIQ17_HEMSTROKE INTRACER | PPIQ17_HEMSTROKE INTRACER | OPIQ17_HEMSTROKE INTRACER | EPIQ17_HEMSTROKE INTRACER | RPIQ17_HEMSTROKE INTRACER |
| IQI 17 ISCHEMSTROKE | TPIQ17_ISCHEMSTROKE | PPIQ17_ISCHEMSTROKE | OPIQ17_ISCHEMSTROKE | EPIQ17_ISCHEMSTROKE | RPIQ17_ISCHEMSTROKE |
| IQI 18 | TPIQ18 | PPIQ18 | OPIQ18 | EPIQ18 | RPIQ18 |
| IQI 19 | TPIQ19 | PPIQ19 | OPIQ19 | EPIQ19 | RPIQ19 |
| IQI 20 | TPIQ20 | PPIQ20 | OPIQ20 | EPIQ20 | RPIQ20 |
| IQI 21 | TPIQ21 | PPIQ21 | OPIQ21 | -- | -- |

| INDICATOR ABBREV | INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES | | | | |
|--|--|----------|---------|----------------|----------------|
| | VARIABLE PREFIX | | | | |
| | T | P | O | E ¹ | R ¹ |
| IQI 22 | TPIQ22 | PPIQ22 | OPIQ22 | -- | -- |
| IQI 30 | TPIQ30 | PPIQ30 | OPIQ30 | EPIQ30 | RPIQ30 |
| IQI 31 | TPIQ31 | PPIQ31 | OPIQ31 | EPIQ31 | RPIQ31 |
| IQI 32 | TPIQ32 | PPIQ32 | OPIQ32 | EPIQ32 | RPIQ32 |
| IQI 33 | TPIQ33 | PPIQ33 | OPIQ33 | -- | -- |
| IQI 34 | TPIQ34 | PPIQ34 | OPIQ34 | -- | -- |
| HOSPITAL-LEVEL COMPOSITE VARIABLES (no prefix, entire variable name represented) | | | | | |
| IQI 90 | COMP1 | COMP1VAR | COMP1SE | COMP1WHT | COMP1LB |
| IQI 91 | COMP2 | COMP2VAR | COMP2SE | COMP2WHT | COMP2LB |

NOTE: 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; E=expected rate; L=lower limit of confidence interval for risk-adjusted rate; O=observed rate; P=denominator (pop); R=risk-adjusted rate; S=smoothed rate; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; V=variance of the risk-adjusted rate; X=smoothed standard error. Dashes (--) indicate the variable is not created in the software.

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

Table D.3. List of Additional Inpatient Quality Indicator (IQI) Variables

| INDICATOR ABBREV | ADDITIONAL INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES | | | | |
|------------------------|---|------------------------|-------------------------|----------------|----------------|
| | VARIABLE PREFIX | | | | |
| | L ¹ | U ¹ | SN | S ¹ | X ¹ |
| IQI 08 | LPIQ08 | UPIQ08 | SNPIQ08 | SPIQ08 | XPIQ08 |
| IQI 09 | LPIQ09 | UPIQ09 | SNPIQ09 | SPIQ09 | XPIQ09 |
| IQI 09 WITH CANCER | LPIQ09_WITH_CANCER | UPIQ09_WITH_CANCER | SNPIQ09_WITH_CANCER | -- | -- |
| IQI 09 WITHOUT CANCER | LPIQ09_WITHOUT_CANCER | UPIQ09_WITHOUT_CANCER | SNPIQ09_WITHOUT_CANCER | -- | -- |
| IQI 11 | LPIQ11 | UPIQ11 | SNPIQ11 | SPIQ11 | XPIQ11 |
| IQI 11 OPEN RUPTURED | LPIQ11_OPEN_RUPTURED | UPIQ11_OPEN_RUPTURED | SNPIQ11_OPEN_RUPTURED | -- | -- |
| IQI 11 OPEN UNRUPTURED | LPIQ11_OPEN_UNRUPTURED | UPIQ11_OPEN_UNRUPTURED | SNPIQ11_OPEN_UNRUPTURED | -- | -- |
| IQI 11 ENDO RUPTURED | LPIQ11_ENDO_RUPTURED | UPIQ11_ENDO_RUPTURED | SNPIQ11_ENDO_RUPTURED | -- | -- |

| INDICATOR ABBREV | ADDITIONAL INPATIENT QUALITY INDICATOR (IQI) VARIABLE NAMES | | | | |
|---|---|---------------------------|----------------------------|----------------|----------------|
| | VARIABLE PREFIX | | | | |
| | L ¹ | U ¹ | SN | S ¹ | X ¹ |
| IQI 11 ENDO UNRUPTURED | LPIQ11_ENDO_UNRUPTURED | UPIQ11_ENDO_UNRUPTURED | SNPIQ11_ENDO_UNRUPTURED | -- | -- |
| IQI 12 | LPIQ12 | UPIQ12 | SNPIQ12 | SPIQ12 | XPIQ12 |
| IQI 15 | LPIQ15 | UPIQ15 | SNPIQ15 | SPIQ15 | XPIQ15 |
| IQI 16 | LPIQ16 | UPIQ16 | SNPIQ16 | SPIQ16 | XPIQ16 |
| IQI 17 | LPIQ17 | UPIQ17 | SNPIQ17 | SPIQ17 | XPIQ17 |
| IQI 17 HEMSTROKE SUBARACH | LPIQ17_HEMSTROKE_SUBARACH | UPIQ17_HEMSTROKE_SUBARACH | SNPIQ17_HEMSTROKE_SUBARACH | -- | -- |
| IQI 17 HEMSTROKE INTRACER | LPIQ17_HEMSTROKE_INTRACER | UPIQ17_HEMSTROKE_INTRACER | SNPIQ17_HEMSTROKE_INTRACER | -- | -- |
| IQI 17 ISCHEMSTROKE | LPIQ17_ISCHEMSTROKE | UPIQ17_ISCHEMSTROKE | SNPIQ17_ISCHEMSTROKE | -- | -- |
| IQI 18 | LPIQ18 | UPIQ18 | SNPIQ18 | SPIQ18 | XPIQ18 |
| IQI 19 | LPIQ19 | UPIQ19 | SNPIQ19 | SPIQ19 | XPIQ19 |
| IQI 20 | LPIQ20 | UPIQ20 | SNPIQ20 | SPIQ20 | XPIQ20 |
| IQI 21 | -- | -- | -- | -- | -- |
| IQI 22 | -- | -- | -- | -- | -- |
| IQI 30 | LPIQ30 | UPIQ30 | SNPIQ30 | SPIQ30 | XPIQ30 |
| IQI 31 | LPIQ31 | UPIQ31 | SNPIQ31 | SPIQ31 | XPIQ31 |
| IQI 32 | LPIQ32 | UPIQ32 | SNPIQ32 | SPIQ32 | XPIQ32 |
| IQI 33 | -- | -- | -- | -- | -- |
| IQI 34 | -- | -- | -- | -- | -- |
| HOSPITAL-LEVEL COMPOSITE VARIABLES (no prefix, entire variable name represented) | | | | | |
| IQI 90 | COMP1UB | | | | |
| IQI 91 | COMP2UB | | | | |

NOTE: 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; E=expected rate; L=lower limit of confidence interval for risk-adjusted rate; O=observed rate; P=denominator (pop); R=risk-adjusted rate; S=smoothed rate; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; V=variance of the risk-adjusted rate; X=smoothed standard error. Dashes (--) indicate the variable is not created in the software.

¹All variables created in PSI software package except PSI 17; variables for PSI 17 are created in PSI 17 software package and PDI software package. Dashes (--) indicate the variable is not created in the software.

Table D.4. Complete List of Patient Safety Indicator (PSI) Variables¹

| INDICATOR ABBREV | T | P | Q | O | E ² | R ² | L ² | U ² | SN | S ² | X ² |
|---------------------|---------------------|---------------------|--------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|----------------|----------------|
| PSI 02 | TPPS02 | PPPS02 | -- | OPPS02 | EPPS02 | RPPS02 | LPPS02 | UPPS02 | SNPPS02 | SPPS02 | XPPS02 |
| PSI 03 | TPPS03 | PPPS03 | QPPS03 | OPPS03 | EPPS03 | RPPS03 | LPPS03 | UPPS03 | SNPPS03 | SPPS03 | XPPS03 |
| PSI 04 | TPPS04 | PPPS04 | -- | OPPS04 | EPPS04 | RPPS04 | LPPS04 | UPPS04 | SNPPS04 | SPPS04 | XPPS04 |
| PSI 04 DVT PE | TPPS04_DVT_PE | PPPS04_DVT_PE | -- | OPPS04_DVT_PE | EPPS04_DVT_PE | RPPS04_DVT_PE | LPPS04_DVT_PE | UPPS04_DVT_PE | SNPPS04_DVT_PE | -- | -- |
| PSI 04 PNEUMONIA | TPPS04_PNEUMONIA | PPPS04_PNEUMONIA | -- | OPPS04_PNEUMONIA | EPPS04_PNEUMONIA | RPPS04_PNEUMONIA | LPPS04_PNEUMONIA | UPPS04_PNEUMONIA | SNPPS04_PNEUMONIA | -- | -- |
| PSI 04 SEPSIS | TPPS04_SEPSIS | PPPS04_SEPSIS | -- | OPPS04_SEPSIS | EPPS04_SEPSIS | RPPS04_SEPSIS | LPPS04_SEPSIS | UPPS04_SEPSIS | SNPPS04_SEPSIS | -- | -- |
| PSI 04 SHOCK | TPPS04_SHOCK | PPPS04_SHOCK | -- | OPPS04_SHOCK | EPPS04_SHOCK | RPPS04_SHOCK | LPPS04_SHOCK | UPPS04_SHOCK | SNPPS04_SHOCK | -- | -- |
| PSI 04 GIHEMORRHAGE | TPPS04_GIHEMORRHAGE | PPPS04_GIHEMORRHAGE | -- | OPPS04_GIHEMORRHAGE | EPPS04_GIHEMORRHAGE | RPPS04_GIHEMORRHAGE | LPPS04_GIHEMORRHAGE | UPPS04_GIHEMORRHAGE | SNPPS04_GIHEMORRHAGE | -- | -- |
| PSI 05 | TPPS05 | PPPS05 | QPPS05 | OPPS05 | -- | -- | -- | -- | -- | -- | -- |
| PSI 06 | TPPS06 | PPPS06 | QPPS06 | OPPS06 | EPPS06 | RPPS06 | LPPS06 | UPPS06 | SNPPS06 | SPPS06 | XPPS06 |
| PSI 07 | TPPS07 | PPPS07 | QPPS07 | OPPS07 | EPPS07 | RPPS07 | LPPS07 | UPPS07 | SNPPS07 | SPPS07 | XPPS07 |
| PSI 08 | TPPS08 | PPPS08 | QPPS08 | OPPS08 | EPPS08 | RPPS08 | LPPS08 | UPPS08 | SNPPS08 | SPPS08 | XPPS08 |
| PSI 09 | TPPS09 | PPPS09 | QPPS09 | OPPS09 | EPPS09 | RPPS09 | LPPS09 | UPPS09 | SNPPS09 | SPPS09 | XPPS09 |
| PSI 10 | TPPS10 | PPPS10 | QPPS10 | OPPS10 | EPPS10 | RPPS10 | LPPS10 | UPPS10 | SNPPS10 | SPPS10 | XPPS10 |

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| INDICATOR ABBREV | T | P | Q | O | E ² | R ² | L ² | U ² | SN | S ² | X ² |
|------------------|----------------|----------------|---------|----------------|----------------|----------------|----------------|----------------|-----------------|----------------|----------------|
| PSI 11 | TPPS11 | PPPS11 | QPPS11 | OPPS11 | EPPS11 | RPPS11 | LPPS11 | UPPS11 | SNPPS11 | SPPS11 | XPPS11 |
| PSI 12 | TPPS12 | PPPS12 | QPPS12 | OPPS12 | EPPS12 | RPPS12 | LPPS12 | UPPS12 | SNPPS12 | SPPS12 | XPPS12 |
| PSI 13 | TPPS13 | PPPS13 | QPPS13 | OPPS13 | EPPS13 | RPPS13 | LPPS13 | UPPS13 | SNPPS13 | SPPS13 | XPPS13 |
| PSI 14 | TPPS14 | PPPS14 | QPPS14 | OPPS14 | EPPS14 | RPPS14 | LPPS14 | UPPS14 | SNPPS14 | SPPS14 | XPPS14 |
| PSI 14 OPEN | TPPS14_OPEN | PPPS14_OPEN | -- | OPPS14_OPEN | EPPS14_OPEN | RPPS14_OPEN | LPPS14_OPEN | UPPS14_OPEN | SNPPS14_OPEN | -- | -- |
| PSI 14 NONOPEN | TPPS14_NONOPEN | PPPS14_NONOPEN | -- | OPPS14_NONOPEN | EPPS14_NONOPEN | RPPS14_NONOPEN | LPPS14_NONOPEN | UPPS14_NONOPEN | SNPPS14_NONOPEN | -- | -- |
| PSI 15 | TPPS15 | PPPS15 | QPPS15 | OPPS15 | EPPS15 | RPPS15 | LPPS15 | UPPS15 | SNPPS15 | SPPS15 | XPPS15 |
| PSI 17 | TPPS17 | PPPS17 | -- | OPPS17 | -- | -- | -- | -- | -- | -- | -- |
| PSI 18 | TPPS18 | PPPS18 | -- | OPPS18 | -- | -- | -- | -- | -- | -- | -- |
| PSI 19 | TPPS19 | PPPS19 | -- | OPPS19 | -- | -- | -- | -- | -- | -- | -- |
| Composite | | | | | | | | | | | |
| PSI 90 | COMP1 | COMP1VAR | COMP1SE | COMP1WHT | COMP1LB | COMP1UB | -- | -- | -- | -- | -- |

NOTE: 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; S=smoothed rate; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; V=variance of the 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. Dashes (--) indicate the variable is not created in the software.

Table D.5. Complete List of Pediatric Quality Indicator (PDI) Variables

| INDICATOR ABBREV | T | P | Q | G | O | E | R | L | U | S | X |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| NQI 03 | TPNQ03 | PPNQ03 | QPNQ03 | -- | OPNQ03 | EPNQ03 | RPNQ03 | LPNQ03 | UPNQ03 | SPNQ03 | XPNQ03 |
| PDI 01 | TPPD01 | PPPD01 | QPPD01 | GPPD01 | OPPD01 | EPPD01 | RPPD01 | LPPD01 | UPPD01 | SPPD01 | XPPD01 |
| PDI 05 | TPPD05 | PPPD05 | QPPD05 | -- | OPPD05 | EPPD05 | RPPD05 | LPPD05 | UPPD05 | SPPD05 | XPPD05 |
| PDI 08 | TPPD08 | PPPD08 | QPPD08 | GPPD08 | OPPD08 | EPPD08 | RPPD08 | LPPD08 | UPPD08 | SPPD08 | XPPD08 |
| PDI 09 | TPPD09 | PPPD09 | QPPD09 | -- | OPPD09 | EPPD09 | RPPD09 | LPPD09 | UPPD09 | SPPD09 | XPPD09 |
| PDI 10 | TPPD10 | PPPD10 | QPPD10 | GPPD10 | OPPD10 | EPPD10 | RPPD10 | LPPD10 | UPPD10 | SPPD10 | XPPD10 |
| PDI 12 | TPPD12 | PPPD12 | QPPD12 | GPPD12 | OPPD12 | EPPD12 | RPPD12 | LPPD12 | UPPD12 | SPPD12 | XPPD12 |
| PDI 14 | TAPD14 | PAPD14 | -- | -- | OAPD14 | EAPD14 | RAPD14 | LAPD14 | UAPD14 | SAPD14 | XAPD14 |
| PDI 15 | TAPD15 | PAPD15 | -- | -- | OAPD15 | EAPD15 | RAPD15 | LAPD15 | UAPD15 | SAPD15 | XAPD15 |
| PDI 16 | TAPD16 | PAPD16 | -- | -- | OAPD16 | EAPD16 | RAPD16 | LAPD16 | UAPD16 | SAPD16 | XAPD16 |
| PDI 18 | TAPD18 | PAPD18 | -- | -- | OAPD18 | EAPD18 | RAPD18 | LAPD18 | UAPD18 | SAPD18 | XAPD18 |
| PDI 90 | TAPD90 | PAPD90 | -- | -- | OAPD90 | EAPD90 | RAPD90 | LAPD90 | UAPD90 | SAPD90 | XAPD90 |
| PDI 91 | TAPD91 | PAPD91 | -- | -- | OAPD91 | EAPD91 | RAPD91 | LAPD91 | UAPD91 | SAPD91 | XAPD91 |
| PDI 92 | TAPD92 | PAPD92 | -- | -- | OAPD92 | EAPD92 | RAPD92 | LAPD92 | UAPD92 | SAPD92 | XAPD92 |

NOTE: 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; T=numerator (top); U=upper limit for confidence interval for risk-adjusted rate; V=variance of the risk-adjusted rate; X=smoothed standard error. Dashes (--) indicate the variable is not created in the software.

Appendix E: SAS Input Data and Output Analytic Files

Table E.1. 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_&SUF. 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_&SUF. | All variables in file | &OUTFILE_AREAOBS. PQAO_&SUF. | 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- 2019_Population_Files_V 2020. | FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2019 | | |
| | | | | |
| PQI_AREA_RISKADJ.sas | &OUTFILE_MEAS. PQMSR_&SUF. | All variables in file | &OUTFILE_AREARISK. PQARSKADJ_&SUF. | MAREA AGECAT SEXCAT RACECAT _TYPE_ |

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| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|-------------|-----------------------------------|---|----------------------|--|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| | POPFILE | FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2019 | | 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 |

NOTE: 1 &SUF. refers to the suffix assigned by the user in the control program (default is v2020).

Table E.2. 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-DX _n HOSPID KEY MDC PAY1 POINTOFORIGINUB04 PR1-PR _n PRDAY1-PRDAY _n ² RACE SEX YEAR | &OUTFILE_MEAS. IQMSR_&SUF _X . ³ | KEY HOSPID DRG MDC SEX AGE YEAR DQTR AGECAT SEXCAT RACECAT PAYCAT APRDRG APRDRG_RISK_MORTALITY 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-TPIQ34 |

| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|-----------------------|-----------------------------------|-----------------------|---------------------------------|--|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| IQI_HOSP_OBSERVED.sas | &OUTFILE_MEAS. IQMSR_&SUF. | All variables in file | &OUTFILE_HOSPOBS. IQHO_&SUF. | HOSPID AGE CAT 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-TPIQ34 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-PPIQ34 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-OPIQ34 |

| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|----------------------|-----------------------------------|---------------------------|---------------------------------------|--|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| IQI_HOSP_RISKADJ.sas | &OUTFILE_MEAS. IQMSR_&SUF. | All variables in the file | &OUTFILE_HOSPRISK. IQHRSKADJ_&SUF. | HOSPID AGE CAT SEXCAT 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-TPIQ32 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-PPIQ32 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-OPIQ32 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 |

| | | | |
|--|---------------------------------|---------------------------|---|
| | &OUTFILE_HOSPOBS. IQHO_&SUF. | All variables in the file | EPIQ17_HEMSTROKE_INTRACER EPIQ17_ISCHEMSTROKE EPIQ18-EPIQ20 EPIQ30-EPIQ32 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-RPIQ32 VPIQ08 VPIQ09 VPIQ09_WITH_CANCER VPIQ09_WITHOUT_CANCER VPIQ11 VPIQ11_VPEN_RUPTURED VPIQ11_VPEN_UNRUPTURED VPIQ11_ENDO_RUPTURED VPIQ11_ENDO_UNRUPTURED VPIQ12 VPIQ15- VPIQ17 VPIQ17_HEMSTROKE_SUBARACH VPIQ17_HEMSTROKE_INTRACER VPIQ17_ISCHEMSTROKE VPIQ18-VPIQ20 VPIQ30-VPIQ32 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-LPIQ32 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 |
|--|---------------------------------|---------------------------|---|

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| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|------------------------|--|---------------------------|----------------------------------|---|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| | | | | UPIQ17_ISCHEMSTROKE UPIQ18-UPIQ20 UPIQ30-UPIQ32 SNPIQ08 SNPIQ09 SNPIQ09_WITH_CANCER SNPIQ09_WITHOUT_CANCER SNPIQ11 SNPIQ11_SNPEN_RSNTPTURED SNPIQ11_SNPEN_UNRSNTPTURED SNPIQ11_ENDO_RSNTPTURED SNPIQ11_ENDO_UNRSNTPTURED SNPIQ12 SNPIQ15-SNPIQ17 SNPIQ17_HEMSTROKE_SUBARACH SNPIQ17_HEMSTROKE_INTRACER SNPIQ17_ISCHEMSTROKE SNPIQ18-SNPIQ20 SNPIQ30-SNPIQ32 SPIQ08 SPIQ09 SPIQ11 SPIQ12 SPIQ15-SPIQ17 SPIQ18-SPIQ20 SPIQ30-SPIQ32 XPIQ08 XPIQ09 XPIQ11 XPIQ12 XPIQ15-XPIQ17 XPIQ18-XPIQ20 XPIQ30-XPIQ32 |
| IQI_HOSP_COMPOSITE.sas | &OUTFILE_HOSPRISK. IQHRKADJ_&SUFEX. | All variables in the file | &OUTFILE_COMP. IQCOMP_&SUFEX. | HOSPID IQC90 IQC90VAR IQC90SE IQC90WHT IQC90LB IQC90UB IQC91 IQC91VAR IQC91SE IQC91WHT IQC91LB IQC91UB |

NOTE: ¹ Only if user sets APRDRGFG = 1 in the IQI_HOSP_CONTROL program. ² Only if user sets PRDAY = 1 in the IQI_HOSP_CONTROL program. ³ &SUFEX. refers to the suffix assigned by the user in the control program (default is v2020).

Table E.3. 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-PRDAYn1 RACE SEX YEAR | &OUTFILE_MEAS.PMSMR_&SUFx.2 | KEY HOSPID DRG MDC MDRG YEAR DQTR AGECAT SEXCAT RACECAT PAYCAT SEX AGE LOS TRANSFER CHF VALVE PULMCIRC PERIVASC HTN_C PARA NEURO CHRNLUNG DM DMCX HYPOTHY RENLFAIL LIVER ULCER AIDS LYMPH METS TUMOR ARTH OBESE WGHTLOSS BLDLOSS ANEMDEF ALCOHOL DRUG PSYCH DEPRESS COAG LYLES DNR 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 XPPS04_DVT_PE_ANY XPPS04_DVT_PE_SEVERE XPPS04_PNEUMONIA_ANY XPPS04_PNEUMONIA_SEVERE XPPS04_SEPSIS_ANY XPPS04_SEPSIS_SEVERE XPPS04_SHOCK_ANY XPPS04_SHOCK_SEVERE XPPS04_GIHEMORRHAGE_ANY XPPS04_GIHEMORRHAGE_SEVERE |

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| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|-----------------------|--|-----------------------|----------------------------------|--|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| PSI_HOSP_OBSERVED.sas | &OUTFILE_ MEAS. PSMSR_&S UFY. | All variables in file | &OUTFILE_HOSPOBS. PSHO_&SUFY. | HOSPID AGECAT SEXCAT PAYCAT _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 |

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| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|----------------------|--|---------------------------|---------------------------------------|--|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| PSI_HOSP_RISKADJ.sas | &OUTFILE_ MEAS. PSMSR_&S UFX. | All variables in the file | &OUTFILE_HOSPRISK. PSHRSKADJ_&SUF. | HOSPID AGECAT SEXCAT PAYCAT _TYPE_ TPPS02-TPPS04 TPPS04_DVT_PE TPPS04_PNEUMONIA TPPS04_SEPSIS |

| | | | |
|--|--|---------------------------|---|
| | &OUTFILE_ HOSPOBS. PSHO_&SU FX. | All variables in the file | 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 |
|--|--|---------------------------|---|

| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|------------------------|---|---------------------------|--------------------------------|---|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| | | | | 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 |
| PSI_HOSP_COMPOSITE.sas | &OUTFILE_ HOSPRISK. PSHRSKAD J_&SUF. | All variables in the file | &OUTFILE_COMP. PSCOMP_&SUF. | HOSPID COMP1 COMP1VAR COMP1SE COMP1WHT COMP1LB COMP1UB |

NOTE: ¹ Only if user sets PRDAY = 1 in the PSI_HOSP_CONTROL program. ² &SUF. refers to the suffix assigned by the user in the control program (default is v2020).

Table E.4. 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_&SUF. ¹ | KEY HOSPID DRG MDC YEAR DQTR PAGECAT AGEDCAT BWHTCAT SEXCAT RACECAT PAYCAT TPPS17 |
| PSI17_HOSP_OBSERVED.sas | &OUTFILE_MEAS. PS17MSR_&SUF. | All variables in the file | &OUTFILE_HOSPOBS. PS17HOBS_&SUF. | HOSPID BWHTCAT AGEDCAT PAGECAT SEXCAT PAYCAT RACECAT _TYPE_ TPPS17 PPS17 OPSS17 |

NOTE: ¹ &SUF. refers to the suffix assigned by the user in the control program (default is v2020).

Table E.5. 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 TRANSFER TRANSFER_ALT D_DXCCSR_: ODC903 ODC904 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 AGE CAT SEXCAT RACECAT _TYPE_ TAPD14-TAPD18 TAPD90-TAPD92 PAPD14-PAPD18 PAPD90-PAPD92 OAPD14-OAPD18 OAPD90-OAPD92 |
| | POPFILE | FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2019 | | |
| 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 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 |
| | POPFILE 2000- 2019_Population_Files_V2020.txt | FIPSTCO SEXCAT POPCAT RACECAT POP_2000-POP_2019 | | |

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| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|-------------------------|-----------------------------------|---------------------------|----------------------------------|---|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| PDI_HOSP_OBSERVED.sas | &OUTFILE_MEAS. PDMSR_&SUF. | All variables in the file | &OUTFILE_HOSPOBS. PDPO_&SUF. | HOSPID BWHTCAT AGEDCAT PAGECAT SEXCAT PAYCAT RACECAT 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_&SUF. | All variables in the file | &OUTFILE_STRAT. PDSTRAT_&SUF. | HOSPID_TYPE_ GPPD01 GPPD08 GPPD10 GPPD12 TPPD01 TPPD08 TPPD10 TPPD12 PPPD01 PPPD08 PPPD10 PPPD12 OPPD01 OPPD08 OPPD10 OPPD12 |

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| SAS PROGRAM | INPUT DATASET/INPUT ANALYTIC FILE | | OUTPUT ANALYTIC FILE | |
|----------------------|-----------------------------------|---------------------------|---------------------------------------|---|
| | FILE NAME | VARIABLES | FILE NAME | VARIABLES |
| PDI_HOSP_RISKADJ.sas | &OUTFILE_MEAS. PDMSR_&SUF. | All variables in the file | &OUTFILE_HOSPRISK. PDHRSKADJ_&SUF. | HOSPID BWHTCAT AGEDCAT PAGECAT SEXCAT PAYCAT RACECAT |
| | &OUTFILE_HOSPOBS. PDHO_&SUF. | All variables in the file | | 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 |

NOTE: ¹ Only if user sets PRDAY = 1 in the PDI_ALL_CONTROL program. ² &SUF. refers to the suffix assigned by the user in the control program (default is v2020).

Appendix F: Input Data Files

| 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 PDI 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). |
| 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 and PSI 10, 11, 13, and 17 will be affected if ATYPE values are missing. |

| VARIABLE NAME | DESCRIPTION | FORMAT | VALUE DESCRIPTION | COMMENTS |
|----------------|---|---------|---|--|
| 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. |
| DXPOA1-DXPOA35 | Diagnosis <i>n</i> , 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. |

| VARIABLE NAME | DESCRIPTION | FORMAT | VALUE DESCRIPTION | COMMENTS |
|---------------|--|---------|--|---|
| HOSPID | HCUP hospital identification number | Numeric | 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, 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. |
| 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_XXI.SAS to reflect the number of procedures. The modules can accept more than 30 procedure codes. The number provided here is the default. |

| VARIABLE NAME | DESCRIPTION | FORMAT | VALUE DESCRIPTION | COMMENTS |
|----------------|--|---------|---|--|
| PRDAY1-PRDAY30 | Number of days from admission to procedure n | Numeric | Days from admission to procedure | Not used by the PQI module. 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 <i>XXI_TYPE_CONTROL.SAS</i> (for PDI, IQI, 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 <i>XXI_TYPE_CONTROL.SAS</i> to equal "0," indicating that no procedure day information is available. |
| 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. |

| VARIABLE NAME | DESCRIPTION | FORMAT | VALUE DESCRIPTION | COMMENTS |
|-------------------|--|---------|---|--|
| 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. |
| Year (YEAR) | The patient's year of discharge. For example, a patient discharged on July 7, 2004, would have a discharge year of 2004. | Numeric | YYYY Discharge year should be within the range of 1997 to present year. | Required data element and used to apply the proper fiscal year coding and to assign the APRDRG if the limited license grouper is used. If this data element is missing, the discharge record will be excluded from the analysis. |

Appendix G: List of Risk Factors

Table G.1. Risk Factors for Area-Level Modules

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

Table G.2. Risk Factors for Hospital-Level Modules

| CATEGORY | IQI | PSI | PDI | NQI |
|------------------------|-------------------------------------|--|--|---------------------------------------|
| Demographics | Sex ^a | Sex ^a | Sex ^a | Sex ^a |
| | 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 | MDCs ^b |
| Clinical/Comorbidities | | AHRQ Comorbidities (with POA) ^b | | |
| | | | AHRQ Clinical Classification Software Refined | |
| | | | Indicator-specific risk stratifiers | |
| Birthweight | | | | Birth weight (500 g 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.

Appendix H: Output Data Files

Table H.1. IQI Module Output

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|--|-----------------|---|
| OBS | Observation 1 (with HOSPID="." or " ") is the overall average for the entire dataset (TYPELVLP=0). The remaining observation are individual providers, or hospitals (TYPELVLP=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 |
| 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 | |
| RPIQnn | The estimated rate calculated by adjusting to an "average" case mix | Numeric | When stratifications other than hospital or area are selected, the RPIQnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables |
| LPIQnn | The lower confidence bound of the risk-adjusted rate | Numeric | |
| UPIQnn | The upper confidence bound of the risk-adjusted rate | Numeric | |

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|---|---------|----------|
| SPIQnn | The smoothed rate calculated using multivariate signal extraction | Numeric | |
| SNPIQnn | Reliability of the risk-adjusted rate | Numeric | |
| XPIQnn | Standard error of smoothed rate | Numeric | |
| VPIQnn | Variance of the risk-adjusted rate | Numeric | |

Table H.2. PSI Module Output

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|---|-----------------|--|
| OBS | Observation 1 (with HOSPID="." or " ") is the overall average for the entire dataset (TYPELVLP=0). The remaining observations are individual providers, or hospitals (TYPELVLP=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 |
| 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 | |
| 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, the RPPSnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. |

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|---|---------|----------|
| LPPSnn | The lower confidence bound of the risk-adjusted rate | Numeric | |
| UPPSnn | The upper confidence bound of the risk-adjusted rate | Numeric | |
| SPPSnn | The smoothed rate calculated using multivariate signal extraction | Numeric | |
| SNPPSnn | Reliability of the risk-adjusted rate | Numeric | |
| XPPSnn | Standard error of smoothed rate | Numeric | |
| VPPSnn | Variance of risk-adjusted rate | Numeric | |

Table H.3. Hospital-Level PDI Module Output

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|---|-----------------|---|
| OBS | Observation 1 (with HOSPID="." or ".") is the overall average for the entire dataset (TYPELVLP=0). The remaining observations are individual providers, or hospitals (TYPELVLP=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 |
| 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 | |

| | | | |
|---------|---|---------|--|
| 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, the RPPDnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. |
| LPPDnn | The lower confidence bound of the risk-adjusted rate | Numeric | |
| UPPDnn | The upper confidence bound of the risk-adjusted rate | Numeric | |
| SPPDnn | The smoothed rate calculated using multivariate signal extraction | Numeric | |
| SNPPDnn | Reliability of the risk-adjusted rate | Numeric | |
| XPPDnn | Standard error of smoothed rate | Numeric | |
| VPPDnn | Variance of risk-adjusted rate | Numeric | |

Table H.4. Area-Level PDI Module Output

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|---|---------------|----------|
| OBS | Observation 1 (with MAREA=“ ”) is the overall average for the entire dataset (TYPELVLP=0). The remaining observations are individual providers, or hospitals (TYPELVLP=16). | Numeric | |
| MAREA | Identifier in the dataset for area | Text | |
| POPCAT | Population age stratification category | Numeric range | |
| SEXCAT | Gender stratification category | Numeric | |
| RACECAT | Race stratification category | Numeric | |
| 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 | |

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| | | | |
|---------|--|---------|--|
| 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 | |
| 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 | |
| VAPDnn | Standard error of smoothed rate | Numeric | |
| XAPDnn | Variance of risk-adjusted rate | Numeric | |

Table H.5. PQI Module Output

| VARIABLE NAME | DESCRIPTION | FORMAT | COMMENTS |
|---------------|---|---------|--|
| OBS | Observation 1 (with MAREA=" ") is the overall average for the entire dataset (TYPELVLP=0). The remaining observations are individual providers, or hospitals (TYPELVLP=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 | |
| 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: List of Setnames

| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|--------------|---|-----|-----|-----|-----|
| ABDOMI15P | Accidental puncture or laceration during a procedure diagnosis codes | No | No | Yes | No |
| ABDOMIPOPEN | Alteration of Abdominal Wall with AutologousTissue Substitute, Open Approach | 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 |
| ACCOPLD | 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 | Complete traumatic amputation at knee level, left lowerleg, initial encounter | 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 |
| 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 |

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| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|---------|---|-----|-----|-----|-----|
| 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 |
| ANOXIID | Anoxic brain injury diagnosis codes | No | No | Yes | No |
| BIRTHID | Birth trauma diagnosis codes | No | Yes | No | No |
| BLANK | Blank | No | Yes | Yes | No |
| BONEMID | Bone malignancy diagnosis codes | No | No | Yes | 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 PSI version | No | No | Yes | No |
| CANITD | Cancer diagnosis codes PDI version | No | Yes | No | No |
| CARDIID | Cardiac arrest diagnosis codes | No | No | Yes | No |
| CARDRID | Cardiac arrhythmia diagnosis codes | No | No | Yes | No |
| CARDSIP | Cardiac procedure codes | No | Yes | Yes | No |
| COAGDID | Coagulation disorders diagnosis codes | No | Yes | Yes | No |
| COMAID | Coma diagnosis codes | No | No | Yes | No |

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| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|------------|--|-----|-----|-----|-----|
| 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 |
| DEEPIVIB | Proximal Deep Vein Thrombosis diagnosis codes | No | No | Yes | No |
| DELIRID | Delirium and other psychoses 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 | Bypass Left Axillary Artery to Lower Arm Vein with Autologous Arterial Tissue, Open Approach | No | No | Yes | Yes |
| DIALYIP | Dialysis procedure 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 |
| 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 | Pneumonia diagnosis codes | No | No | Yes | No |

| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|----------|--|-----|-----|-----|-----|
| FTR3EXA | Respiratory complications diagnosis codes | No | No | Yes | No |
| FTR3EXB | Viral pneumonia or influenza diagnosis codes | No | No | Yes | No |
| FTR4DX | Sepsis diagnosis codes | 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 varices with bleeding | Yes | No | Yes | No |
| GASTRID | Gastrointestinal hemorrhage diagnosis codes | No | No | Yes | No |
| GESTC1D | Extreme immaturity of newborn, gestational age 23 completed weeks | No | Yes | No | No |
| GESTC2D | Extreme immaturity of newborn, gestational age 24 completed weeks | No | Yes | No | No |
| GESTC3D | Extreme immaturity of newborn, gestational age 25 completed weeks | No | Yes | No | No |
| GESTC4D | Extreme immaturity of newborn, gestational age 27 completed weeks | No | Yes | No | No |
| GESTC5D | Preterm newborn, gestational age 29 completed weeks | No | Yes | No | No |
| GESTC6D | Preterm newborn, gestational age 31 completed weeks | No | Yes | No | No |
| GESTC7D | Preterm newborn, gestational age 33 completed weeks | No | Yes | No | No |
| GESTC8D | Preterm newborn, gestational age 35 completed weeks | 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 |

| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|------------|---|-----|-----|-----|-----|
| HEMOTH2P | Control of perioperative 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 | 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 |
| 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 750 to 999 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 |

| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|---------|--|-----|-----|-----|-----|
| 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 |
| LYMPHID | Lymphoid malignancy diagnosis codes | No | No | Yes | No |
| M1AREA | County Level with Modified FIPS | No | No | No | Yes |
| M2AREA | OMB 1999 METRO AREA | No | No | No | Yes |
| M3AREA | OMB 2003 METRO AREA | No | No | 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 |
| METACID | Metastatic cancer diagnosis codes | No | No | Yes | No |
| MRTAMID | Acute myocardial infarction (AMI) 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 | Yes | No | No | No |
| MTHIP2D | Periprosthetic fracture diagnosis codes | Yes | No | No | No |
| MTHIPFD | Hip fracture diagnosis codes | Yes | No | No | No |
| MTPNEUD | Pneumonia diagnosis codes | Yes | No | No | No |
| NEUROMD | Neuromuscular disorders diagnosis codes | No | Yes | Yes | No |

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| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|----------------|---|-----|-----|-----|-----|
| 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 |
| OBTRAD | Third and fourth degree obstetric trauma diagnosis codes | No | No | Yes | No |
| 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 |
| POAXMPT_V33FMT | Present On Admission Exempt ICD-10-CM Diagnosis Codes FY 2016 (Version 33) | No | Yes | Yes | No |
| POAXMPT_V34FMT | Present On Admission Exempt ICD-10-CM Diagnosis Codes FY 2017 (Version 34) | No | Yes | Yes | No |
| POAXMPT_V35FMT | Present On Admission Exempt ICD-10-CM Diagnosis Codes FY 2018 (Version 35) | No | Yes | Yes | No |
| POAXMPT_V36FMT | Present On Admission Exempt ICD-10-CM Diagnosis Codes FY 2019 (Version 36) | No | Yes | Yes | No |
| POAXMPT_V37FMT | Present On Admission Exempt ICD-10-CM Diagnosis Codes FY2020 (Version 37) | No | Yes | Yes | No |

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| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|----------|--|-----|-----|-----|-----|
| POHMRI2D | Perioperative hemorrhage or hematoma diagnosis codes | No | Yes | Yes | No |
| POISOID | Poisoning diagnosis codes | No | No | Yes | No |
| POPCAT | Pediatric population categories | No | Yes | No | No |
| POVCAT | County Poverty Deciles - Based on 2016 Census Data | No | Yes | No | Yes |
| PR9604P | Reintubation procedure codes | No | Yes | Yes | No |
| PR9671P | Mechanical ventilation for less than 96 consecutive hours | No | Yes | Yes | No |
| PR9672P | Mechanical ventilation for 96 consecutive hours or more procedure code | No | Yes | Yes | No |
| PRAAA2D | Unruptured abdominal aortic (AAA) aneurysm diagnosis codes | Yes | No | No | No |
| PRAAA2P | Endovascular abdominal aortic (AAA) aneurysm 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 |

| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|-----------|---|-----|-----|-----|-----|
| 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 |
| 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 |
| SEIZUID | Seizure diagnosis codes | No | No | Yes | No |
| SEPTI2D | Sepsis diagnosis codes | 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 |
| SEVSEPDY | Severe sepsis diagnosis codes | No | No | Yes | No |
| SEXCAT | Sex categories | Yes | Yes | Yes | Yes |
| SHOCKID | Shock diagnosis codes | No | No | Yes | No |
| SOLKIDD | Solitary kidney disease | No | No | Yes | No |
| SPINEP | Spine surgery procedure codes | No | Yes | No | No |

| SETNAME | DESCRIPTION | IQI | PDI | PSI | PQI |
|--------------|---|-----|-----|-----|-----|
| STROKID | Stroke and occlusion of arteries diagnosis codes | No | No | Yes | No |
| SURGI2R | Surgical discharge MS-DRGs | No | Yes | Yes | No |
| SYNCOID | Syncope diagnosis codes | No | No | Yes | No |
| TECHNI15D | Accidental puncture or laceration during a procedure diagnosis codes PSI 15 version | No | No | Yes | No |
| TECHNID | Accidental puncture or laceration during a procedure diagnosis codes PDI 01 version | 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 J.1. 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 J.2. Levels of Summarization for IQI_HOSP_OBSERVED.sas and
 PSI_HOSP_OBSERVED.sas**

| TYPELVLP | 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 | |
| 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 | | * | Sex | | | | | | | | |
| 29 | Hospital | | * | Age | | * | Sex | | * | Race | | |
| 30 | Hospital | | * | Age | | * | Sex | | * | Payer | | |
| 31 | Hospital | | * | Age | | * | Sex | | * | Payer | * | Race |

NOTE: TYPELVLP 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 J.3. Levels of Summarization for PDI_HOSP_OBSERVED.sas

| TYPVLVLP | 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 | | | |
| 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 | | |

| TYPE/LVP | | SUMMARIZATION | | | | | | | | | |
|----------|----------|---------------|--|--------|---|-----|-----|-------|-------|------|------|
| 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 | |
| 54 | Bwht | * | | Ageday | * | Sex | * | Payer | | | |
| 55 | Bwht | * | | Ageday | * | Sex | * | Payer | * | Race | |
| 56 | Bwht | * | | Ageday | * | | | | | | |
| 57 | Bwht | * | | Ageday | * | * | | | | Race | |
| 58 | Bwht | * | | Ageday | * | * | | Payer | | | |
| 59 | Bwht | * | | Ageday | * | * | | Payer | * | Race | |
| 60 | Bwht | * | | Ageday | * | * | Sex | | | | |
| 61 | Bwht | * | | Ageday | * | * | Sex | * | | Race | |
| 62 | Bwht | * | | Ageday | * | * | Sex | * | Payer | | |
| 63 | Bwht | * | | Ageday | * | * | 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 | | | | | | | |

| TYPVLVLP | SUMMARIZATION | | | | | | | | | | | |
|----------|---------------|---|------|--------|--------|-----|-----|-----|-------|-------|------|------|
| 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 | |
| 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 | | | | | | | |

| TYPELVLP | SUMMARIZATION | | | | | | | | | | | | |
|----------|---------------|---|------|---|--------|---|-----|---|-----|-----|-------|---|------|
| 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 | * | Ageday | * | Age | | | | | | |
| 121 | Hospital | * | Bwht | * | Ageday | * | Age | * | | | | | Race |
| 122 | Hospital | * | Bwht | * | Ageday | * | Age | * | | | Payer | | |
| 123 | Hospital | * | Bwht | * | Ageday | * | Age | * | | | Payer | * | Race |
| 124 | Hospital | * | Bwht | * | Ageday | * | Age | * | Sex | | | | |
| 125 | Hospital | * | Bwht | * | Ageday | * | Age | * | Sex | * | | | Race |
| 126 | Hospital | * | Bwht | * | Ageday | * | Age | * | Sex | * | Payer | | |
| 127 | Hospital | * | Bwht | * | Ageday | * | Age | * | Sex | * | Payer | * | Race |

NOTE: TYPELVLP 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.