AHRQ Quality Indicators Software Instruction, SAS
Version 4.4

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Abstract

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) were developed specifically to meet the short-term needs for information on healthcare quality using standardized, user-friendly methods and existing sources of data.

This document contains the software instructions for the AHRQ Quality Indicators Version 4.4, which is provided on the AHRQ Quality Indicators Web site. The software was developed in SAS 9.2, for use on a personal computer. AHRQ's goal, by making this tool publicly available, is to assist users in producing information on healthcare quality more cost effectively.

The AHRQ Quality Indicators were designed to capitalize on the availability of administrative data on inpatient stays to produce information for four modules of Quality Indicators: Inpatient Quality Indicators (IQI), Pediatric Quality Indicators (PDI), Prevention Quality Indicators (PQI), and Patient Safety Indicators (PSI). This document will discuss all four modules of indicators and replaces the set of four separate instruction manuals from previous versions of the software. Throughout the document, where there are differences in the modules they will be highlighted and discussed accordingly.

Data captured by and characteristics of each of the individual modules of indicators are shown in Table 1.

Table 1. Characteristics of Quality Indicators modules

IQI	PDI	PQI	PSI
• *volume* of certain intensive, high-technology, or highly complex procedures for which evidence suggests that institutions performing more of these procedures may have better outcomes; • *mortality* for inpatient procedures and for inpatient conditions; and • *utilization* indicators which examine procedures whose use varies significantly across hospitals and for which questions have been raised about overuse, underuse, or misuse.	• use indicators from the other three modules with adaptations for use among children and neonates to reflect **quality of care inside hospitals**, as well as **geographic areas**, and **identify potentially avoidable hospitalizations**.	• *potential health care quality problem areas* that might need further investigation. • measure of *primary care access* or outpatient services in a community by using patient data found in a typical hospital discharge abstract.	• *potentially preventable complications* and iatrogenic events for patients treated in hospitals. • *screening tool* for problems that patients experience as a result of exposure to the healthcare system and that are likely amenable to prevention by changes at the system or provider level.

Detailed definitions of each set of indicators, with complete listings of the ICD-9-CM and DRG codes specifically included or excluded, are contained in the corresponding *Technical Specifications* documents for each set of measures. For the PDI and PSI, additional data on provider rates and standard deviation; area rates and standard deviation; and population rate, as

appropriate for each indicator, are found in their corresponding *Comparative Data* documents. See Appendix A: Links for links to these documents as well as additional documents on each measure (e.g., recent changes) and other documents on the AHRQ QI.

Contents

List of Figures

List of Tables

1.0 Introduction

This documentation describes the software for implementing all four AHRQ Quality Indicator (also referred to as AHRQ QI or QI) modules of the AHRQ Quality Indicators Version 4.4, and highlights features of the analytic approach that may be of particular interest to new users.

The programs documented here were developed for use in Statistical Analysis System (SAS®)[1]. The SAS® version of the AHRQ QI software is designed as a PC-based single-user application. It has been tested with SAS® version 9.2 on a 32-bit machine running Windows XP Professional. In addition, limited testing was conducted under a 64-bit, Windows 7 operating system. To use the SAS version of the QI software, users must have access to the commercially available SAS® statistical software package, including but not limited to Base SAS, SAS/STAT and SAS/ACCESS. For more information, visit the SAS Institute website at http://www.sas.com.

The reference population database used by the software was updated to the Healthcare Cost and Utilization Project's (HCUP) Year 2008 State Inpatient Databases (SID). This database was used to create the regression coefficients applied in risk adjustment (see Section 7.4) and the shrinkage factors used to calculate smoothed rates (see Section 7.5).

The syntax supports a data weighting variable (DISCWT) like those used in the Nationwide Inpatient Sample (NIS). This numeric variable must be present in the input file and should be set to 1 if weighting is not desired.

Effective March 1, 2007, the UB-04 data specification manual includes a Present on Admission (POA) indicator (http://www.cdc.gov/nchs/data/icd9/icdguide09.pdf). POA data may impact the prevalence of the outcome of interest and the risk-adjusted rates by excluding secondary diagnoses coded as complications from the identification of covariates. If the user's input file does not include POA data, an estimation procedure is used to adjust the prevalence of the covariates to account for the missing POA data. You may include POA data for all of your records, some of your records, or none of them. Including records with and without POA data is also allowed; the estimation procedure is applied only to those records for which POA data are missing.

Version 4.4 contains the following additional changes:

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[1] SAS is a statistical software package distributed by the SAS Institute, Inc. (http://www.sas.com). The company may be contacted directly regarding the licensing of their products. The SAS Institute, Inc., has no affiliation with AHRQ nor involvement in the development of the AHRQ QI.

Table 2. Changes implemented in V4.4

All four modules	IQI	PDI
• Formats that incorporate ICD-9-CM and DRG coding through September 30, 2011. • An historical list of the coding changes made for each fiscal year for each module may be found on the AHRQ QI website.	• The 3M® APR® DRG Limited License Grouper for SAS® software has been updated to Version 29 which covers FY2012 codes. • Beginning with Version 23, 3M will update the APR-DRG every fiscal year. • The optional limited license grouper available with the AHRQ QI software is "multi-version" (i.e., Versions 20, 23 to 29). • The software will apply the correct version based on the discharge year and quarter. • Users who have their own APR-DRG grouper can use either the applicable APR-DRG version or the ICD-9-CM mapping to Version 20. • See Section 5.3 for information on APR-DRG variables.	• The software now incorporates state level estimates of diabetes prevalence by age from the CDC National Diabetes Surveillance System. • PDI 15 (Diabetes Short-term Complications Admission Rate) can be calculated using the number of diabetics in the state as the denominator, stratified by age.

Naming Conventions of Programs

Most of the QI modules programs use the naming format of *XX*SASi, *XX*SASAi, or *XX*SASPi.

The first two characters, denoted here as *XX* will be designated as "IQ" to indicate an Inpatient Quality Indicators program, "PD" to indicate a Pediatric Quality Indicators program, "PQ" to indicate a Prevention Quality Indicators program, or "PS" to indicate a Patient Safety Indicators program. The next three characters of the program name are "SAS."

In the programs that are specific to either area-level or provider-level indicators, the sixth character of the program name is either "A" or "P." The sixth character is an "A" if the program is for the production of area-level indicator rates that use county or Office of Management and Budget (OMB) defined metropolitan or micropolitan area (Metro Area) populations as denominators. The sixth character is a "P" if the program is for the production of provider-level indicator rates that use subsets of the hospital discharge population. The PSI, IQI, and PDI modules have both provider-level and area-level indicators, but the PQI contains only area-level indicators.

The last character (i) of the variable name designates the number of the specific program.

Supporting Documentation

Each Quality Indicators *Comparative Data* document provides comparative values, including average volumes, provider rates, and population rates, depending on the type of indicator. In addition, the *Technical Specifications* documents for each set of indicators list all ICD-9-CM and DRG codes included in and excluded from the numerator and denominator of each indicator.

See Appendix A for links to these and other documents, as well as Web sites that may be of interest to users.

See Appendix B, "Using Different Types of QI Rates," for an explanation of observed, expected, risk adjusted, and smoothed rates and for guidance in the use of these rates. This documentation includes:

- A discussion of the data elements necessary to produce the AHRQ Quality Indicators and the uniform coding conventions recommended for those elements

- Descriptions of the processing steps in nontechnical language

- Detailed descriptions of the functions of each SAS program.

Installing the Prediction Module software

Once completed, Prediction Module installation does not need to be repeated unless it is subsequently uninstalled.

- Click "Prediction Module" link at http://www.qualityindicators.ahrq.gov/software/SAS.aspx.

- Save the "AHRQ_PM_SAS_Setup 0.9.2.195.msi" file to a directory on local machine.

- Double-click "AHRQ_PM_SAS_Setup 0.9.2.195.msi" and proceed through the AHRQ Setup Wizard – this will install the Prediction Module executable file and license key in "C:\AHRQQI\AHRQPrediction" (2 files total).

Saving the required files to run the AHRQ QI SAS software

- Create three sub-folders under "C:\AHRQQI\" named for each of the three modules that use the Prediction Module (i.e., "IQI", "PDI", and "PSI"). The PQI has no provider rates, so the Prediction Module is not used for risk adjustment.

- The AHRQ QI software packages for IQI, PDI, and PSI each contain another zip file called "*XXX*_GEE_Input_Files.zip", where *XXX* denotes the three letter abbreviation for the module being used, i.e., IQI, PDI or PSI. The files within each zip file need to be extracted to the module's respective sub-folder "C:\AHRQQI*XXX*" (again, replacing the *XXX* with the appropriate three letter abbreviation for the module).

- Repeat these steps for each of the modules that you intend to use.

The syntax will compute risk-adjusted rates and observed-to-expected ratios for the pre-defined set of stratification variables (e.g., age, gender, payer, and race). When stratifications other than hospital or area are selected, the RP*XX*nn and RA*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables. ***Please note that the above instructions and files, beginning with "Installing the Prediction Module software", are not necessary for calculating area-level risk-adjusted indicators.***

2.0 Components of the Quality Indicators Modules

As shown in Table 3 below and Tables 4 through 15 in Section 3.0, each Quality Indicators module consists of various SAS programs and ASCII text files that contain auxiliary data. These programs and text files are described in the subsequent sections of this document.

Table 3. SAS programs and ASCII text files for QI software components

IQI	PDI	PQI	PSI
• 8 SAS programs • 6 ASCII text files	• 9 SAS programs • 9 ASCII text files	• 6 SAS programs • 5 ASCII text files	• 7 SAS programs • 8 ASCII text files

Note:

❖ The IQI, PDI and PSI SAS packages include the IQI_COMPOSITE.SAS, PDI_COMPOSITE.SAS, and PSI_COMPOSITE.SAS programs, respectively.

3.0 Quick References

This section is intended to serve as a set of quick references to assist in reading this documentation and in reviewing the AHRQ Quality Indicator module outputs. Each module has a set of four Quick Reference pages. Processing steps are shown on the first two pages of each reference set, followed by a listing of the module variables, variable prefixes, and module contents in a set of three tables. One suggestion is to print each Quick Reference section in duplex mode on two sheets of paper so that they can then be easily referenced as the need arises.

3.1 Inpatient Quality Indicators Quick Reference

Figure 1 shows processing steps for the Inpatient Quality **provider-level** Indicators, while Figure 2 shows steps for the Inpatient Quality **area-level** Indicators. The tables following these figures list the module indicator variables (Table 4), variable prefixes (Table 5), and module contents (Table 6).

Figure 1. Processing steps for the Inpatient Quality provider-level Indicators
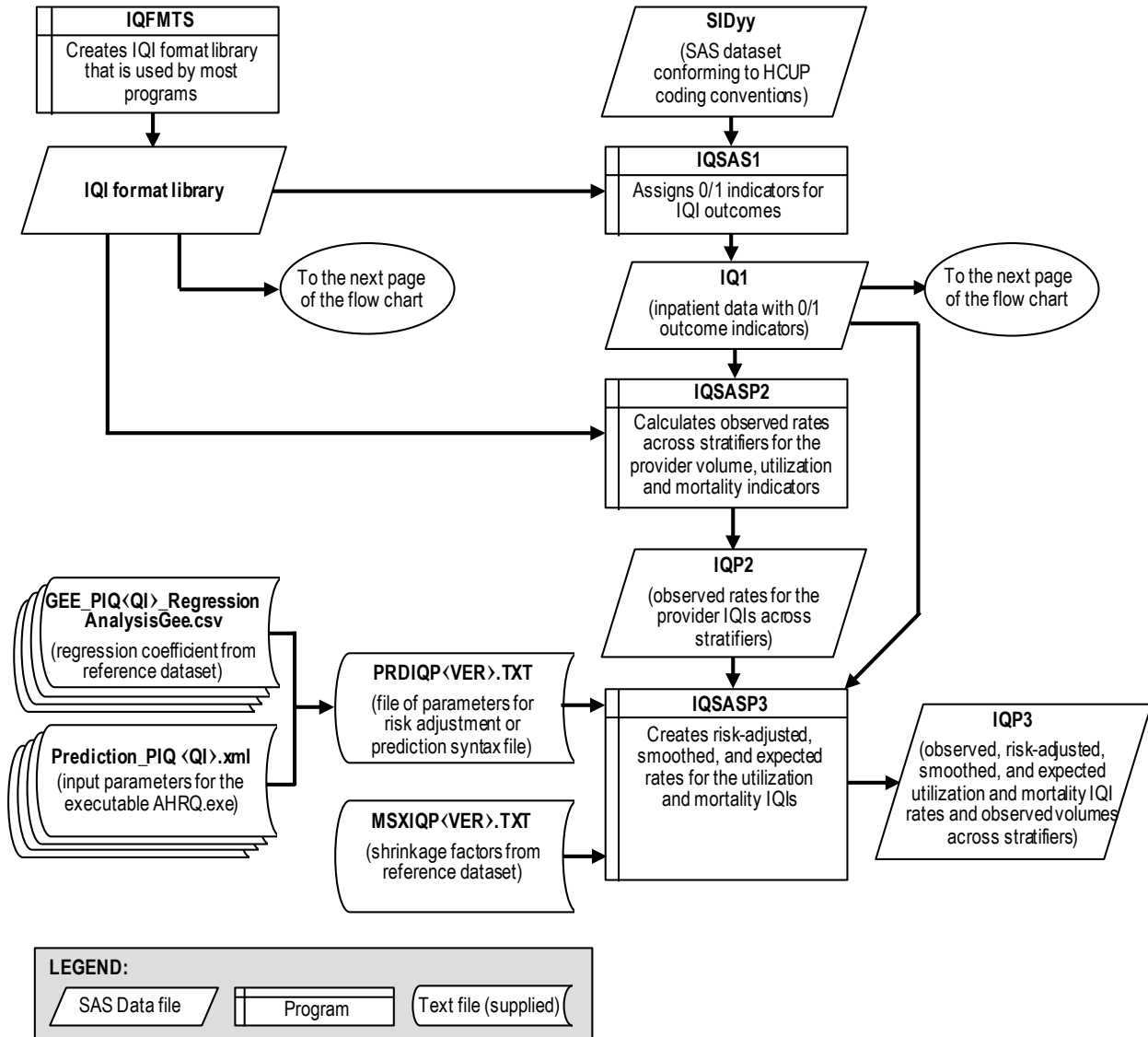
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_IQI.SAS program, which contains code the user must modify in order to run the IQI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data set.

Figure 2. Processing steps for the Inpatient Quality area-level Indicators
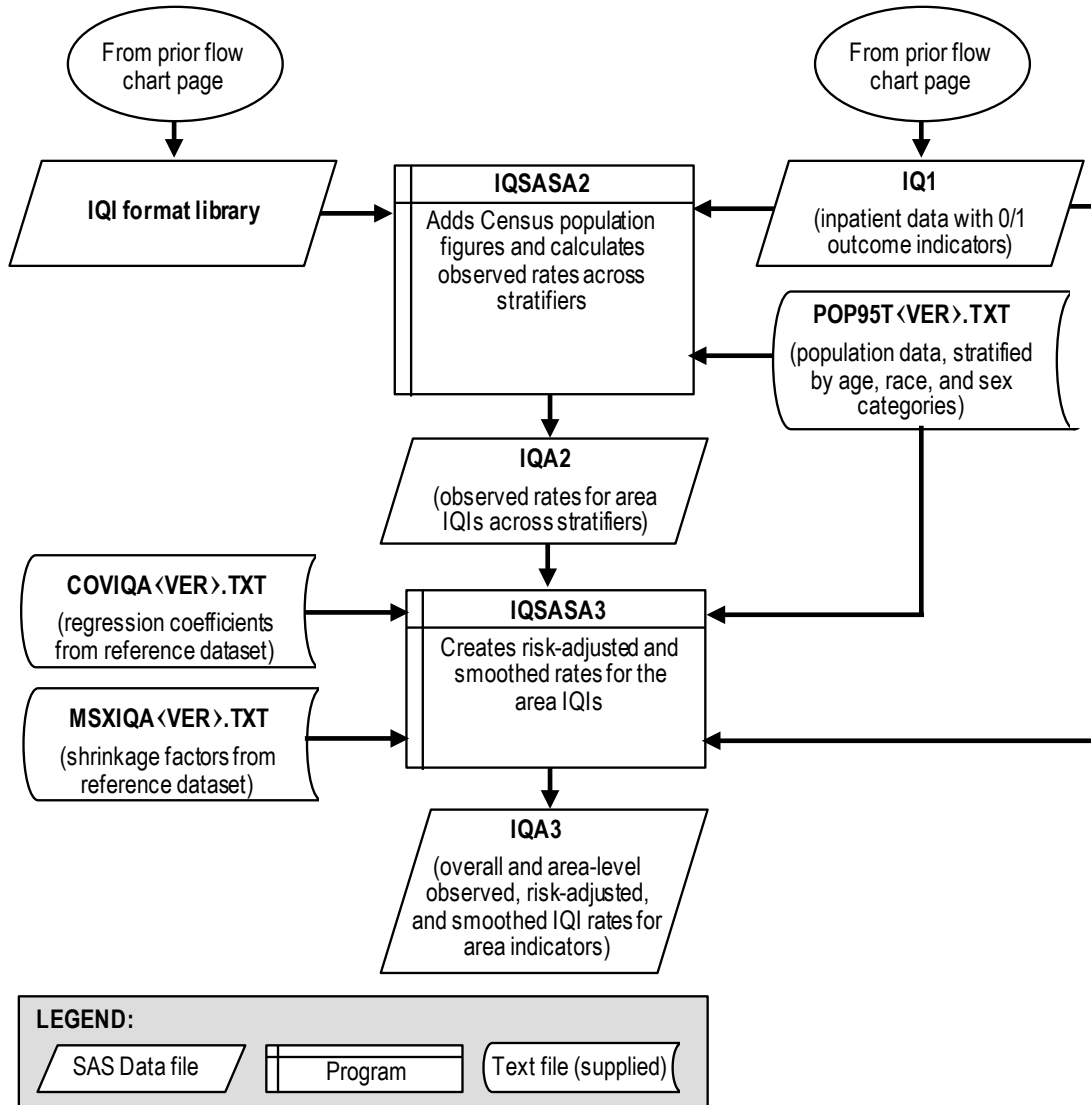
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_IQI.SAS program, which contains code the user must modify in order to run the IQI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data set.

Table 4. Inpatient Quality Indicator (IQI) variables

QI number	Indicator	Age categories		
		18 to 39	40 to 64	65 +
Provider	**Volumes**			
1	Esophageal Resection Volume[a]			
2	Pancreatic Resection Volume[b]			
4	AAA Repair Volume[c]			
5	CABG Volume	No		
6	PCI Volume[d]	No		
7	Carotid Endarterectomy Volume			
Provider	**Post-procedural Mortality Rates**			
8	Esophageal Resection Mortality Rate[a]			
9	Pancreatic Resection Mortality Rate[b]			
11	AAA Repair Mortality Rate[c]			
12	CABG Mortality Rate	No		
30	PCI Mortality Rate[d]	No		
13	Craniotomy Mortality Rate			
14	Hip Replacement Mortality Rate			
Provider	**In-hospital Mortality Rates**			
15	AMI Mortality Rate			
32	AMI Mortality Rate Without Transfer Cases			
16	Heart Failure Mortality Rate			
17	Acute Stroke Mortality Rate			
18	GI Hemorrhage Mortality Rate			
19	Hip Fracture Mortality Rate			
20	Pneumonia Mortality Rate			
Provider	**Utilization Rates**			
21	Cesarean Delivery Rate			
33	Primary Cesarean Delivery Rate			
22	VBAC Rate Uncomplicated			
34	VBAC RateAll			
23	Laparoscopic Cholecystectomy Rate			
24	Incidental Appendectomy In the Elderly Rate	No	No	
25	Bi-lateral Cardiac Catheterization Rate			
Area-level	**Utilization Rates**			
26	CABG Rate	No		
27	PCI Rate	No		
28	Hysterectomy Rate			
29	Laminectomy or Spinal Fusion Rate			

Note. AAA = Abdominal Aortic Aneurysm; CABG = Coronary Artery Bypass Graph; PCI = Percutaneous Coronary Intervention; AMI = Acute Myocardial Infarction; GI = Gastrointestinal; VBAC = Vaginal Birth After Cesarean.

[a] IQI #01 and IQI #08 are paired measures that are to be reported together.
[b] IQI #02 and IQI #09 are paired measures that are to be reported together.
[c] IQI #04 and IQI #11 are paired measures that are to be reported together.
[d] IQI #06 and IQI #30 are paired measures that are to be reported together.

Table 5. Prefixes for the Inpatient Quality Indicator (IQI) variables

Prefix	Contents	EXAMPLES	
		Provider indicator 8, Esophageal resection	Area-level indicator 26, CABG utilization
T	Inpatient numerator (top)	TPIQ08	TAIQ26
P	Population denominator (pop)	PPIQ08	PAIQ26
Q	POA flag	QPIQ08	N/A
O	Observed rate (not applicable to IQI 1-7)	OPIQ08	OAIQ26
E	Expected rate	EPIQ08	N/A
R	Risk-adjusted Rate (not applicable to IQI 1-7)	RPIQ08	RAIQ26
L	Lower limit of confidence interval of risk-adjusted rate	LPIQ08	N/A
U	Upper limit of confidence interval of risk-adjusted rate	UPIQ08	N/A
S	Smoothed rate	SPIQ08	N/A
X	Standard error of smoothed rate	XPIQ08	N/A

Note. CABG = Coronary Artery Bypass Graph; POA= Present on Admission.

Table 6. Inpatient quality module contents

SAS programs	ASCII text files
CONTROL_IQI.SAS	POP95T12.TXT
IQFMTS.SAS	COVIQA44.TXT
IQSAS1.SAS	MSXIQP44.TXT
IQSASP2.SAS	
IQSASP3.SAS	MSXIQA44.TXT
IQSASA2.SAS	gee_piqnn_RegressionAnalysisGee.csv*
IQSASA3.SAS	Prediction_PIQnn.xml*
	PRDIQP44.TXT

* contained in IQI_GEE_Input_Files.zip

   The ASCII text files are data files provided with the IQI module and are necessary for the programs to run. There is no need to convert these files to SAS format for use with the software. Note that POP95T12.TXT is available on the website as a separate download.

# 3.2 Pediatric Quality Indicators Quick Reference

Figure 3 shows processing steps for the Pediatric Quality **provider-level** Indicators, while Figure 4 shows steps for the Pediatric Quality **area-level** Indicators. The tables following these figures list the module indicator variables (Table 7), variable prefixes (Table 8), and module contents (Table 9).

Figure 3. Processing steps for the Pediatric Quality provider-level Indicators
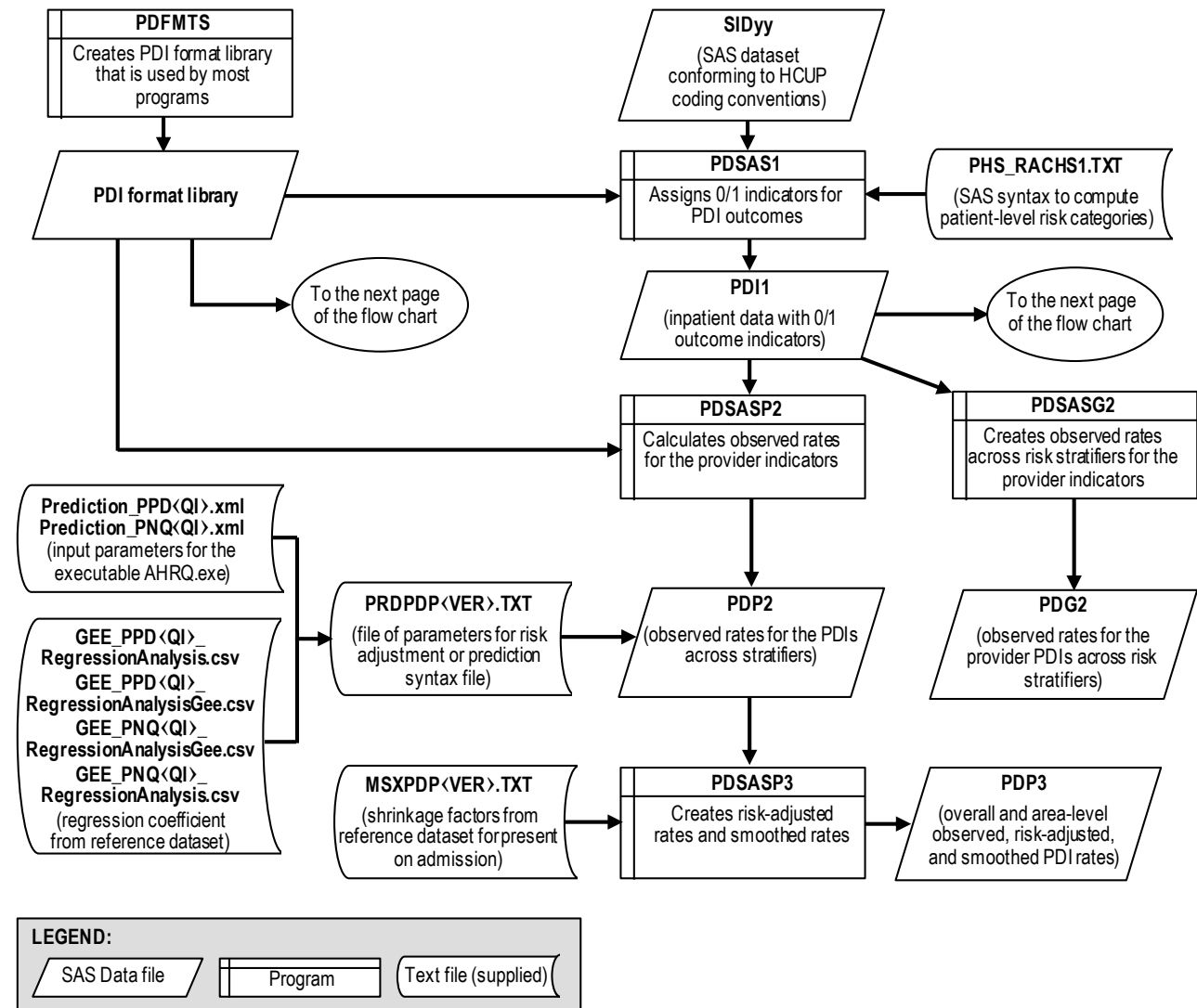
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_PDI.SAS program, which contains code the user **must** modify in order to run the PDI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data set.

Figure 4. Processing steps for the Pediatric Quality area-level Indicators
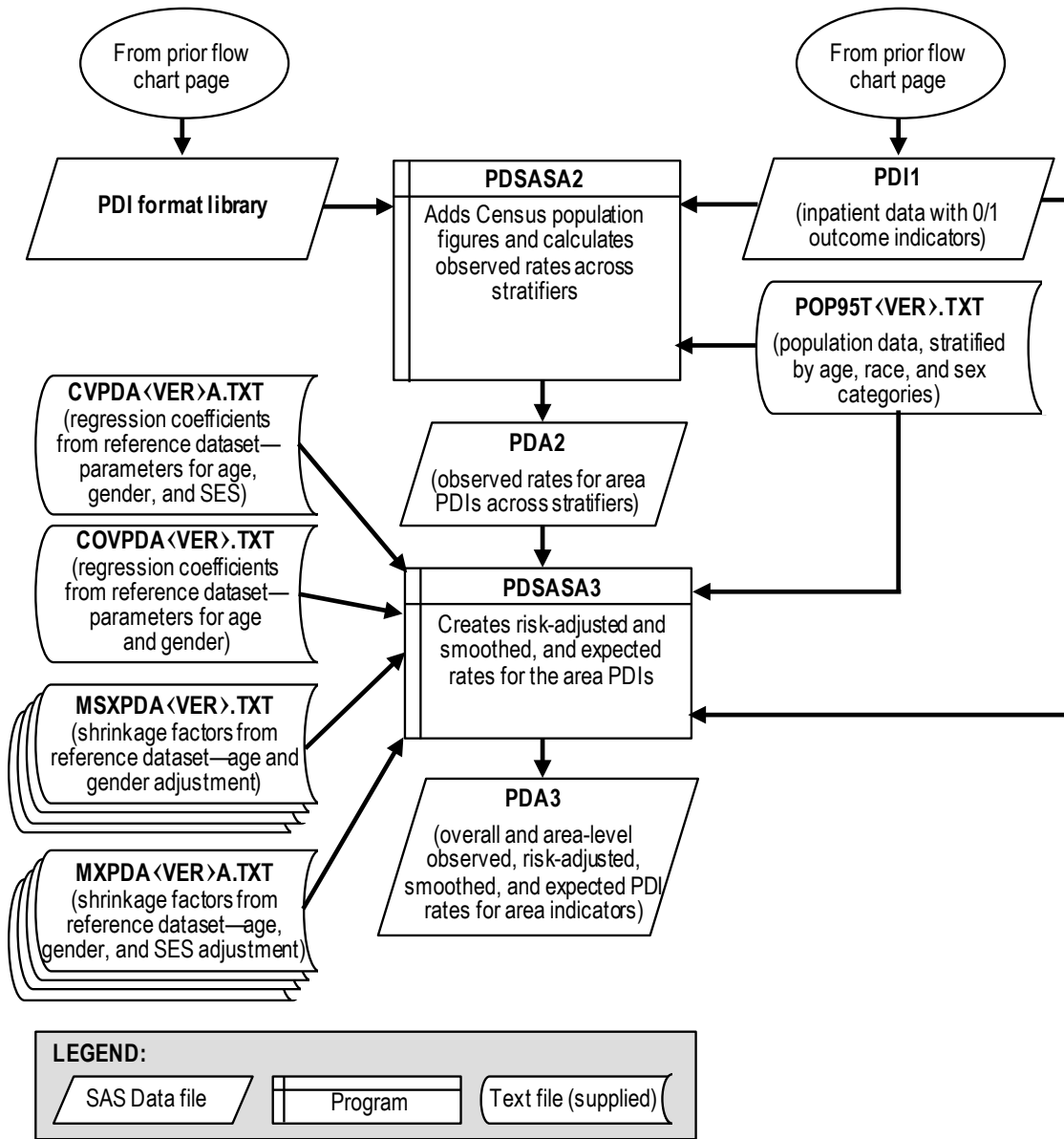
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_PDI.SAS program, which contains code the user must modify in order to run the PDI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data set.

Table 7. Pediatric Quality Indicator (PDI) variables

QI Number	Indicator
Pediatric Quality Provider Indicators	
1	Accidental Puncture or Laceration
2	Pressure Ulcer
3	Foreign Body Left During Procedure
5	Iatrogenic Pneumothorax
6	Pediatric Heart Surgery Mortality
7	Pediatric Heart Surgery Volume
8	Postoperative Hemorrhage or Hematoma
9	Postoperative Respiratory Failure
10	Postoperative Sepsis
11	Postoperative Wound Dehiscence
12	Central Venous-Associated Blood Stream Infection
13	Transfusion Reaction
PSI 17	Birth Trauma-Injury to Neonate [a]
PQI 9	Low Birth Weight [a]
Pediatric Quality Area Indicators	
14	Asthma Admission Rate
15	Diabetes Short-term Complications Admission Rate
16	Gastroenteritis Admission Rate
17	Perforated Appendix Admission Rate*
18	Urinary Tract Infection Admission Rate
90	PDI Composite
91	PDI Composite (acute only)
92	PDI Composite (chronic only)
Neonatal Quality Indicators	
1	Neonatal Iatrogenic Pneumothorax Rate
2	Neonatal Mortality Rate
3	Neonatal Blood Stream Infection Rate

[a] Indicators PSI 17 and PQI 9 are calculated by the PDI SAS module because these indicators are based on pediatric discharges.

* The denominator for PDI 17 includes all hospital admissions for appendicitis in the area.

Table 8. Prefixes for the Pediatric Quality Indicator (PDI) variables

Prefix	Contents	Examples	
		Provider Indicator 8, Postoperative Hemorrhage or Hematoma	Area Indicator 14, Asthma
T	Inpatient numerator (top)	TPPD08	TAPD14
P	Population denominator (pop)	PPPD08	PAPD14
Q	POA flag	QPPD08	N/A
O	Observed rate	OPPD08	OAPD14
E	Expected rate	EPPD08	EAPD26
R	Risk-adjusted rate	RPPD08	RAPD26
L	Lower limit of confidence interval of risk-adjusted rate	LPPD08	N/A
U	Upper limit of confidence interval of risk-adjusted rate	UPPD08	N/A
S	Smoothed rate	SPPD08	N/A
X	Standard error of smoothed rate	XPPD08	N/A

Note. POA= Present on Admission.

Table 9. Pediatric quality module contents

SAS programs (syntax files)	ASCII text files (data)
CONTROL_PDI.SAS	POP95T12.TXT
PDFMTS.SAS	MSXPDA44.TXT
PDSAS1.SAS	MSXPDP44.TXT
PDSASA2.SAS	PHS_RACHS1.TXT
PDSASA3.SAS	gee_ppdnn_RegressionAnalysisGee.csv or gee_ppdnn_RegressionAnalysis.csv *
PDSASG2.SAS	Prediction_PPDnn.xml *
PDSASP2.SAS	gee_pnqnn_RegressionAnalysisGee.csv or gee_pnqnn_RegressionAnalysis.csv *
PDSASP3.SAS	Prediction_PNQnn.xml *
	PRDPDP44.TXT
	MXPDA44A.TXT
	MSXPDC44.TXT
	CVPDA44A.TXT
	COVPDA44.TXT

*contained in PDI_GEE_Input_Files.zip

The ASCII text files are data files provided with the Pediatric Quality module and are necessary for the programs to run. There is no need to convert these files to SAS format for use with the software. Note that POP95T12.TXT is available on the website as a separate download.

3.3 Prevention Quality Indicators Quick Reference

Figure 5 shows processing steps for the Prevention Quality **area-level** Indicators, while Figure 6 shows steps for the Prevention Quality **condition-specific** Indicators (that is, area-level indicators with a condition-specific denominator – e.g., diabetes). The tables following these figures list the module indicator variables (Table 10), variable prefixes (Table 11), and module contents (Table 12).

Figure 5. Processing steps for the Prevention Quality area-level Indicators
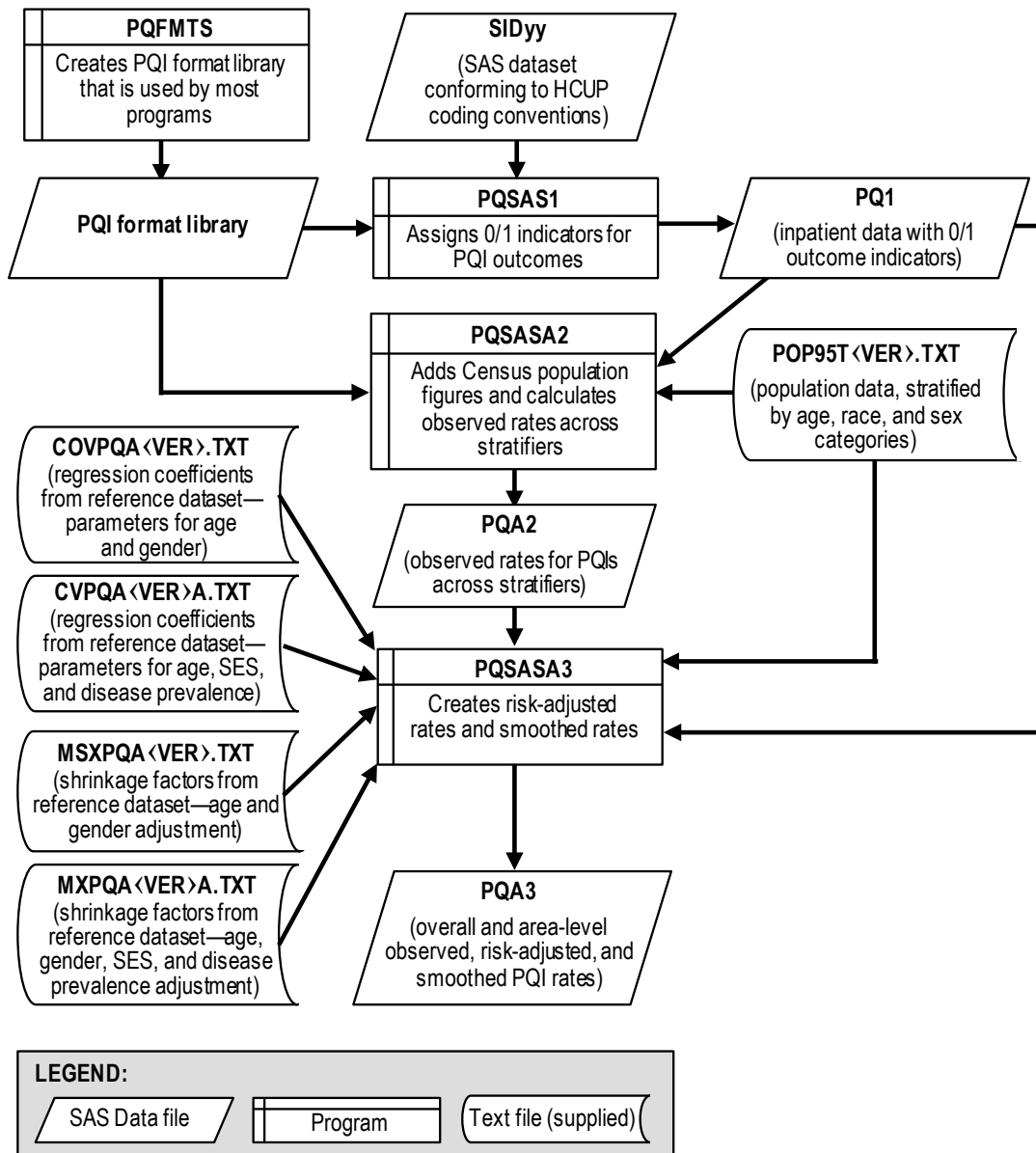
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_PQI.SAS program, which contains code the user **must** modify in order to run the PQI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data sets.

Figure 6. Processing steps for the condition-specific Prevention Quality Indicators
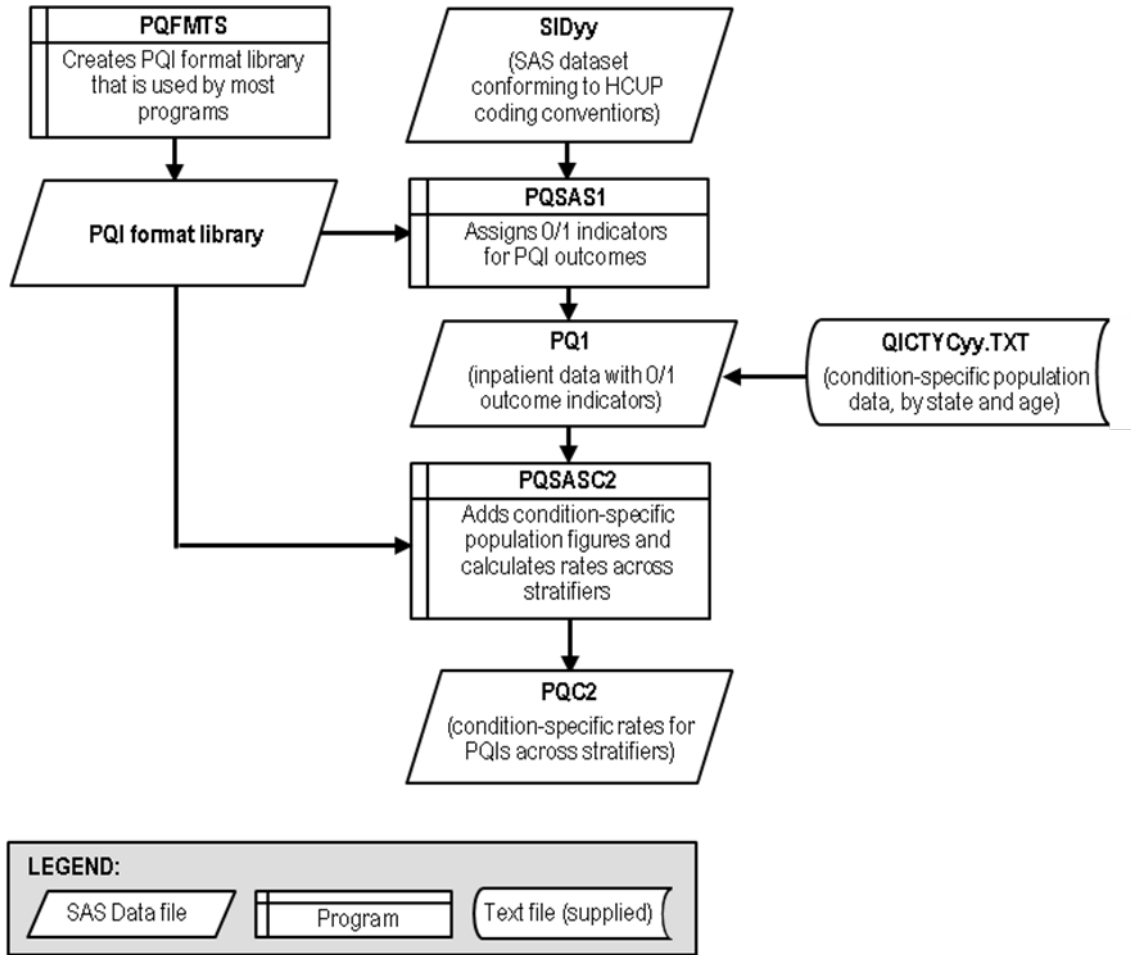
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_PQI.SAS program, which contains code the user **must** modify in order to run the PQI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data sets.

Table 10. Prevention Quality Indicator (PQI) variables

QI number	Numerator (admissions for ACSC)	Denominator
1	Diabetes Short-term Complications Admissions Rate	Area population
2	Perforated Appendix Admission Rate	Appendicitis*
3	Diabetes Long-term Complications Admission Rate	Area population
5	Chronic Obstructive Pulmonary Disease or Asthma in Older Adults Admission Rate	Area population
7	Hypertension Admission Rate	Area population
8	Heart Failure Admission Rate	Area population
9	Low Birth Weight Rate [a]	All liveborn births (newborns)
10	Dehydration Admission Rate	Area population
11	Bacterial Pneumonia Admission Rate	Area population
12	Urinary Tract Infection Admission Rate	Area population
13	Angina without Procedure Admission Rate	Area population
14	Uncontrolled Diabetes Admission Rate	Area population
15	Asthma in Younger Adults Admission Rate	Area population
16	Rate of Lower-Extremity Amputation Among Patients with Diabetes	Area population
90	Overall Composite	Area population
91	Acute Composite	Area population
92	Chronic Composite	Area population

ACSC – Ambulatory Care Sensitive Condition
* The denominator includes all hospital admissions for this condition in the area.
[a] This indicator is calculated by the PDI SAS module because it is based on pediatric discharges.

Except for PQI 2 and PQI 9, population rates are expressed per 100,000.

Table 11. Prefixes for the Prevention Quality Indicator (PQI) variables

Prefix	Contents	Example (for PQI 1, Diabetes short–term complications)
T	Inpatient numerator (top)	TAPQ01
P	Population denominator (pop)	PAPQ01
O	Observed Rate	OAPQ01
E	Expected Rate	EAPQ01
R	Risk-adjusted Rate	RAPQ01
L	Lower limit of confidence interval of risk-adjusted rate	LAPQ01
U	Upper limit of confidence interval of risk-adjusted rate	UAPQ01
S	Smoothed Rate	SAPQ01
X	Standard error of smoothed rate	XAPQ01
C	Condition-specific Rate	CAPQ01

Table 12. Prevention Quality Indicator module contents

SAS programs (syntax files)	ASCII text files (data)	
CONTROL_PQI.SAS	POP95T12.TXT	COVPQA44.TXT
PQFMTS.SAS	QICTYC12.TXT	CVPQA44A.TXT
PQSAS1.SAS		MSXPQA44.TXT
PQSASA2.SAS		MXPQA44A.TXT
PQSASA3.SAS		
PQSASC2.SAS		

The ASCII text files are provided with the Prevention Quality Indicators module, and are necessary for the programs to run. There is no need to convert these files to SAS format for use with the software. Note that POP95T12.TXT is available on the website as a separate download.

3.4 Patient Safety Indicators Quick Reference

Figure 7 shows processing steps for the Patient Safety **provider-level** Indicators, while Figure 8 shows steps for the Patient Safety **area-level** Indicators. The tables following these figures list the module indicator variables (Table 13), variable prefixes (Table 14), and module contents (Table 15).

Figure 7. Processing steps for the Patient Safety provider-level Indicators
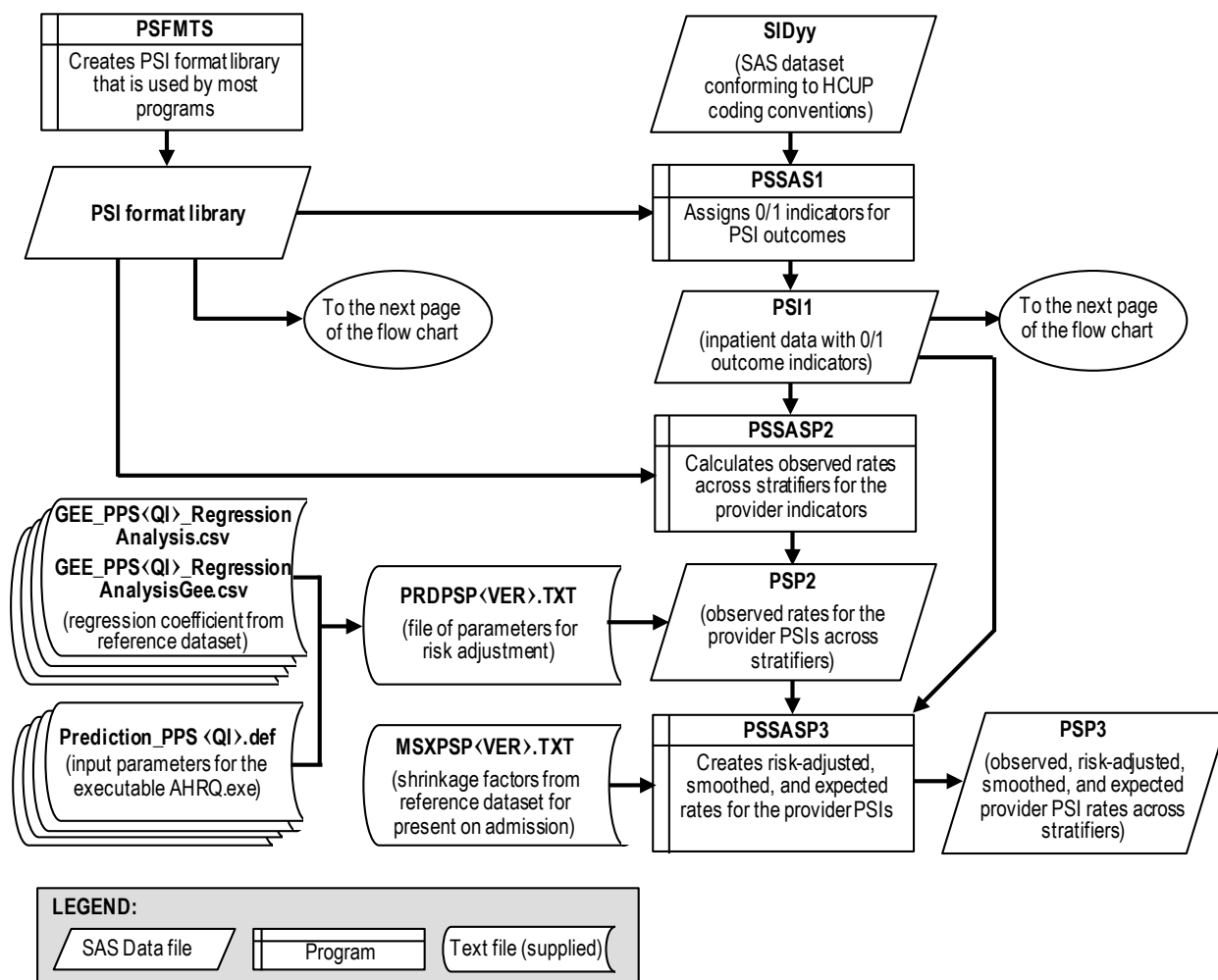
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_PSI.SAS program, which contains code the user must modify in order to run the PSI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data set.

Figure 8. Processing steps for the Patient Safety area-level Indicators
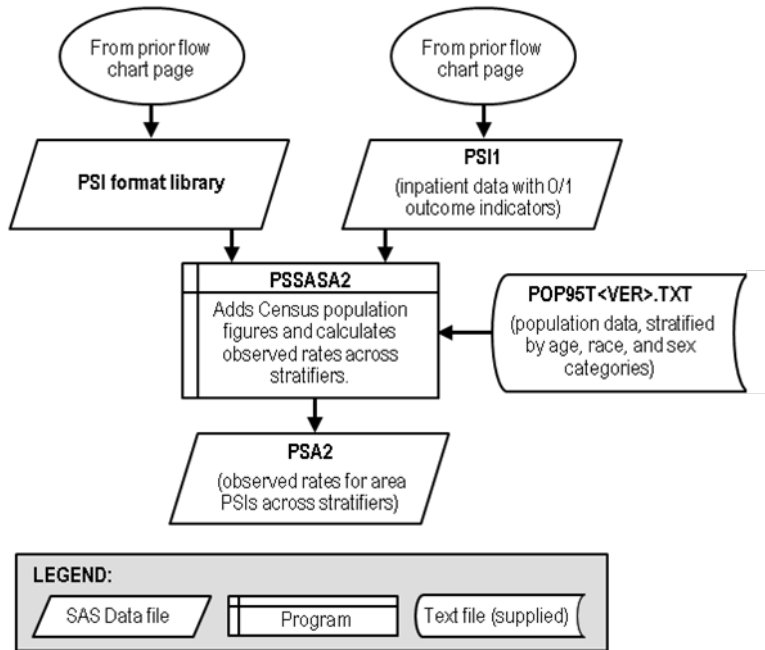
NOTE: Each of the SAS Programs in this figure incorporates the CONTROL_PSI.SAS program, which contains code the user must modify in order to run the PSI software. The modifications include such items as specifying the name and location of the input data set, the population data set, and the output data set.

Table **13. Patient Safety Indicator (PSI) variables**

QI Number	Indicator
	Patient Safety Provider Indicators
2	Death in Low-MortalityDRGs[2]
3	Pressure Ulcer Rate
4	Death among Surgical Inpatients
5	Foreign Body Left During Procedure Volume
6	Iatrogenic Pneumothorax Rate
7	Central Venous Catheter-Related Blood Stream Infection
8	Postoperative Hip Fracture Rate
9	Postoperative Hemorrhage or Hematoma Rate
10	Postoperative Physiologic and Metabolic Derangement Rate
11	Postoperative Respiratory Failure Rate
12	Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate
13	Postoperative Sepsis Rate
14	Postoperative Wound Dehiscence Rate
15	Accidental Puncture or Laceration Rate
16	Transfusion Reaction Volume
17	Birth Trauma Rate-Injury to Neonate[a]
18	Obstetric Trauma Rate – Vaginal Delivery with Instrument
19	Obstetric Trauma Rate – Vaginal Delivery without Instrument
	Patient Safety Area Indicators
21	Rate of Foreign Body Left During Procedure
22	Iatrogenic pneumothorax Rate
23	Central Venous Catheter-related Blood Stream Infection Rate
24	Postoperative Wound Dehiscence Rate
25	Accidental Puncture or Laceration Rate
26	Transfusion Reaction Rate
27	Postoperative Hemorrhage or Hematoma Rate

[a] PSI 17 is calculated by the PDI SAS module because it is based on pediatric discharges.

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[2] DRG = Diagnosis Related Group

Table 14. Prefixes for the Patient Safety Indicator (PSI) variables

Prefix	Contents	Examples	
		Provider Indicator 8, Postoperative Hip Fracture	**Area Indicator 23, Central Venous Catheter-related BSI**
T	Inpatient numerator (top)	TPPS08	TAPS23
P	Population denominator (pop)	PPPS08	PAPS23
O	Observed rate	OPPS08	OAPS23
Q	POA Flag	QPPS08	N/A
E	Expected rate	EPPS08	N/A
R	Risk-adjusted rate	RPPS08	N/A
L	Lower limit of confidence interval of risk-adjusted rate	LPPS08	N/A
U	Upper limit of confidence interval of risk-adjusted rate	UPPS08	N/A
S	Smoothed rate	SPPS08	N/A
X	Standard error of smoothed rate	XPPS08	N/A

Note. BSI = Blood Stream Infection; POA= Present on Admission.

Table 15. Patient safety module contents

| SAS programs (syntax files)	ASCII text files (data)
CONTROL_PSI.SAS PSFMTS.SAS PSSAS1.SAS PSSASP2.SAS PSSASP3.SAS PSSASA2.SAS	POP95T12.TXT MSXPSC44.TXT MSXPSP44.TXT CMBFQI32.TXT CMBAQI32.TXT CMBFQI37.TXT CMBAQI37.TXT gee_ppsnn_RegressionAnalysisGee.csv or gee_ppsnn_RegressionAnalysis.csv * Prediction_PPSnn.xml * PRDPSP44.TXT

*contained in PSI_GEE_Input_Files.zip

   The ASCII text files are data files provided with the Patient Safety Indicators module and are necessary for the programs to run. There is no need to convert these files to SAS format for use with the software. Note that POP95T12.TXT is available on the website as a separate download.

4.0 Background

Each set of AHRQ Quality Indicators reflects quality of care measures to highlight potential quality concerns, identify areas that need further study and investigation, and track changes over time. The data required for measuring these indicators come from hospital discharge abstracts or billing claims (administrative data), which are readily available within hospitals or from many state data organizations. The residential population data for the area-level utilization indicators are from the U.S. Census Bureau.

The software generates 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 including the health outcome of interest divided by the count of discharge records in the patient population at risk. Risk-adjusted and expected rates are derived by accounting for the average case mix of a reference population file that reflects a large proportion of the U.S. hospitalized or residential population. Smoothed rates are estimates that remove fluctuations over time due to random variation.

The software also calculates 95% intervals for some of the rates (confidence intervals in the case of risk-adjusted rates, probability intervals for composite and smoothed rates). These intervals can be used to test whether the computed rate is statistically different from a reference value. If the reference value is *greater than the upper bound of the interval*, then the computed rate is statistically *lower* than the reference value. If the reference value is *less than the lower bound of the interval*, then the computed value is statistically *higher* than the reference value. If the reference value falls *between the lower and upper bounds*, then there is *no statistical difference* between the computed rate and the reference value.

For the area-level utilization indicators, geographic areas are defined at the user's option in one of four ways:

- County level with U.S. Census FIPS[3]
- County level with modified FIPS
- Metro Area with OMB 1999 definition
- Metro Area with OMB 2003 definition.

The MSALEVL parameter has been renamed to MALEVL to reflect the change in OMB definitions for areas. Refer to Section 5.1 for information on these area definitions and MALEVL parameter settings.

4.1 Inpatient Quality Indicators Background

The Inpatient Quality Indicator module contains 32 indicators (plus two composite indicators) that reflect the quality of care inside hospitals. The six volume measures are intended to be paired with the corresponding mortality indicators. The indicators include three groups of measures based on hospital stays.

1. There are six **Volume** indicators for inpatient procedures for which there is evidence that a higher volume of procedures is associated with lower mortality. A nontrivial number of these procedures are performed by institutions that do not meet recommended volume

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[3] Federal Information Processing Standard, as defined by the U.S. Department of Commerce, National Institute of Standards and Technology (formerly National Bureau of Standards).

thresholds. The volume indicators are measured as counts of admissions in which particular procedures were performed.

2. There are 15 Inpatient **Mortality** indicators for medical conditions and surgical procedures that have been shown to have mortality rates that vary substantially across institutions and for which evidence suggests that high mortality may be associated with deficiencies in the quality of care. These indicators are measured as rates, the number of deaths divided by the number of admissions for the procedure or condition. Eight of these mortality indicators are for procedures, six of which are also measured by a volume indicator. The other seven mortality indicators are associated with medical conditions.

3. There are eleven **Utilization** indicators for procedures for which there are questions of overuse, underuse, or misuse. The usage of the procedures being examined varies significantly across hospitals and areas, and high or low rates by themselves do not represent poor quality of care; rather the information is intended to inform consumers about local practice patterns. Seven of these utilization indicators are rates based on the hospitalized population. Four other utilization indicators are rates based on an area's residential population. Two of these area-level utilization indicators (IQI 26 CABG and IQI 2 PTCA) have counterparts in the set of volume indicators.

4.2 Pediatric Quality Indicators Background

The PDI module contains 15 indicators that reflect the quality of care inside hospitals and eight indicators that reflect the quality of care outside hospitals. These indicators serve as flags for potential quality problems rather than definitive measures of quality of care. The indicators include two groups of measures based on hospital stays.

1. There are 15 **provider-level** Pediatric Quality Indicators for medical conditions and procedures that have been shown to have complication/adverse event rates that vary substantially across institutions and for which evidence suggests that high complication/adverse event rates may be associated with deficiencies in the quality of care. There are also three indicators for neonates. These indicators are measured as rates—outcome of interest/adverse events divided by the population at risk for the procedure or condition. The adverse event related provider-level indicators usually include only those cases where a secondary diagnosis code flags a potentially preventable complication. A few indicators are based on procedure codes that imply or infer a potential preventable adverse event. Four of the adverse event related indicators are for surgical discharges and seven are for either medical or surgical discharges. Four of the provider-level PDI (PDI 2, 8, 9, 11) incorporate information about when procedures were performed (relative to the admission date) if this information is available. Note, however, that if the day of procedure information is missing, the computed rates for these indicators will be slightly lower than if the information was available. Admission type and point of origin is used by two of the PDI, postoperative hemorrhage or hematoma and postoperative respiratory failure (PDI 8 and PDI 9), to identify elective surgeries.

2. There are eight **area-level** Pediatric Quality Indicators (five individual indicators and three composites).

Note that PQI 9 and PSI 17 are not included in the list, but these indicators are also calculated using the PDI module since they are based on discharges of patients age 18 and under. PQI 9, Low Birth Weight, is now generated by the SAS PDI module, although it retains its original name. This measure uses in-hospital live births as the denominator. PSI 17, Birth Trauma – Injury to Neonate, is also generated by the SAS PDI module since it is based on pediatric discharges, although it retains its original name. This measure uses all in-hospital newborns as the denominator.

4.3 Prevention Quality Indicators Background

The PQI module contains 13 indicators and three composite indicators that measure adult hospital admissions for ambulatory care sensitive conditions (ACSC) across geographic areas. PQI 9 is not included in the total of 13 indicators because it is based on pediatric discharges and hence is calculated by the PDI SAS module.

ACSCs represent conditions for which hospitalization could be avoided if the patient receives timely and adequate outpatient care. Many factors influence the quality of outpatient care, including access to care and adequately prescribed treatments, once care is obtained. In addition, patient compliance with those treatments and other patient factors may play a role. In general, areas with lower socio-economic status tend to have higher admission rates for ACSCs than areas with higher socio-economic status. As with utilization indicators, there are no "right rates" of admission for these conditions. Very low rates could signal inappropriate underutilization of healthcare resources while very high rates could indicate potential overuse of inpatient care.

Therefore, hospital admission for ACSCs is not a measure of hospital quality but a potential indicator of outpatient and community healthcare need. For example, if an area has a relatively high hospital admission rate for diabetes complications, the local healthcare providers should work with the community to identify reasons and strategies to address the problem.

Except for perforated appendix, each indicator is measured as the number of hospital admissions for a particular ACSC per 100,000 residential population in an area.

4.4 Patient Safety Indicators Background

The PSI module contains 24 indicators that reflect the quality of care inside hospitals. (PSI 17 is not included in the list of 24 PSI since it is based on pediatric discharges and hence is calculated by the PDI module.) The indicators include two groups of measures based on hospital stays.

1. There are 17 **provider-level** Patient Safety Indicators for medical conditions and surgical procedures that have been shown to have complication/adverse event rates that vary substantially across institutions and for which evidence suggests that high complication/adverse event rates may be associated with deficiencies in the quality of care. These indicators are measured as rates—number of complications/adverse events divided by the number of admissions for the procedure or condition. The provider-level indicators include only those cases where a secondary diagnosis code flags a potentially preventable complication.

Eight of these indicators are for surgical discharges, eight are for either medical or surgical discharges, and four are for obstetric discharges. Six of the provider-level PSI (PSI 3, 9, 10, 11, 12, 14), incorporate information about when procedures were performed (relative to the admission date) if this information is available. Note, however, that if the day of procedure information is missing, the computed rates for these indicators will be slightly lower than if the information was available. Admission type is used by four of the PSI: postoperative physiologic and metabolic derangements, postoperative respiratory failure, postoperative sepsis, and birth trauma (PSI 10, 11, 13 and 17) to identify elective surgeries and newborn admissions.

Note that PSI 2 (Death in Low Mortality DRGs) is reported as a single provider-level measure (observed and risk-adjusted). A single measure is necessary to insure adequate reliability of the provider-level rates by pooling an infrequent event over a large group of patients. However, the denominator for the indicator is very heterogeneous, and the mortality rate among the low mortality DRGs varies by DRG type. Users should compare the observed rate to the risk-adjusted rate, which accounts for differences among hospitals in patient case-mix (i.e., age, gender, DRG and comorbidities). For example, a hospital may have a high Death in Low Mortality DRG observed rate only because the hospital has a higher-than-average share of adult medical DRGs.

2. There are seven area-level Patient Safety Indicators. These indicators are identical to provider-level indicators, except that the numerator uses principal diagnosis in addition to secondary diagnoses in order to capture all cases of the complication, and not only those that develop during a given hospital admission.

5.0 Data Elements and Coding Conventions

See Appendix C for a detailed description of the input data elements and coding conventions used by the SAS QI software.

5.1 Input for the AHRQ Quality Indicators

This software was written to process data from discharge data abstracts that contain information about hospital stays. However, not all discharge data records should necessarily be included in a data set for analysis. For example, the AHRQ QI focus on acute care, not including 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 data elements. These modules were tested on data from the AHRQ Healthcare Cost and Utilization Project (HCUP). HCUP is an ongoing Federal-State-private collaboration to build uniform databases from administrative hospital-based data collected by State data organizations and hospital associations.

❖ *The input data file for the Quality Indicators software must be in SAS.*

❖ *It is strongly recommended that users recode data elements in their input file to be consistent with the coding expected by the software. This step will minimize the number of internal changes that will be necessary in the QI software. For example, recoding the SEX data element in the input file to be consistent with the coding described in Appendix C (i.e., 1 for male and 2 for female) is easier than modifying all uses of the Sex data element in the QI programs.*

❖ *Not every value for every data element is referenced by the QI software. 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). However, the complete set of standardized values is included, based on HCUP specifications (see Appendix A) to assist users of the uniform HCUP data files.*

❖ *To minimize internal changes to the software, all required elements should be present in the input data file. If a required element is not available, a placeholder element (i.e., a variable with the same name and format as the required element but missing values) should be provided. Failure to provide a placeholder element will result in errors during the execution of the QI programs.*

❖ *Six of the indicators (PDI 8 and 9 and PSI 4, 10, 11, and 13) use admission type (ATYPE) to identify elective surgeries. If admission type (ATYPE) is not available in the user's data, the user may want to evaluate other data in the file to create a proxy to identify elective admission types.*

The data elements listed in Appendix C are those required for the input files of **all** the SAS QI modules. When a variable is not required for the program, the notation "Not used by the QI program" will be present in the Comments column. Standardizing the variables and data values in the input data file will be helpful for ease of use with any of the AHRQ QI software modules.

❖ *Appendix C has been standardized to represent the input data file specifications required for use with any of the QI modules. If a specific variable is not used by the program, it is not necessary to create a placeholder variable in the input data file. For example, the variable APR-DRG is used only by the IQI software, so it is not necessary to have this data element in the input data file or create a placeholder variable for the PQI software program to run correctly.*

The data element HOSPSTCO has been renamed to PSTCO to emphasize the importance of calculating the area-level QI by the location of the patient residence. If the user wants to calculate the area-level QI based on the population of the Metro Area or county associated with the patient residence, the values for this variable should be the FIPS state/county code associated with each individual patient's place of residence. If the patient information is not available or the user wants to calculate the QI using the population associated with the hospital location as the denominator, the values for this variable should be the individual hospital FIPS state/county codes.

❖ *If the hospital FIPS code is used in PSTCO, users should be aware that rates may be biased for hospitals that serve as regional referral centers. These hospitals are likely to treat patients from outside the Metro Area, county, or even the state in which the facility is located.*

❖ *Users no longer have to use the Modified FIPS codes assignment for area denominators. However, that option is still available. In the modified FIPS codes, certain independent cities (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.*

❖ *Using the patient FIPS state/county code for analysis may more accurately reflect the true population at risk. Using the hospital FIPS state/county code for analysis should be done with caution, and at larger levels of geographic area (i.e., Metropolitan Area) to minimize the bias with patients that come from a different county than the hospital location.*

❖ *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 (in the PSTCO data field) are excluded from the calculations of observed, risk-adjusted, and smoothed QI area-level rates. They will be included in the output from the first program (XXSAS1.SAS, where XX indicates the specific QI set of indicators (IQ, PD, PQ or PS)).*

❖ *The software will generate area-level QI rates for each county included in the PSTCO data field. If using the hospital FIPS state/county code for analysis, users are encouraged to limit cases in their input file to those patients discharged from the geographic area of interest. For example, if you are using data from the state of Wisconsin and are interested in generating a rate for Wisconsin, you 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 Wisconsin.*

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

❖ *In the software programs, the MALEVL parameter should be set as follows:*
  0-County level with U.S. Census FIPS
  1-County level with modified FIPS
  2-Metro Area with 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 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 the federal Office of Management and Budget (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 (NECMAs). OMB defines NECMAs as a county-based alternative to the city- and town-based New England MSAs and Consolidated MSAs (CMSAs). For example, Hampden and Hampshire counties in Western Massachusetts are assigned to the Springfield MA NECMA, even though Holland town in Hampden County is part of the Boston MSA; and 3) The "2003 OMB" definition is from the federal OMB circular 03-04, (Last Revised December 4, 2005). The mapping is from county to either Metropolitan Statistical Area or Micropolitan Statistical Area.

5.2 Coding of Diagnoses, Procedures, DRGs, and MDCs

❖ *Diagnoses and procedures must be coded using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM).*

❖ *Significant modifications to ICD-9-CM codes occurred in the early 1990s. QI definitions only reflect codes valid on and after October 1, 1994, so they may not accurately analyze data collected before October 1994.*

Diagnosis and procedure codes should be in character strings. Diagnosis and procedure codes should not contain any decimal points. Diagnosis and procedure codes should be left justified. Diagnosis codes with fewer than five digits should be padded with spaces (not zeros) on the right. Procedure codes with fewer than four digits should be padded with spaces (not zeros) on the right.

❖ *The QI programs assume accurate and specific coding of ICD-9-CM codes. If an ICD-9-CM code is specified using five digits, the software recognizes only five-digit versions of that code and not versions truncated at three or four digits. Similarly, if an ICD-9-CM code is specified using four digits, the software recognizes only four-*

digit versions of that code and not versions truncated at three digits. For example, 4281 is the ICD-9-CM diagnosis code for left heart failure. If your data are coded less specifically (i.e., 428 is used to designate "heart failure"), these less specific codes are not recognized by the software and will result in undercounting cases.

Diagnosis-related groups (DRGs) and Major Diagnostic Categories (MDCs) are those derived from the Centers for Medicare & Medicaid Services Medicare grouper. The software expects that you will be using the DRG effective on the discharge date. The software now refers to data elements DRG and MDC. Your 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.

❖ *Version 4.4 of the software accounts for ICD-9-CM and DRG coding effective through FY2012 (through September 30, 2012).*

The data elements in the AHRQ QI are based on the coding specifications used in the State Inpatient Databases (SID) in the Healthcare Cost and Utilization Project (HCUP). The SID coding specifications are similar to the Uniform Bill (UB-04) but not identical. For data elements used in the AHRQ QI, crosswalks between the SID and UB-04 coding specifications are included in the SID documentation available at http://hcup-us.ahrq.gov/db/state/siddbdocumentation.jsp.

5.3 APR-DRG Variables

It is recommended that users either use their own 3M™ APR DRG Grouper software or download and run the 3M™ APR DRG Limited License Grouper for AHRQ QI SAS® software on their patient data before running the IQI SAS programs. The Limited License Grouper software is available on the AHRQ IQI download page (see Appendix A for link.)
The Grouper software creates APR-DRG categories and associated risk of mortality data elements. These APR-DRG variables are used to enhance the risk-adjustment of selected IQI provider indicators.

❖ *APR-DRG software must be downloaded and run separately.*

❖ *Users who wish to use APR-DRG results to risk-adjust the provider IQI rates should run the APR-DRG software on their patient data **before** running the IQI programs.*

5.4 Use of External Cause of Injury Codes

External cause of injury codes (E-codes) are used to classify environmental events, circumstances and conditions as the cause of injury, poisoning or other adverse events. The use of E-codes is not always required by a state uniform billing committee or a state data organization. Users should be knowledgeable of the E-code requirements and practices of hospitals represented in the input data file. Several of the indicators use E-codes in their numerator or denominator definitions.

5.5 Missing Values

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

> ❖ *Cases that are missing data in fields used for indicator definitions or for risk adjustment (such as age and sex) will be excluded from analysis.*

Data files of hospital discharge abstract data may have numeric data elements coded using special SAS missing "dot" values. For example, besides the standard SAS value of "." for missing data, there might also be present values of ".A" for invalid data, ".B" for data unavailable from a particular source, or ".C" for inconsistent data. However, the QI programs do **not** distinguish among the different types of missing codes. Therefore, all types of missing values in the input data must be represented by a single value – missing data (.) for numeric variables and blank (' ') for alphanumeric (or character) variables.

5.6 Treatment of Missing Data

The software is designed to handle missing data in a particular manner; specifically, the software requires confirmation for the assignment of a poor outcome or negative event. For instance, in order to be assigned as a death, each case must actually be coded as a death. Missing data are considered neutral. Missing data for some elements result in the exclusion of that case from the denominator. For a few other elements, the case is retained. Tables 16 through 19 list the impact of missing data for each data element in the AHRQ QI software.

Table 16. Treatment of missing data elements for IQI software

Variable	Label	D	N	E	S	Treatment of Missing Data
AGE	Age In Years At Admission	X	X		X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
ASOURCE	Admission Source			X		Case excluded from denominator where used in specification (e.g., IQI 32).
DISP	Disposition Status		X	X		Case excluded from denominator where used in specification (e.g., IQI 15).
DQTR	Discharge Quarter	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
DX1	Principal Diagnosis Code	x	x	x	x	Record excluded from analysis
Sex	Patient Gender	X	X		X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
PAY 1	Payer				x	Classified As "Other."
POINTOFORIGINUB04	Point of Origin	x		x		Missing values of POINTOFORIGINUB04 result in a case being excluded from the denominator for IQI 32 (along with ASOURCE)
PSTCO	Location of Patient Residence or Hospital Location Modified FIPS State/County Code	X				Dropped from denominator in rate calculations (stratified by county or Metro Area), case will appear in calculation of the overall rate.
RACE	Race				X	Classified As "Other."
YEAR	Discharge Year	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).

Note. D = Denominator; N = Numerator; E = Exclusion; S = Stratification.

Table 17. Treatment of missing data elements for PDI software

Variable	Label	D	N	E	S	Treatment of Missing Data
AGE	Age In Years At Admission	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
AGEDAY	Age in days (coded only when the age in years is less than 1)					The value is treated as if it was less than 29 days.
ATYPE	Admission Type	X				Case excluded from denominator where used in specification.
DISP	Disposition Status		X	X		Case excluded from denominator where used in specification (i.e., PDI 6 and NQI 2).
DQTR	Discharge Quarter	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
DX1	Principal Diagnosis Code	X	X	X	X	Record excluded from analysis
LOS	Length of Stay	X		X		Case excluded from denominator where used in specification.
SEX	Patient Gender	X	X		X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
PAY1	Payer				X	Classified as "Other."
PSTCO	Location of Patient Residence or Hospital Location Modified FIPS State/County Code	X				Dropped from denominator in rate calculations (stratified by county or Metro Area), case will appear in calculation of the overall rate.
RACE	Race				X	Classified As "Other."
YEAR	Discharge Year	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).

Note. D = Denominator; N = Numerator; E = Exclusion; S = Stratification.

Table 18. Treatment of missing data elements for PQI software

Variable	Label	D	N	E	S	Treatment of Missing Data
AGE	Age In Years At Admission	X	X		X	Case excluded from all analysis (e.g., dropped from numerator of all population based measures and from the denominator of the discharge based indicator, PQI 2.
DQTR	Discharge Quarter	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
DX1	Principal Diagnosis Code	X	X	X	X	Record excluded from analysis
SEX	Patient Gender	X	X		X	Case excluded from all analysis (e.g., dropped from numerator of all population based measures and from the denominator of the discharge based indicator, PQI 2.
PAY 1	Payer				X	Classified As "Other."
PSTCO	Location of Patient Residence or Hospital Location Modified FIPS State/County Code	X			X	Dropped from denominator in rate calculations (stratified by county or Metro Area), case will appear in calculation of the overall rate.
RACE	Race				X	Classified As "Other"
YEAR	Discharge Year	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).

Note. D = Denominator; N = Numerator; E = Exclusion; S = Stratification.

Table 19. Treatment of missing data elements for PSI software

Variable	Label	D	N	E	S	Treatment of Missing Data
AGE	Age In Years At Admission	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
ATYPE	Admission Type	X				Case excluded from denominator where used in specification (e.g., PSI 10).
DISP	Disposition Status		X	X		Case excluded from denominator where used in specification (e.g., PSI 4 and PSI 5).
DQTR	Discharge Quarter	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
DX1	Principal Diagnosis Code	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
LOS	Length of Stay	X		X		Case excluded from denominator where used in specification (e.g., PSI 3).
SEX	Patient Gender	X	X		X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).
PAY1	Payer				X	Classified as "Other"
PSTCO	Location of Patient Residence or Hospital Location Modified FIPS State/County Code	X				Dropped from denominator in rate calculations (stratified by county or Metro Area), case will appear in calculation of the overall rate.
RACE	Race				X	Classified As "Other."
YEAR	Discharge Year	X	X	X	X	Case excluded from all analysis (e.g., dropped from the denominator of the discharge based indicators and from numerator of all population based measures).

Note. D = Denominator; N = Numerator; E = Exclusion; S = Stratification.

6.0 User Feedback for Future Updates

The QI software reflects its development and implementation with discharge data available to AHRQ through the HCUP program. The goal was to develop the tools, illustrate their use, and then 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 QI software to better serve their 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 of QI based on original definitions is lost. Users are encouraged to identify ways to improve the QI methodology and to share their suggestions with AHRQ for future software updates.*

AHRQ provides public access to HCUPnet (http://hcupnet.ahrq.gov/), which is an interactive tool for identifying, tracking, analyzing, and comparing statistics on hospital care. HCUPnet generates statistics in a table format using data from the NIS and SID for those States that have agreed to participate. HCUPnet includes statistics based on the AHRQ QI which have been applied to the HCUP NIS. If users change definitions of the QI, it will not be possible to compare users' results to the national estimates in HCUPnet.

7.0 Producing Quality Indicator Rates: Processing Steps

These six steps below describe the QI calculations. The next section of this document describes the specifics of each software component of the SAS QI software.

An outcome of interest is the number of cases with the indicator outcome like mortality or a procedure.

For AHRQ QI that are expressed as a rate the calculation is shown below:

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

{or}

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

A multiplier is used to express the rates in whole number. Multiplying the raw rate by 100,000 will produce the rates per 100,000 for the population at risk.

Conceptually, five steps are necessary to produce most of the QI rates (six steps are required for PQI rates). (Note that volume and count-based measures are not expressed as rates.) The following instruction describes the steps and how the software performs them.

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.

7.1 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 measures.

Records are marked by setting a series of flag variables, each of which corresponds to the numerator for a particular QI. For example, if the inpatient record meets the conditions for inclusion in the outcome for IQI 1, then the outcome indicator for IQI 1 is set to one by the SAS software.

IQI
PSI
PDI

The first six indicators in the IQI and PSI 5 and 16 and PDI 1 and PDI 3 are volume measures, and for these QI, Step 1 is all that is necessary to calcuate the results.

This step requires one pass through the discharge-level data and outputs a discharge-level SAS dataset containing the flag indicator variables for the outcomes for each QI in its respective module. This dataset also contains the original input variables, with the exception of the diagnosis and procedure variables that have been removed to reduce the size of the file.

The remaining steps are relevant for the remaining IQI which are rates as opposed to volume measures.

7.2 Step 2. Identify Populations at Risk

For the Provider QI, the populations at risk (the denominators for calculating the QI rates, or "pop") are derived from the hospital discharge records.

For the Area-level QI, the populations at risk (the denominators for calculating the QI rates) are derived from U.S. Census population figures defined by county in all areas of the U.S., or by Metro Area in urban areas and by county in rural areas.

7.3 Step 3. Calculate Observed (Raw) Quality Indicator Rates

Using the output SAS dataset from Step 1 and either hospital discharge or U.S. Census population data from Step 2, the QI rates are calculated for user-specified combinations of stratifiers. These stratifiers include hospitals, age groups, race/ethnicity categories, sex, and payer categories for the provider-level QI, and areas (Metro Areas/counties), age groups, race/ethnicity categories, and sex for the area-level QI. This step outputs the observed rates for user-specified categories, alone or in combination. For example, provider-level QI observed rates could be output at the hospital level, at the payer level, or at the hospital level by payer.

❖ *The programs calculate QI rates regardless of the number of cases available (above a minimum of 3). However, QI rates based on only a few cases should be interpreted with caution.*

In some performance measurement work, it is often recommended that rates be suppressed when there are fewer than 30 cases in the denominator. This exclusion rule serves two purposes:

• It eliminates unstable estimates based on too few cases.

• It helps protect the identities of hospitals and patients.

7.4 Step 4. Risk-Adjust the Quality Indicator Rates

Regression coefficients from a reference population database (reflecting a large proportion of the U.S. population) are applied to the individual cases in the risk-adjustment process. These reference population file regression coefficients are provided as part of the QI software. The risk-adjusted rates will then reflect the age, sex, condition/severity and comorbidity (provider-level) or age, sex (area-level) distribution in the reference population file rather than the distribution for the hospitals or areas present in the user's data. This approach will allow risk-adjusted rates produced by various users to be compared directly to one another. The regression coefficients were derived from HCUP's State Inpatient Databases (SID) and U.S. Census Data (area-level only). The code to generate these reference population coefficients is not part of the QI software.

QI

This step applies to both provider- and area-level data.

QI (PQI, IQI, PSI, PDI) that are not risk-adjusted are noted in the risk-adjustment tables available on the applciable module resources page on the QI website (http://www.qualityindicators.ahrq.gov/modules/Default.aspx)

❖ *The programs calculate risk-adjusted QI rates regardless of the number of cases available (above a minimum of 3). However, QI rates based on only a few cases should be interpreted with caution.*

7.5 Step 5. Create MSX Smoothed Rates

Shrinkage factors are applied to the risk-adjusted rates for each QI in a process called multivariate signal extraction (MSX). These shrinkage factors were calculated from the HCUP SID database. For each QI, the shrinkage estimate reflects a "reliability adjustment" unique to each indicator. The less reliable the QI is over time and across hospitals or areas, the more the estimate "shrinks" the QI toward the overall area mean. The resulting rate will appear "smoother" than the raw rate, meaning that the year-to-year fluctuations in performance are likely to be reduced. The shrinkage factors are provided as part of the QI software and do not need to be calculated by users. More information on interpreting smoothed rates is contained in Appendix B – "Using Different Types of QI Rates."

QI

This step applies to provider-level and area-level QI, even those that are not risk-adjusted.

7.6 Step 6. Calculate Condition-Specific Rates (For PQI Only)

For selected PQI, data are available on the prevalence of the relevant condition. The SAS software incorporates state-level estimates of diabetes prevalence by age from the CDC National Diabetes Surveillance System (see Appendix A.) The four PQI related to diabetes (PQI 1, 3, 14, and 16) can be calculated using the number of diabetics in the state as the denominator, stratified by age.

PQI

Step 6 applies to the PQI only.

8.0 Program Descriptions

This section describes the SAS programs that assign, calculate, and print the QI results (see Table 20 Summary of programs).

For each program there is a description, a list of input and output files, and an explanation of changes to the program that may be required. The flow of data through the QI module programs is shown in the flowcharts in Section 3.0.

❖ *All of the naming conventions for the programs and codes have been standardized in this manual so that "XX" in a program title denotes the specific QI module. For example, XXFMTS can be interpreted as IQFMTS, PDFMTS, PQFMTS or PSFMTS, depending on which set of indicators is being analyzed (IQI, PDI, PQI or PSI, respectively).*

Table 20. Summary of programs

Function	Module			
	IQI	**PDI**	**PQI**	**PSI**
File Locations & Options	CONTROL_IQI .SAS	CONTROL_PDI. SAS	CONTROL_PQI. SAS	CONTROL_PSI. SAS
Create Format File	IQFMTS.SAS	PDFMTS.SAS	PQFMTS.SAS	PSFMTS.SAS
Identify Discharges in Numerator and Denominator	IQSAS1.SAS	PDSAS1.SAS	PQSAS1.SAS	PSSAS1.SAS
Stratified Risk Categories	-	PDSASG2.SAS	-	-
Provider Observed Rates	IQSASP2.SAS	PDSASP2.SAS	-	PSSASP2.SAS
Provider Risk Adjusted & Smoothed Rates	IQSASP3.SAS	PDSASP3.SAS	-	PSSASP3.SAS
Area Observed Rates	IQSASA2.SAS	PDSASA2.SAS	PQSASA2.SAS	PSSASA2.SAS
Area Risk Adjusted & Smoothed Rates	IQSASA3.SAS	PDSASA3.SAS	PQSASA3.SAS	-
Condition-specific Rates	-	-	PQSASC2.SAS	-

If you desire to create and examine observed QI rates, then the CONTROL_*XX*I, *XX*FMTS, and the *XX*SAS1 programs will need to be used, followed by *XX*SASP2 (for Provider-level observed rates and volume indicators) and/or *XX*SASA2 (for Area-level observed rates). If you also wish to create risk-adjusted and smoothed QI rates, then you will need to run the *XX*SASP3 and/or the *XX*SASA3 program.

PDI

The PDI module offers two alternatives for analyzing provider level rates, stratification and risk adjustment.

If you wish to create stratified Provider PDI, you will need to run PDSASG2.

PQI

If you wish to create condition-specific (diabetes) rates in the PQI module, you will need to run the PQSASC2 program.

PSI

For the PSI, risk-adjusted and smoothed PSI rates are only calculated at the hospital (provider) level, not for area PSI.

8.1 Modify Statements in the CONTROL_*XX*I.SAS Code

The CONTROL_*XX*I.SAS contains most of the SAS statements that you need to modify in order to run the remaining QI module programs. This location is where you specify, for example, the path names or locations of all your input and output data sets. There is also a TITLE line that the user can fill in. The items that need to be changed in order to run the *XX*SAS1, *XX*SASP2, PDSASG2, PQSASC2, *XX*SASP3, *XX*SASA2, and *XX*SASA3 programs are described below.

❖ *The CONTROL_XXI.SAS code is automatically inserted into the remaining programs when they are executed. You do **not** need to run CONTROL_XXI.SAS as a separate program.*

❖ *All of the changes needed for the CONTROL_XXI.SAS code are listed in the following descriptions for the other programs. Each program description contains a section labeled "Changes" that enumerates the modifications for CONTROL_XXI.SAS that are associated with that particular program.*

❖ *Lines of code to be modified are identified by the phrase "<===USER MUST modify," which means the user **must** make the change or by "<===USER MAY modify," which means the modification is optional.*

In all of the remaining programs included with the SAS QI modules, there is one line of code near the beginning of each program that needs to be modified. This line of code starts with the phrase "FILENAME CONTROL." You *must* modify this line to point to the path name where you stored your modified copy of the CONTROL_*XX*I.SAS file. Pathnames should not exceed 255 characters in length.

CONTROL_*XX*I.SAS has a collection of parameters that allow you to read in data from different locations or pathnames and write out data to different locations or pathnames. For example, "LIBNAME IN0" points to the location of your input data set for program *XX*SAS1, and "LIBNAME OUT1" points to the location of the output data set created by the *XX*SAS1 program. The parameters allow these locations to be different from one another. However, if you wish to read in and write out all of the data to the same location, it is recommended that you make a global change in CONTROL_*XX*I.SAS, changing "C:\pathname" to the single directory location that you wish to use.

There is a global PRINT parameter in CONTROL_*XX*I.SAS that may be used to print all of the output summary records at the end of the *XX*SASP2, *XX*SASP3, PDSASG2, PQSASC2, *XX*SASA2, and *XX*SASA3 programs. These printouts may be quite large if you have a large database with many hospitals and/or many areas (e.g., counties, Metro Areas) and if you choose the results to be finely stratified. This feature is turned off by default (i.e., PRINT is set to zero in CONTROL_*XX*I.SAS); to turn this feature on, set PRINT to have a value of 1.

> ❖ *The global MALEVL parameter in CONTROL_XXI.SAS by default instructs all programs to define geographic areas by county for all areas in the input datasets. Refer to Section 5.1 for a list of values for the MALEVL parameter.*

8.2 Run *XX*FMTS

The *XX*FMTS program defines a format library, which contains the diagnosis and procedure screens necessary for assigning the outcomes of interest. This format library is used by most of the other SAS programs.

The first few formats in this program are for the stratifiers (i.e., age, sex, race/ethnicity and payer). These are followed by formats that are used for the identification of outcomes of interest in the *XX*SAS1 program, and by formats that map FIPS county codes to Metro Areas in the *XX*SAS1, *XX*SASA2 and *XX*SASA3 programs. At the end of the program are formats used to assign age, modified DRG and comorbidity categories for the risk adjustment process implemented in *XX*SASP3 and *XX*SASA3, and formats used with APR-DRG categories in *XX*SASP3.

Input: None.

Output: Permanent SAS format library (FMTLIB).

Changes:
      1. You must modify the "FILENAME CONTROL" statement at the beginning of the program to change the path, so it points to your location of the CONTROL_*XX*I.SAS code.

2. In CONTROL_*XX*I.SAS, specify the location (path) of the format library in the "LIBNAME LIBRARY" statement.

8.3 Run *XX*SAS1

The *XX*SAS1 program processes hospital discharge abstract data and flags inpatient records if they contain outcomes of interest. Outcome indicator names, or numerators, have a prefix of "T" (Top). Stratifier variables are constructed at the beginning of the program.

This program assumes that the input data file (consisting of inpatient discharge abstract data) conforms to specific variable names, attributes and coding conventions. See Quick References section for variable names and attributes for the input data file.

Partial definitions of the QI are also given in Section 3.0. This table is presented to assist those individuals who desire to examine the software source code statements. Complete definitions of the indicators are given in the document *Technical Specifications* documents for each QI (see Appendix A for a link to these documents).

Input:

1. User supplied SAS inpatient data set consisting of administrative hospital discharge abstract data. This data set is a discharge level file with an array of diagnosis and procedure codes, among other data elements.

2. SAS format library (FMTLIB) created from the *XX*FMTS program.

PDI and PSI

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

Output:

1. SAS dataset containing inpatient records with input variables, stratifiers, comorbidity variables, and flag indicators (TP*XX*nn and TA*XX*nn, where *XX* refers to the QI set and nn refers to the indicator number) for the outcomes of interest that will later form the numerators for the QI rates.

2. PROC MEANS (with N, NMISS, MIN, MAX, MEAN and SUM) of all 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:

1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_*XX*I.SAS code.

2. In CONTROL_*XX*I.SAS, specify the locations (paths) of the input and output files in the "LIBNAME IN0" and "LIBNAME OUT1" statements.

3. In CONTROL_*XX*I.SAS, specify the names of the input and output files in the "INFILE0" and "OUTFILE1" statements. Note that SAS file references must not include file extensions. The default file name may be used for "OUTFILE1".

4. To define urban areas by Metro Area rather than by county, change the MALEVL parameter in CONTROL_*XX*I.SAS from 0 to 1, 2 or 3. Rural areas will be defined by county no matter how MALEVL is specified. Refer to Section 5.1 for a list of values for the MALEVL parameter.

❖ *The QI modules assume that your starting SAS dataset contains 30 diagnoses and 30 procedures. If these numbers are different in your input inpatient data, then modify the NDX and NPR parameters in CONTROL_XXI.SAS.*

❖ *If your variables are named differently from those used in the QI software (see [Section 3.0](#)), you MUST either rename those variables prior to running this program or modify XXSAS1 to include the renaming of your variables to match those expected by the software. Similarly, if your variables are not the same type, i.e., character or numeric, as those expected by the software, you MUST modify your variables prior to running this program.*

Additional Changes for the IQI Module:

5. In the IQI module, if you wish to use APR-DRG variables in the later IQSASP3 program to risk-adjust the provider-level indicators, then in CONTROL_IQI.SAS, set the APRDRGFG flag parameter to one. If you do not intend to run IQSASP3 to risk-adjust the provider-level indicators or if you do not have the APR-DRG variables available to you, then set APRDRGFG to zero. See Table 21 below.

IQI

Additional changes for the IQI module

6. Also in the IQI module, if you wish to risk-adjust the provider-level indicators by later running the IQSASP3 program, then in CONTROL_IQI.SAS, set the three APRDRG, APRDRG_RISK_MORTALITY, and XPRDRG_RISK_MORTALITY parameters to be the names of the DRG category variable, and the mortality indicators created by APR-DRG software. If you do not intend to use APR-DRG software, then set the three APRDRG, APRDRG_RISK_MORTALITY, and XPRDRG_RISK_MORTALITY parameters to equal zero. See Table 21 below.
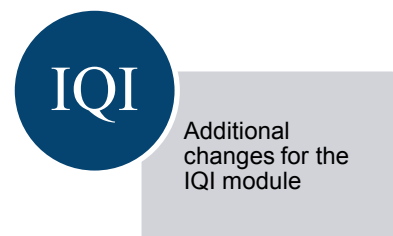
Table 21. How to set up IQI parameters and your data for using APR-DRG variables

	If you do not intend to risk-adjust the provider indicators	If you are going to run IQSASP3 to risk adjust the provider indicators:	
		If you have APR-DRG software available	If you do not have APR-DRG software available
Preliminary data processing	None	Run APR-DRG software to create APR-DRGs, and mortality indicators	None
Setting the APRDRGFG parameter in CONTROL_IQI.SAS	Set to equal zero.	Set to equal one.	Set to equal zero.
Setting the APR_DRG, APRDRG_RISK_MORTALITY, and XPRDRG_RISK_MORTALITY parameters in CONTROL_IQI.SAS	No action required.	Set to equal the names of the variables output from the APR-DRG software.	Set to equal zero.

8.4 Run *XX*SASP2

For all but the volume indicators (IQI 1-7), the *XX*SASP2 program calculates the observed or raw rates for the provider-level QI, using the data derived in a previous step (*XX*SAS1). These observed rates are stratified by combinations of providers, sex, age, race and payer categories. The program first totals the indicator flags created by the *XX*SAS1 program and then for each of the desired stratifiers divides these totals by the hospital discharges in the at-risk population for the indicator. The population denominators are stored in variables with names that have a prefix of "P" (Pop). The Observed rates are stored in variables that have a prefix of "O."

The *XXSASP2* program does not apply to the PQI module, as those indicators are all area-level measures. If only using the PQI module or if provider-level estimation is not desired, refer to Section 8.6 for details related to area-level estimation.

PQI

The *XX*SASP2 program does not apply to the PQI module.

PQI indicators are all area-level measures.

IQI

The *XX*SASP2 program does not apply to the volume indicators in the IQI module.

The IQI volume indicators are IQI #1 through 7.
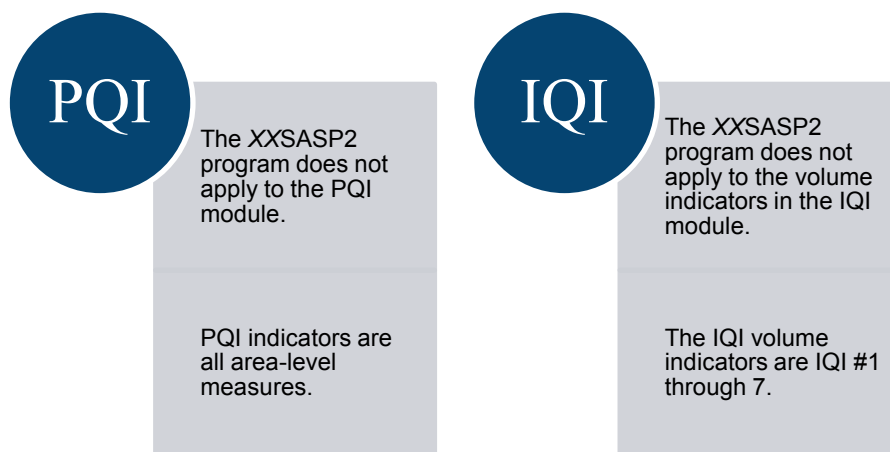
Input:

1. The SAS dataset that was created in the *XX*SAS1. This dataset is a discharge-level file that contains inpatient records with input variables, stratifiers and the flag indicators for the QI Provider outcomes of interest.

2. SAS format library (FMTLIB) created from the *XX*FMT program.

Output:

1. SAS dataset with summary records that contain observed rates (OP*XX*nn variables where "nn" refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TP*XX*nn variables), and the hospital discharge totals that formed the denominators of the observed rates (PP*XX*nn variables). It also includes variables identifying present on admission (POA) conditions for provider-level outcomes of interest (QP*XX*nn). The output file has records summarized to the various combinations of stratifiers specified in the TYPELVLP parameter that is described in the "**Changes**" section below. Note that the observed rates and the denominator totals are not generated for the Provider volume indicators (IQI 1-7).

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 OP*XX*nn observed rates, the TP*XX*nn counts of outcomes that formed the numerators of the rates and the PP*XX*nn counts of outcomes that formed the denominators of the rates. The different records/rows in the text file will correspond to the different TYPELVLP stratification combinations.

3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the provider-level summary records that shows statistics for the *OPXXnn* observed rates, the TP*XX*nn counts of outcomes that formed the numerators of the rates, and the PP*XX*nn counts of outcomes that formed the denominators of the rates. These means will only be generated if the user included a value of 16 for IQI and PSI or 64 for PDI for the TYPELVLP parameter discussed in the "**Changes**" 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 types of stratifications that the user requests with the TYPELVLP parameter discussed in the "**Changes**" section below. If the user does not wish to generate this printout, then the global "PRINT" parameter in CONTROL_*XX*I.SAS code should be set to zero.

6. The output summary dataset may be written to a comma-delimited CSV file. If the user wishes to create this file, then the global "TEXTP2" parameter CONTROL_*XX*I.SAS code should be set to one.

Changes:
1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_*XX*I.SAS code.

2. In CONTROL_*XX*I.SAS, specify the locations (paths) of the input and output SAS files in the "LIBNAME IN1" and "LIBNAME OUTP2" statements.

3. In CONTROL_*XX*I.SAS, specify the names of the input and output files in the "INFILE1" and "OUTFILP2" statements. The name that you specify with INFILE1 should be for the file that you created using the *XX*SAS1 program. The default names for these files may be used.

4. In CONTROL_*XX*I.SAS, specify the levels of aggregation 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 Tables 22 through 24. The default values of 0 and 16 (for IQI and PSI) or 0 and 64 (for PDI), will provide an overall total and provider-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 XXSAS1 program.*

5. In CONTROL_*XX*I.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "FILENAME *XX*TEXTP2" statement, and set the TEXTP2 parameter to 1. Otherwise, the default value of zero for TEXTP2 will skip the code that would generate this file.

Table 22. IQSASP2 Aggregation Possibilities

TYPELVLP	Stratification									
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	**Provider**									
17	Provider	*								Race
18	Provider	*						Payer		
19	Provider	*						Payer	*	Race
20	Provider	*			Sex					
21	Provider	*			Sex	*				Race
22	Provider	*			Sex	*	Payer		
23	Provider	*			Sex	*	Payer	*	Race
24	Provider	*	Age							
25	Provider	*	Age	*						Race
26	Provider	*	Age	*			Payer		
27	Provider	*	Age	*			Payer	*	Race
28	Provider	*	Age	*	Sex				
29	Provider	*	Age	*	Sex	*				Race
30	Provider	*	Age	*	Sex	*	Payer		
31	Provider	*	Age	*	Sex	*	Payer	*	Race

0 and 16 TYPELVLP (overall and provider) are default values for the level of computation in the software.

For example, if you are using a state inpatient hospital database, you might specify the following TYPELVLP values:

    0 – provides overall rates for your entire state
    8 – provides overall rates for your state, broken down by age groups
    16 – provides rates for providers within your state
    24 – provides rates for age groups within these providers

Table 23. PDSASP2 Aggregation Possibilities

TYPELVLP	Stratification
0	overall
1	race
2	payer
3	payer * race
4	sex
5	sex * race
6	sex * payer
7	sex * payer * race

TYPELVLP	Stratification
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
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

TYPELVLP	Stratification
56	bwht * ageday * age
57	bwht * ageday * age * race
58	bwht * ageday * age * payer
59	bwht * ageday * age * payer * race
60	bwht * ageday * age * sex
61	bwht * ageday * age * sex * race
62	bwht * ageday * age * sex * payer
63	bwht * ageday * age * sex * payer * race
64	provider
65	provider * race
66	provider * payer
67	provider * payer * race
68	provider * sex
69	provider * sex * race
70	provider * sex * payer
71	provider * sex * payer * race
72	provider * age
73	provider * age * race
74	provider * age * payer
75	provider * age * payer * race
76	provider * age * sex
77	provider * age * sex * race
78	provider * age * sex * payer
79	provider * age * sex * payer * race
80	provider * ageday
81	provider * ageday * race
82	provider * ageday * payer
83	provider * ageday * payer * race
84	provider * ageday * sex
85	provider * ageday * sex * race
86	provider * ageday * sex * payer
87	provider * ageday * sex * payer * race
88	provider * ageday * age
89	provider * ageday * age * race
90	provider * ageday * age * payer
91	provider * ageday * age * payer * race
92	provider * ageday * age * sex
93	provider * ageday * age * sex * race
94	provider * ageday * age * sex * payer
95	provider * ageday * age * sex * payer * race
96	provider * bwht
97	provider * bwht * race
98	provider * bwht * payer
99	provider * bwht * payer * race
100	provider * bwht * sex
101	provider * bwht * sex * race
102	provider * bwht * sex * payer

TYPELVLP	Stratification
103	provider * bwht * sex * payer * race
104	provider * bwht * age
105	provider * bwht * age * race
106	provider * bwht * age * payer
107	provider * bwht * age * payer * race
108	provider * bwht * age * sex
109	provider * bwht * age * sex * race
110	provider * bwht * age * sex * payer
111	provider * bwht * age * sex * payer * race
112	provider * bwht * ageday
113	provider * bwht * ageday * race
114	provider * bwht * ageday * payer
115	provider * bwht * ageday * payer * race
116	provider * bwht * ageday * sex
117	provider * bwht * ageday * sex * race
118	provider * bwht * ageday * sex * payer
119	provider * bwht * ageday * sex * payer * race
120	provider * bwht * ageday * age
121	provider * bwht * ageday * age * race
122	provider * bwht * ageday * age * payer
123	provider * bwht * ageday * age * payer * race
124	provider * bwht * ageday * age * sex
125	provider * bwht * ageday * age * sex * race
126	provider * bwht * ageday * age * sex * payer
127	provider * bwht * ageday * age * sex * payer * race

0 and 64 TYPELVLP (overall and provider) are default values for the level of computation in the software.

For example, if you are using a state inpatient hospital database, you might specify the following TYPELVLP values:

    0 – provides overall rates for your entire state
    8 – provides overall rates for your state, broken down by age groups
    64 – provides rates for providers within your state
    72 – provides rates for age groups within these providers

Table 24. PSSASP2 Aggregation Possibilities

TYPELVLP	Stratification							
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	**Provider**							
17	Provider	*						Race
18	Provider	*				Payer		
19	Provider	*				Payer	*	Race
20	Provider	*		Sex				
21	Provider	*		Sex	*			Race
22	Provider	*		Sex	*	Payer		
23	Provider	*		Sex	*	Payer	*	Race
24	Provider	*	Age					
25	Provider	*	Age	*				Race
26	Provider	*	Age	*		Payer		
27	Provider	*	Age	*		Payer	*	Race
28	Provider	*	Age	*	Sex			
29	Provider	*	Age	*	Sex	*		Race
30	Provider	*	Age	*	Sex	*	Payer	
31	Provider	*	Age	*	Sex	*	Payer	*	Race

0 and 16 TYPELVLP (overall and provider) are default values for the level of computation
in the software.

For example, if you are using a state inpatient hospital database, you might specify the
following TYPELVLP values:

    0 – provides overall rates for your entire state
    8 – provides overall rates for your state, broken down by age groups
    16 – provides rates for providers within your state
    24 – provides rates for age groups within these providers

8.5 Run *XX*SASP3

The *XX*SASP3 program calculates risk-adjusted rates by patient age, sex, birthweight (in the PDI only), modified-DRG, Clinical Classifications Software (CCS) comorbidity, and APR-DRG, if available, for each QI and then calculates smoothed rates. The risk-adjusted and smoothed rates are not calculated for the Provider volume indicators in the IQI module (IQI 1-7) just as observed rates were not calculated for these indicators.

The *XX*SASP3 program does not apply to the PQI module, as those indicators are all area-level measures.

❖ *The programs calculate risk-adjusted QI rates regardless of the number of cases available. However, QI rates based on only a few cases should be interpreted with caution.*

The output SAS dataset has records summarized to the various combinations of stratifiers that were specified in the TYPELVLP parameter of the preceding *XX*SASP2 program. See Tables 22 through 24 above.

Input:
1. SAS format library (FMTLIB) created from the *XX*FMT program.

2. The discharge-level file that was created with the *XX*SAS1 program.

3. The SAS dataset with summary records that was created with the *XX*SASP2 program.

4. A text file containing logistic regression coefficients from a regression that was run on a reference SID dataset. These coefficients will be used in the risk-adjustment process. Two files are provided as part of the SAS QI software.

   - Gee_p*XX*nn_RegressionAnalysisGee.csv contains the regression coefficients.
   - Prediction_P*XX*nn.xml contains the input parameters for the executable AHRQ.exe.

❖ *Users must create a directory "C:\AHRQQI\XXI" and copy the zip file XXI_GEE_Input_Files.zip to that directory. Extract all of the files from XXI_GEE_Input_Files.zip into the directory "C:\AHRQQI\XXI." (See Section 1.0)*

5. A text file containing two (in PDI) or three (in IQI and PSI) arrays for use in the smoothing process. The arrays contain noise variance estimates, signal variance estimates and mean area rates for each QI. Specify file MSX*XX*P44.TXT. The text file does not need to be converted to a SAS file for use with the software.

Output:

1. A SAS dataset with an overall summary record and with provider-level summary records that contain the three types of indicator rates, along with the components of the initial raw rates. Depending on the QI module, the file may contain the observed rates (OP*XX*nn variables), the risk-adjusted rates (RP*XX*nn variables), the smoothed rates (SP*XX*nn variables), the expected rates (EP*XX*nn variables), risk adjusted rate confidence intervals (LPPSnn variables for lower bounds and UPPSnn variables for upper bounds), the counts of outcomes that formed the numerators of the observed rates (TP*XX*nn variables), the smoothed rate standard errors (XPPSnn) and the hospital discharge totals that formed the denominators of the observed rates (PP*XX*nn variables). When stratifications other than hospital are selected, the RP*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk-adjustment variables.

PSI

Also included in the PSI module are the counts of outcomes that formed the numerators of the observed rates (TPPSxx variables), and the residential population totals that formed the denominators of the observed rates (PPPSxx variables).

The VPPSxx variables are the variance for respective indicators.

In previous versions, we did not save these quantities if the standard error or confidence intervals were presented. For recent versions, this information is required by the composite indicator programs and so is retained.

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 OP*XX*nn observed rates and their TP*XX*nn and PP*XX*nn numerator and denominator components, the RP*XX*nn risk-adjusted rates with upper (UPPSnn) and lower (LPPSXX) limits, the SP*XX*nn smoothed rates with their standard errors (XPPSnn), and the EP*XX*nn expected rates. Each record or row in the text file will correspond to a specification group.

3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the provider-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 *XX*SASP2 program (see Tables 22 through 24).

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 types of stratifications that the user requested with the TYPELVLP parameter of the preceding *XX*SASP2 program (see Tables 22 through 24). If the user does not wish to generate this printout, then the global "PRINT" parameter in CONTROL_*XX*I.SAS code should be set to zero.

Changes:

1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_*XX*I.SAS code.

2. In CONTROL_*XX*I.SAS, specify the locations (paths) of the input and output SAS files in the "LIBNAME IN1," "LIBNAME INP2," and "LIBNAME OUTP3" statements.

3. In CONTROL_*XX*I.SAS, specify in the "INFILE1" statement the name of the discharge-level file that you created with the *XX*SAS1 program. The default file name may be used.

4. In CONTROL_*XX*I.SAS, specify in the "INFILEP2" statement the name of the summary file that you created with the *XX*SASP2 program. The default file name may be used.

5. In CONTROL_*XX*I.SAS, specify in the "FILENAME MSXP" statement the path (including the file name) for the ASCII text file that contains the estimates to smooth the indicator rates. This file is provided as part of the module. Specify file name as MSX*XX*P44.TXT.

6. In CONTROL_*XX*I.SAS, specify in the "OUTFILP3" statement the name that you wish the output file to have. The default file name may be used.

7. In CONTROL_*XX*I.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "FILENAME *XX*TEXTP3" statement, and set the TEXTP3 parameter to 1. Otherwise, the default value of zero for TEXTA3 will skip the code that would generate this file.

8.6 Run *XX*SASA2

The *XX*SASA2 program calculates the observed or raw rates for the area-level QI, using the data derived in a previous step (*XX*SAS1). 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 *XX*SAS1 program, and then for each of the desired stratifiers divides these totals by the pertinent residential population. The population denominators are stored in variables with names that have a prefix of "P" (Pop). The Observed rates are stored in variables that have a prefix of "O,"

Input:
1. The SAS dataset that was created in the *XX*SAS1 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 populations, stratified by area, age, sex, and ethnicity categories. The file POP95T12.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 (FMTLIB) created from the *XX*FMT program.

Output:
1. SAS dataset with summary records that contain observed rates (OA*XX*nn variables, where *XX* refers to the QI module and nn refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TA*XX*nn variables) and the residential population totals that formed the denominators of the observed rates (*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**" section below.

2. An optional ASCII (comma delimited) text file that the user can then import into a spreadsheet. This text file contains the same information as the SAS output dataset. The text file will contain the OA*XX*nn observed rates, the TA*XX*nn counts of outcomes that formed the numerators of the rates, and the PA*XX*nn residential population totals. The different records/rows in the text file will correspond to the different TYPELVLA stratification combinations.

3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the area-level summary records that shows statistics for the OA*XX*nn observed rates, the TA*XX*nn counts of outcomes that formed the numerators of the rates and the PA*XX*nn residential populations totals. These means will only be generated if the user included a value of 8 for the TYPELVLA parameter discussed in the "**Changes**" 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 types of stratifications that the user requests with the TYPELVLA parameter discussed in the "**Changes**" section below. If the user does not wish to generate this printout, then the global "PRINT" parameter in CONTROL_*XX*I.SAS code should be set to zero.

Changes:

1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_*XX*I.SAS code.

2. In CONTROL_*XX*I.SAS, specify the locations (paths) of the input and output SAS files in the "LIBNAME INA2" and "LIBNAME OUTA2" statements.

3. In CONTROL_*XX*I.SAS, specify the names of the input and output files in the "INFILE1" and "OUTFILA2" statements. The name that you specify with INFILE1 should be for the file that you created using the *XX*SAS1 program. The default file names may be used.

4. In CONTROL_*XX*I.SAS, specify the path (including the file name) for the ASCII population text file in the "FILENAME POPFILE" statement. The file name will be POP95T12.TXT. The user should set POPYEAR to the year that best matches the user's discharge data file (yyyy).

5. In CONTROL_*XX*I.SAS, specify the levels of aggregation 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.

❖ *WARNING: TYPELVLA must include the values 0 (overall) and 8 (area) if you wish to subsequently run program XXSASA3 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 XXSAS1 program.*

6. In CONTROL_*XX*I.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "FILENAME *XX*TEXTA2" statement, and set the TEXTA2 parameter to 1. Otherwise, the default value of zero for TEXTA2 will skip the code that would generate this file.

Table 25. IQSASA2 aggregation possibilities

TYPELVLA	Stratification						
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

0 (overall) and 8 (are) TYPELVLA are default values for the level of computation in the software.

For example, if you are using a state inpatient hospital database, you might specify the following TYPELVLA values:

    0 – provides overall rates for your entire state
    4 – provides overall rates for your state, broken down by age groups
    8 – provides rates for areas within your state
    12 – provides rates for age groups within these areas

Table 26. PDSASA2 aggregation possibilities

TYPELVLA	Stratification						
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

0 (overall) and 8 (are) TYPELVLA are default values for the level of computation in the software.

For example, if you are using a state inpatient hospital database, you might specify the following TYPELVLA values:

0 – provides overall rates for your entire state
4 – provides overall rates for your state, broken down by age groups
8 – provides rates for areas within your state
12 – provides rates for age groups within these areas

Table 27. PQSASA2 aggregation possibilities

TYPELEVLA	Stratification						
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

0 and 8 TYPELEVLA (overall and area) are default values.

For example, if you are using a state inpatient hospital database, you might specify the following TYPELEVLA values:

0 – provides overall rates for your entire state
4 – provides overall rates for your state, broken down by age groups
8 – provides rates for areas within your state
12 – provides rates for age groups within these areas

Table 28. PSSASA2 aggregation possibilities

TYPELVLA	Stratification						
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

0 (overall) and 8 (are) TYPELVLA are default values for the level of computation in the software.

For example, if you are using a state inpatient hospital database, you might specify the following TYPELVLA values:

    0 – provides overall rates for your entire state
    4 – provides overall rates for your state, broken down by age groups
    8 – provides rates for areas within your state
    12 – provides rates for age groups within these areas

8.7 Run PDSASG2

The PDSASG2 program calculates the observed or raw rates for the provider-level PDI, using the data derived in a previous step (PDSAS1). These observed rates are stratified by risk group categories that are specific to each indicator. The program first sums the indicator flags created by the PDSAS1 program (numerator) and then divides this sum by the count of the hospital discharges (denominator) for each of the risk group stratifiers. The stratifiers are stored in variables with names that have a prefix of "G" (Group). The numerators are stored in variables with names that have a prefix of "T" (Top). The population denominators are stored in variables with names that have a prefix of "P" (Pop). The Observed rates are stored in variables that have a prefix of "O."

PDI

This PDSASG2 program is only used in the PDI module
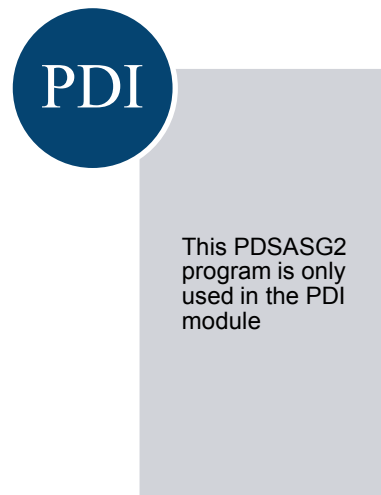
Input:

1. The SAS dataset that was created in the PDSAS1. 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 6 of these indicators have risk group stratifiers and are included as input into the G2 module (PDI 1, 2, 8, 10, 11 and 12).

2. SAS format library (FMTLIB) created from the PDFMT program.

Output:

1. SAS dataset with summary records that contain observed rates (OPPDnn variables where nn refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TPPDnn variables), and the hospital discharge totals that formed the denominators of the observed rates (PPPDnn variables). It also includes variables identifying present on admission (POA) conditions for provider-level outcomes of interest (QPPDnn).The output file has records summarized to the indicator-specific pre-defined 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 OPPDnn observed rates, the TPPDnn counts of outcomes that formed the numerators of the rates and the PPPDnn counts of outcomes that formed the denominators of the rates. The different records/rows in the text file will correspond to the indicator-specific pre-defined 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 pre-defined 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 CONTROL_PDI.SAS code should be set to zero.

Changes:
1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_PDI.SAS code.

2. In CONTROL_PDI.SAS, specify the locations (paths) of the input and output SAS files in the "LIBNAME IN1" and "LIBNAME OUTG2" statements.

3. In CONTROL_PDI.SAS, specify the names of the input and output files in the "INFILE1" and "OUTFILG2" statements. The name that you specify with INFILE1 should be for the file that you created using the PDSAS1 program. The default file names may be used.

4. In CONTROL_PDI.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then set the TEXTG2 parameter to 1. Otherwise, the default value of zero for TEXTG2 will skip the code that would generate this file.

5. In CONTROL_PDI.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "FILENAME PDTEXTG2" statement.

8.8 Run *XX*SASA3

The *XX*SASA3 program calculates age and sex risk-adjusted rates for each area-level QI (overall rates and rates by area), and then calculates smoothed rates. This program does not apply to the PSI module.

Input:
1. SAS format library (FMTLIB) created from the *XX*FMT program.

2. The discharge-level file that was created with the *XX*SAS1 program.

3. The SAS dataset with summary records that was created with the *XX*SASA2 program.

4. A text file with Census area residential populations (stratified by area, sex and discrete age categories). One file is currently provided along with the QI software. The file is POP95T12.TXT. The user should set POPYEAR to the year that best matches the user's discharge data file (yyyy). The text file does not need to be converted to a SAS file for use with the software.

<u>Additional Input Specific to the PDI and PQI Modules:</u>

5. Two text files containing logistic regression coefficients from a regression that was run on the reference SID dataset. These coefficients will be used in the risk adjustment process. COVPDA44.TXT or COVPQA44.TXT should be used with risk adjustment for age and gender only, for the PDI and PQI modules, respectively. CVPDA44A.TXT or CVPQA44A.TXT should be used with adjustment for age, gender, and socioeconomic status (SES), for the PDI and PQI modules, respectively. These files are provided to you as part of the QI software and do not need to be converted to a SAS file for use with the software.

PDI and PQI

Additional input for the PDI and PQI modules

6. Two text files containing two arrays for use in the smoothing process. The arrays contain noise variance estimates, signal variance estimates, and mean area rates for each QI. MSXPDA44.TXT or MSXPQA44.TXT should be used with adjustment for age and gender only, for the PDI and PQI modules, respectively. MXPDA44A.TXT or MXPQA44A.TXT should be used with adjustment for age, gender and SES, for the PDI and PQI modules, respectively. These files are provided to you as part of the QI software and do not need to be converted to a SAS file for use with the software.

<u>Output</u>:

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

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

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

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

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

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 of all of the numeric variables in the final output data file.

Changes:

1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_*XX*I.SAS code.

2. In CONTROL_*XX*I.SAS, specify the locations (paths) of the input and output SAS files in the "LIBNAME IN1," "LIBNAME INA2," and "LIBNAME OUTA3" statements.

3. In CONTROL_*XX*I.SAS, specify in the "INFILE1" statement the name of the discharge-level file that you created with the *XX*SAS1 program. The default file name may be used.

4. In CONTROL_*XX*I.SAS, specify the path (including the file name) for the ASCII population text file in the "FILENAME POPFILE" statement. The file name is POP95T12.TXT. These files are provided along with the software. The file used should be the one that is closest to the year associated with your particular data. These files contain Census residential population estimates by area, gender and discrete age categories.

5. In CONTROL_*XX*I.SAS, specify in the "FILENAME COVARA" statement the path (including the file name) for the ASCII text file that contains regression coefficients from a logistic regression that was run on reference SID dataset.

6. In the PDI and PQI modules, to perform the risk adjustment by age and gender, use COVPDA44.TXT or COVPQA44.TXT for the PDI and PQI modules, respectively. To perform the risk adjustment by SES, use CVPDA44A.TXT or CVPQA44A.TXT for the PDI and PQI modules, respectively.

PDI and PQI Additional changes for the PDI and PQI modules

7. In CONTROL_*XX*I.SAS in the PDI and PQI modules, specify in the "FILENAME MSX" statement the path (including the file name) for the ASCII text file that contains the estimates to smooth the indicator rates. Use MSXPDA44.TXT or MSXPQA44.TXT for age and gender risk adjustment in the PDI and PQI modules, respectively and MXPDA44A.TXT or MXPQA44A.TXT for age, gender and SES risk adjustment in the PDI and PQI modules, respectively.

8. In CONTROL_*XX*I.SAS, specify in the "INFILEA2" statement the name of the summary file that you created with the *XX*SASA2 program. The default file name may be used.

9. In CONTROL_*XX*I.SAS, specify in the "OUTFILA3" statement the name that you wish the output file to have. The default file name may be used.

10. In CONTROL_*XX*I.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "FILENAME *XX*TEXTA3" statement, and set the TEXTA3 parameter to 1. Otherwise, the default value of zero for TEXTA3 will skip the code that would generate this file.

8.8 Run PQSASC2

This program is only for use in the PQI module. The PQSASC2 program calculates condition-specific rates for the four diabetes area-level Prevention Quality Indicators (PDI 15, PQI 1, 3, 14, and 16), using the data derived in the previous step (PQSAS1). These condition-specific rates are stratified by state and age categories. The program first totals the indicator flags created by the PQSAS1 program, and then for each of the stratifiers divides these totals by the pertinent condition-specific population. The condition-specific denominators are stored in variables with names that have a prefix of "P" (<u>P</u>op). The condition-specific rates are stored in variables that have a prefix of "C."

PQI The PQSASC2 program is for use in the PQI module only.

Input:

1. The SAS dataset that was created in the previous step (PQSAS1). This is a discharge-level file that contains inpatient records with input variables, stratifiers, and the 4 new flag indicators for the selected PQI outcomes of interest (i.e., PQI 1, 3, 14 and 16).

2. A text file with diabetes populations, stratified by state and age categories. The file currently provided along with the PQI module software is QICTYC12.TXT. The user should select the file for the year that best matches the user's discharge data file.

    ❖ *Users do **not** need to convert the ASCII text file to a SAS dataset for use with the software.*

3. SAS format library (FMTLIB) created from the PQFMTS program.

Output:

1. SAS dataset with summary records that contain condition-specific rates (CAPQnn variables where nn refers to the indicator number), the counts of outcomes that formed the numerators of the rates (TAPQnn variables), and the condition-specific population totals that formed the denominators of the observed rates (PAPQnn variables). The output file has records for the overall state rate and by age.

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 CAPQnn condition-specific rates, the TAPQnn counts of outcomes that formed the numerators of the rates, and the PAPQnn condition-specific population totals. The different records/rows in the text file will correspond to the overall state rate and by age.

3. A PROC MEANS (with N, NMISS, MIN, MAX, MEAN, and SUM) of the area-level summary records that shows statistics for the CAPQnn condition-specific rates, the TAPQnn counts of outcomes that formed the numerators of the rates, and the PAPQnn condition-specific populations totals. These means will be generated for the overall state rate and by age.

4. A PROC CONTENTS of the output SAS summary dataset is output to hardcopy.

5. A PROC PRINT of the output summary dataset is provided at the end of the hardcopy printout. If the user does not wish to generate this printout, then the global "PRINT" parameter in CONTROL_PQI.SAS code should be set to zero.

Changes:

1. The "FILENAME CONTROL" statement at the beginning of the program must be changed to reflect the location of the CONTROL_PQI.SAS code.

2. In CONTROL_PQI.SAS, specify the locations (paths) of the input and output SAS files in the "LIBNAME INC2" and "LIBNAME OUTC2" statements.

3. In CONTROL_PQI.SAS, specify the names of the input and output files in the "INFILE1" and "OUTFILC2" statements. The name that you specify with INFILE1 should be for the file that you created using the previous PQSAS1 program.

4. In CONTROL_PQI.SAS, specify the path (including the file name) for the ASCII population text file in the "FILENAME POPFILE2" statement. The file name will be QICTYC12.TXT. These files are provided to you as part of the PQI module. The file used should be the one that is closest to the year associated with your particular data.

5. In CONTROL_PQI.SAS, if you wish to create an ASCII (comma delimited) text file that you can import into a spreadsheet, then specify the path (including the file name) for this ASCII text file in the "FILENAME PQTEXTC2" statement, or set the TEXTC2 parameter to 1. Otherwise, the default value of zero for TEXTC2 will skip the code that would generate this file.

9.0 Reviewing the Printed Output

This section contains tips for reviewing some of the printed output from the QI modules. These tips are oriented toward explaining the interrelationships between printout items from different programs and hopefully will help to reveal the nature and structure of the module outputs. See Appendix D for each module's output data dictionary.

> ❖ *Depending on the QI module and whether or not you have elected to risk-adjust and smooth the data, the final output may be a PROC PRINT from XXSASP2, XXSASP3, XXSASA2 and/or XXSASA3. All interim printouts are for checking and trouble-shooting.*

9.1 *XX*SAS1

The initial printout from the *XX*SAS1 program contains **PROC MEANS** for all of the numeric variables (including the comorbidity indicators) in the output discharge-level dataset. It will contain information for the newly constructed TA*XX*nn and TP*XX*nn flag variables that will later form the numerators for the indicator rates. For each TA*XX*nn and TP*XX*nn flag variable:

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

The exceptions to this are PQI 2 and PDI 17 for perforated appendix and PQI 9 for low birth weight, which are based on a subset of the hospitalized population rather than the area residential population. For these indicators, a value of 0 was assigned to the TA*XX*nn flag if a particular observation was part of the population for the rate denominator but did not have the particular outcome of interest to be included in the rate numerator. So for example, TAPQ02 = 0 implies a patient who had an appendectomy performed, but did not have a perforated appendix. For PQI 2, the MEAN will contain a close approximation of the eventual overall observed indicator rate. The value will change slightly after PQSASA2 has applied additional parts of the indicator definition.

PDI 17 and PQI 2,9

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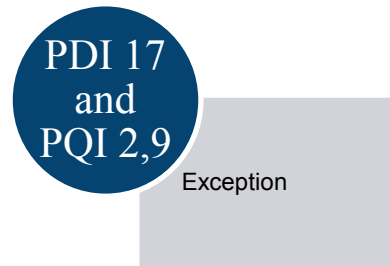
Most of the provider indicators will have a value of 1, 0, or missing ('.'). For these indicators, a value of 0 was assigned to the TP*XX*nn flag if a particular observation was part of the population at risk for a particular indicator but did not have the particular outcome of interest. So for example,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

For most of the provider indicators, the MEANs will contain a close approximation of the eventual overall observed indicator rates. The values will change slightly after *XX*SASP2 has applied additional parts of the indicator definitions.

N lists the number of observations in the dataset with non-missing values. For the area indicators, N for TA*XX*nn will be the same as the SUM. For most of the provider-level indicators, including PQI 2, N will contain the denominator for the observed indicator rate.

For the six IQI provider volume indicators, the MEAN, MINIMUM, and MAXIMUM will usually be the value one since the flag variables have either been set to missing (".") or to a value of 1. Also, N for TPIQnn or TAIQnn will be the same as the SUM. Note: the N's or denominators for six of the IQI mortality indicators (i.e., IQI 08-12, 30, and 31) will be similar to the Ns and SUMs for the six IQI volume indicators (TPIQ01- TPIQ02 TPIQ04-TPIQ07), but often they will not be exactly identical (e.g., the mortality indicators exclude discharges that were transferred to other hospitals).

IQI

Exception

There may be differences in the output from *XX*SAS1.SAS and XXSASA2.SAS and *XX*SASA3.SAS programs based on missing data. If any cases are missing the FIPS codes, they will be included in the output from *XX*SAS1.SAS but will be excluded from the subsequent analyses (the second and third programs).

The *XX*SAS1 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.

9.2 *XX*SASP2

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

The printout from the *XX*SASP2 program contains **PROC MEANS** on the provider-level summary records for all of the numeric variables in the output summary dataset. It will contain information for the newly constructed OP*XX*nn rates, the PP*XX*nn denominators, and the TP*XX*nn numerators.

The _TYPE_ variable described in the MEANS table identifies the stratification level for the records in the output data set. The _TYPE_ variable corresponds to the TYPELVLP parameter values that were specified (see the "**Changes**" section for the *XX*SASP2 program). In this case, _TYPE_ always assumes the value of 16 (for IQI and PSI) or 64 (for PDI), since only the provider-level records are selected.

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

The MINIMUM value for most of the numerators will usually be zero since values of zero were assigned for observations that were part of the population for the rate denominator but did not have the particular outcome of interest to be included in the rate numerator. For the IQI volume indicators, (TPIQ01 - TPIQ02 and TPIQ04 - TPIQ07), the MINIMUM value will be one 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 hospital means; i.e., all hospitals are given equal weight, regardless of the number of discharges in the different hospitals.*

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

If the "PRINT" parameter in the CONTROL_*XX*I.SAS program is set to one, the subsequent **PROC PRINT** output contains a complete dump of the output summary file. Listed for each record are the stratification values, the PP*XX*nn population denominators for the provider indicators, the TP*XX*nn outcome numerators for the provider indicators and the OP*XX*nn observed rates.

9.3 *XX*SASP3

The **PROC PRINT** at the end of this program provides your **final output**. (This printout appears if the "PRINT" parameter in the CONTROL_*XX*I.SAS program is set to one.)

Table 29 lists the column headers shown on the printed output and describes each. 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 29. Provider-level printed 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, or hospitals (TYPELVLP = 16).
HOSPID	Identifier for each provider in the dataset.
AGECAT	Age stratification category – See Tables 22 to 24 for TYPELVLP settings.
SEXCAT	Gender stratification category – See Tables 22 to 24 for TYPELVLP settings.
PAYCAT	Payer stratification category – See Tables 22 to 24 for TYPELVLP settings.
RACECAT	Race stratification category – See Tables 22 to 24 for TYPELVLP settings.
TP*XX*nn	Number of cases in the numerator.
PP*XX*nn	Number of cases in the denominator (population at risk).
OP*XX*nn	Observed (raw) rate – Numerator divided by Denominator.
EP*XX*nn	Expected rate – Rates the provider would have if it performed the same as the reference population given the provider's actual case-mix (e.g., age, gender, modified DRG and comorbidities)
RP*XX*nn	Risk-adjusted rate – Accounts for the difference between the case-mix of the reference population and the provider's case-mix. When stratifications other than hospital or area are selected, the RP*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
LP*XX*nn	Lower limit of confidence interval of risk-adjusted rate.
UP*XX*nn	Upper limit of confidence interval of risk-adjusted rate.
SP*XX*nn	Smoothed rate – Rates with removal of fluctuation over time.
XP*XX*nn	Standard error of smoothed rate.

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

You may wish to express the results in more understandable terms:

- Multiply the mortality rates by 100 to express them as a percentage (e.g., 0.0338 * 100 = 3.4% mortality for CABG)

- Multiply the utilization rates by 100 to express them as a percentage (e.g., 0.2040 * 100 = 20.4% C-section rate).

The MEANS table is generated from the permanent provider-level output file and is provided for trouble-shooting and understanding your data, but not for reporting. The means are provided just for the provider-level summary records.

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

The MEANS, MINIMUMs, and MAXIMUMs have their normal meaning and provide comparisons among the different hospitals or providers in your 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.*

Note: The denominators for six of the IQI mortality indicators (IQI 8 – 12, 30, and 31) will be similar to the totals for the six IQI volume indicators (TPIQ01-TPIQ07), but often they will not be exactly identical (e.g., the mortality indicators exclude discharges that were transferred to other hospitals).

IQI

Exception

If the "PRINT" parameter in the CONTROL_*XX*I.SAS program is set to one, at the end of the printout is a **PROC PRINT** on the final provider-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.

9.4 *XX*SASA2

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 can be specified as well. Note that risk-adjusted and smoothed rates are shown in the output from the next program.

The printout from the *XX*SASA2 program contains **PROC MEANS** for all of the numeric variables in the output summary dataset. It will contain information for the newly constructed OA*XX*nn rates, the PA*XX*nn denominators, and the TA*XX*nn numerators.

The _TYPE_ variable described in the first row of the MEANS table identifies the stratification level for the records in the output data set. The _TYPE_ variable corresponds to the TYPELVLA parameter values that were specified (see the "**Changes**" section for the *XX*SASA2 program). In this case, _TYPE_ always assumes the value of 8, since only the area-level records are selected.

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

The MINIMUM value for the TA*XX*nn numerators will be one 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.*

In the PQI module, the MINIMUM value for the perforated appendix TAPQnn numerator will usually be zero since values of zero were assigned for observations that were part of the population for the rate denominator but did not have the particular outcome of interest to be included in the rate numerator. For the other 12

PQI 2

Exception

indicators, based on the residential area population, the MINIMUM value will be one or higher.

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

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

Table 30 lists the column headers shown on the printed output and describes each. 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 30. Area-level printed output

Column Heading	Description
Obs	Observation 1 is the overall average for the entire dataset (TYPELVLA = 0). The remaining observations are individual areas (TYPELVLA = 8).
Area	Identifier in the dataset for area.
TA*XX*nn	Number of cases in the numerator.
PA*XX*nn	Number of cases in the denominator (population at risk).
OA*XX*nn	Observed (raw) rate - Numerator divided by Denominator.
RA*XX*nn	Risk-adjusted rate - Accounts for the difference between the case-mix of the reference 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
SA*XX*nn	Smoothed rate - Rates with removal of fluctuation over time.

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

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

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

The N for all but the TA*XX*nn counter variables should contain the number of different areas (Metro Areas and counties) in your database.

The means, minimums, and maximums have their normal meaning and provide comparisons among the different areas in your database. Note that the maximums for the counter variables (the TA*XX*nn and PA*XX*nn variables) are associated with specific areas, and therefore these maximums may not match those in the prior *XX*SAS2 printouts, since that run typically will include a record for the entire database.

9.5 *XX*SASA3

The PROC PRINT at the end of this program provides your final output. (This printout appears if the "PRINT" parameter in the CONTROL_*XX*I.SAS program is set to one.) Table 31 lists the column headers shown on the printed output and describes each. 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 31. Final Area-level printed output

Column Heading	Description
OBS	Observation 1 is the overall average for the entire dataset (TYPELVLA = 0). The remaining observations are individual areas (TYPELVLA = 8).
AREA	Identifier in the dataset for area.
TA*XX*nn	Number of cases in the numerator.
PA*XX*nn	Number of cases in the denominator (population at risk).
OA*XX*nn	Observed (raw) rate - Numerator divided by Denominator.
RA*XX*nn	Risk-adjusted rate - Accounts for the difference between the case-mix of the reference population and the provider's case-mix. When stratifications other than area are selected, the RA*XX*nn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables.
LA*XX*nn	Lower limit of confidence interval of risk-adjusted rate.
UA*XX*nn	Upper limit of confidence interval of risk-adjusted rate.
SA*XX*nn	Smoothed rate - Rates with removal of fluctuation over time.
XA*XX*nn	Standard error of smoothed rate.
EA*XX*nn	Expected rate - Rates the area would have if it performed the same as the reference population given the area's actual case-mix (e.g., age, gender, modified DRG and comorbidities)

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

You 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 hysterectomies per 100,000 population).

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

The N for all but the TA*XX*nn counter variables should contain the number of different areas (Metro Areas and counties) in your database

The means, minimums, and maximums have their normal meaning and provide comparisons among the different areas in your database. Note that the maximums for the counter variables (the TA*XX*nn and PA*XX*nn variables) are associated with specific areas, and therefore these

maximums may not match those in the prior *XX*SAS2 printouts since 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, but instead 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 area means; i.e., all areas are given equal weight, regardless of the number of discharges in the different areas.*

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

9.6 PQSASC2

This program and its output are specific to the PQI module. The purpose of this printout is to provide the condition-specific rates for selected area-level indicators. The default printout shows results by state and age category. The printout from the PQSASC2 program contains **PROC MEANS** on the state-level summary records for all of the numeric variables in the output summary dataset. It will contain information for the newly constructed CAPQnn rates, the PAPQnn denominators, and the TAPQnn numerators.

PQI

The PQSASC2 program and its output are specific to the PQI module.

The _TYPE_ variable described in the first column of the MEANS table identifies the stratification level for the records in the output data set. The _TYPE_ value of 1 corresponds to the state level, while a value of 3 corresponds to the state*age category level.

The N statistic contains the number of states in the output summary data set.

The minimum value will be one or higher (for PAPQnn and TAPQnn) or zero or higher (for CAPQnn).

For the condition-specific 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 area means; i.e., all areas are given equal weight, regardless of the populations in the different areas.

The sums for the counter variables TAPQnn and PAPQnn will contain overall file totals for these data elements. The SUMs for the *condition-specific* rates have no intuitive meaning.

If the "PRINT" parameter in the CONTROL_PQI.SAS program is set to one, the subsequent PROC PRINT output contains a complete dump of the output summary file. Listed for each record are the stratification values, the PAPQnn population denominators for the 4 indicators, the TAPQnn outcome numerators for the 16 indicators, and the 4 CAPQnn condition-specific rates.

10.0 Benchmark Timings

The benchmark runtimes given below for IQI and PQI are from runs made on a Windows XP workstation, with a Pentium 4 CPU 2.80 GHz processor, 512 MB of RAM, and an IDE hard drive. The datasets contained 757,624 observations with 15 diagnosis fields and 15 procedure fields.

Step	Run time (in seconds)
Run IQFMTS to create the format library	2
Run IQSAS1	157
Run IQSASP2	21
Run IQSASP3	86
Run IQSASA2	10
Run IQSASA3	185

Step	Run time (in seconds)
Run PQFMTS to create the format library	2
Run PQSAS1	66
Run PQSASA2	16
Run PQSASA3	55
Run PQSASC2	3

The benchmark runtimes given below for PSI are from runs made on a Microsoft Windows 2000 workstation, with Pentium 4, 2.8 GHZ processor, and 1 GB of RAM. The dataset contained 498,515 observations with 15 diagnosis fields and 15 procedure fields.

Step	Run time (in seconds)
Run PSFMTS to create the format library	4
Run PSSAS1	232
Run PSSASP2	2
Run PSSASP3	1533
Run PSSASA2	3

The benchmark runtimes given below for PDI are from runs made on a Windows XP workstation, with an Intel® Xeon® CPU 2.53 GHz processor, and 3.87 GB of RAM. The dataset contained 1,585,109 observations with 30 diagnosis fields and 30 procedure fields.

Step	Run time (in seconds)
Run PDFMTS to create the format library	29
Run PDSAS1	429
Run PDSASP2	116
Run PDSASP3	596
Run PDSASG2	53
Run PDSASA2	122
Run PDSASA3	123

11.0 User Support

Technical assistance for the QI software is available through an electronic user support system monitored by the AHRQ QI support team. The same e-mail address may be used to communicate to AHRQ any suggestions for QI enhancements, general questions, and any QI related comments you may have. AHRQ welcomes your feedback.

The e-mail address for user support and feedback is: support@qualityindicators.ahrq.gov.

AHRQ also offers a listserv to keep you informed on the Quality Indicators. The listserv is used to announce any QI changes or updates, new tools and resources, and to distribute other QI related information. This is a free service. Simply follow the process described below to begin receiving important QI information. All you need is a computer, Internet access, and an e-mail address. It works just like other electronic distribution lists.

Here's how to register:

1. Send an e-mail message to: listserv@qualityindicators.ahrq.gov.

2. On the subject line, type: Subscribe.

3. In the body of the message type: sub Quality_Indicators-L and your full name. For example: **sub Quality_Indicators-L John Doe**

4. You will receive a message confirming that you are signed up.

If you have any questions, contact AHRQ QI Support at the e-mail noted above. You should receive an automatic response e-mail message confirming receipt. If you do not receive a confirmation message, call (888) 512-6090.

Appendix A: Links

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

AHRQ Quality Indicators Version 4.4 Documents and Software

Available at:
http://www.qualityindicators.ahrq.gov/modules/iqi_resources.aspx,
http://www.qualityindicators.ahrq.gov/modules/pdi_resources.aspx,
http://www.qualityindicators.ahrq.gov/modules/pqi_resources.aspx,
http://www.qualityindicators.ahrq.gov/modules/psi_resources.aspx and
http://www.qualityindicators.ahrq.gov/software/default.aspx.

Title	Description
IQI User Guide: Composite Measures *PDI User Guide: Composite Measures* *PQI User Guide: Composite Measures* *PSI User Guide: Composite Measures*	These user guides provide technical overviews of the composite measures.
IQI Technical Specifications *PDI Technical Specifications* *PQI Technical Specifications* *PSI Technical Specifications*	Provide detailed definitions of each indicator, including all ICD-9-CM and DRG codes that are included in or excluded from the numerator and denominator. Note that exclusions from the denominator are automatically applied to the numerator.
IQI Comparative Data *PDI Comparative Data* *PQI Comparative Data* *PSI Comparative Data*	These documents provide the average volume, provider rate, and population rate, as appropriate, for each indicator.
Log of Changes to IQI Documents and Software *Log of Changes to PDI Documents and Software* *Log of Changes to PQI Documents and Software* *Log of Changes to PSI Documents and Software*	The Change Log document 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. This document also summarizes changes to indicator definitions resulting from all fiscal year changes to ICD-9-CM coding and DRG changes. Changes to indicator specifications that were not a result of new ICD-9-CM and DRG codes are also described in the Change Log.
IQI Risk Adjustment Coefficient Tables *PDI Risk Adjustment Coefficient Tables* *PQI Risk Adjustment Coefficient Tables* *PSI Risk Adjustment Coefficient Tables*	Tables for each indicator provide the stratification and coefficients used to calculate the risk-adjusted rate for each stratum.

Title	Description
SAS® AHRQ QI Software Documentation	This software documentation provides detailed instructions on how to use the SAS ® version of the software including data preparation, calculation of the rates, and interpretation of output.
SAS® IQI Software SAS® PDI Software SAS® PQI Software SAS® PSI Software	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
3M™ APR DRG Limited License Grouper for SAS®	Creates APR-DRG variables for use with SAS version of IQI software. Instructions for running the software are included in the Zip file.
AHRQ QI Population File	Population data that are constructed from public-use Census data and provided for use with the Quality Indicators syntax for area-level analyses.
Version 4.4 Listserv announcement	This document announces the release of the Version 4.4 software and documentation, and provides a summary of changes and links to relevant pages.

AHRQ QI Windows Application

The AHRQ QI Windows Application calculates rates for all of the AHRQ Quality Indicators modules and does not require SAS®. It is available at:

http://www.qualityindicators.ahrq.gov/software/default.aspx

Additional Documents

A number of documents are catalogued within the "Archive" section of the **AHRQ QI** Web page for historical purposes:

http://www.qualityindicators.ahrq.gov/Archive/default.aspx

Additional documents may be accessed at the AHRQ QI Modules Web page:

http://www.qualityindicators.ahrq.gov/modules/Default.aspx

Examples of documents available at this link include:
- *AHRQ QI Measure Development, Implementation, Maintenance and Retirement*
- *ICD-9-CM to ICD-10-CM/PCS Conversion of AHRQ QI, March 2011*
- *AHRQ QI Empirical Methods, May 2011*
- *Guidance for Using the AHRQ Quality Indicators for Hospital-level Public Reporting or Payment, August 2004*
- *AHRQ Summary Statement on Comparative Hospital Public Reporting, December 2005*
- *Appendix A: Current Uses of AHRQ Quality Indicators and Considerations for Hospital-level*
- *Comparison of Recommended Evaluation Criteria in Five E*xisting National Frameworks
- *List of AHRQ QI Endorsed by the National Quality Forum*

Other documents, including newsletter archives, can be viewed or downloaded from the AHRQ QI News Web page:

http://www.qualityindicators.ahrq.gov/news/default.aspx
http://www.qualityindicators.ahrq.gov/Archive/News.aspx

Other Tools and Information

QI rates can be calculated using the modified Federal Information Processing Standards (FIPS) State/county code. A list of codes is available at:

http://www.census.gov/popest/about/geo/codes.html

AHRQ provides a free, on-line query system based on HCUP data that provides access to health statistics and information on hospital stays at the national, regional, and State level. It is available at:

http://hcupnet.ahrq.gov/

Information on the 3M™ APR-DRG system is available at:

http://solutions.3m.com/wps/portal/3M/en_US/3M_Health_Information_Systems/HIS/?WT.mc_id=www.3m.com/us/healthcare/his/

The CDC National Diabetes Surveillance System provides state level estimates of diabetes prevalence by age.

http://apps.nccd.cdc.gov/DDTSTRS/default.aspx

Appendix B: Using Different Types of QI Rates

When should you use the observed, expected, risk adjusted, and/or smoothed rates generated by the AHRQ QI software? Here are some guidelines.

If the user's primary interest is to identify cases for further follow-up and quality improvement, then the observed rate would help to identify them. The observed rate is the raw rate generated by the QI software from the data the user provided. Areas for improvement can be identified by the magnitude of the observed rate compared to available benchmarks and/or by the number of patients impacted.

Additional breakdowns by the default patient characteristics used in stratified rates (e.g., age, gender or payer) can further identify the target population. Target populations can also be identified by user-defined patient characteristics supplemented to the case/discharge level flags. Trend data can be used to measure change in the rate over time.

Another approach to identify areas to focus on is to compare the observed and expected rates. The expected rate is the rate the provider would have if it performed the same as the reference population given the provider's actual case-mix (e.g., age, gender, DRG and comorbidity categories).

If the observed rate is higher than the expected rate (i.e., the ratio of observed/expected is greater than 1.0, or observed minus expected is positive), then the implication is that the provider performed worse than the reference population for that particular indicator. Users may want to focus on these indicators for quality improvement.

If the observed rate is lower than the expected rate (i.e., the ratio of observed/expected is less than 1.0, or observed minus expected is negative), then the implication is that the provider performed better than the reference population. Users may want to focus on these indicators for identifying best practices.

Users can also compare the expected rate to the reference population rate reported in the AHRQ QI software or Comparative Data document to determine how their case-mix compares to the reference population. The population rate refers to the overall rate for the reference population. The reference population is defined in the Comparative Data Document. If the population rate is higher than the expected rate, then the provider's case-mix is less severe than the reference population. If the population rate is lower than the expected rate, then the provider's case-mix is more severe than the reference population.

We use this difference between the population rate and the expected rate to "adjust" the observed rate to account for the difference between the case-mix of the reference population and the provider's case-mix which is the provider's risk-adjusted rate.

If the provider has a less severe case-mix, then the adjustment is positive (population rate > expected rate) and the risk-adjusted rate is higher than the observed rate. If the provider has a more severe case-mix, then the adjustment is negative (population rate < expected rate) and the risk-adjusted rate is lower than the observed rate. The risk-adjusted rate is the rate the provider would have if it had the same case-mix as the reference population given the provider's actual performance.

Finally, users can compare the risk-adjusted rate to the smoothed or "reliability-adjusted" rate to determine whether this difference between the risk-adjusted rate and reference population rate is likely to remain in the next measurement period. Smoothed rates are weighted averages of the population rate and the risk-adjusted rate, where the weight reflects the reliability of the provider's risk-adjusted rate.

A ratio of (smoothed rate - population rate)/(risk-adjusted rate - population rate) greater than 0.80 suggests that the difference is likely to persist (whether the difference is positive or negative). A ratio less than 0.80 suggests that the difference may be due in part to random differences in patient characteristics (patient characteristics that are not observed and controlled for in the risk-adjustment model). In general, users may want to focus on areas where the differences are more likely to persist.

Appendix C: Data Dictionary

QI Program Input Data Dictionary

Variable name	Description	Format	Value description	Comments
KEY	Sequence number. Unique case identifier.	Numeric	User defined unique numeric identifier for each discharge record	Used by the QI programs for sorting discharge records, and may facilitate possible exploration; allows user to link the records from the *XX*SAS1.SAS program output file back to the original input data file.
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 (coded only when the age in years is less than 1)	Numeric	Age in days	Not used in the IQI program. If not present in the input data file it is not necessary to create a placeholder variable for this module.
RACE	Race of patient.	Numeric 1 2 3 4 5 6	 White Black Hispanic Asian or Pacific Island Native American Other	The values of 1-5 are used directly in the QI software. All other ethnicity codes are mapped to an 'other' category.
SEX	Sex of patient	Numeric 1 2	 Male Female	If this data element is missing the discharge record will be excluded from the analysis.
PAY1	Expected primary payer	Numeric 1 2 3 4 5 6	 Medicare Medicaid Private, incl. HMO Self-pay No charge Other	The values of 1, 2, 3, and 4 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 Provider-level IQI (01 to 25 and 30 to 34); Provider-level PDI (01 to 13); and Provider-level PSI (02 to 19).
PAY2 (SAS Only)	Expected secondary payer	Numeric 1 2 3 4 5 6	 Medicare Medicaid Private, incl. HMO Self-pay No charge Other	Use is optional, but must be present in data (set to missing if data element not available)
PSTCO	Location of patient residence or hospital location (FIPS† State/county code)	Numeric ssccc	Modified Federal Information Processing Standards State/county code[1]	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.

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[1] Federal Information Processing Standard, as defined by the U.S. Department of Commerce, National Institute of Standards and Technology (formerly National Bureau of Standards). Note: Certain independent cities (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 as compared to the U.S. Census Bureau groupings. The AHRQ QI software uses the Modified FIPS code assignment of these areas. Failure to use the Modified FIPS codes assignment will result in the use of incorrect denominator estimates for area indicators. A list is available at http://www.census.gov/popest/geographic/codes02.pdf

Variable name	Description	Format	Value description	Comments
HOSPID	Data Source hospital number	Numeric (default) or String[2]	Hospital identification number	Used to facilitate data exploration and possible trouble shooting. May also be selected as a stratifier (see Tables 22-24 for provider-level aggregation possibilities).
DISP	Disposition of patient	Numeric 1 2 3 4 5 6 7 20	Routine Short-term hospital Skilled nursing facility Intermediate care Another type of facility Home health care Against medical advice Died in the hospital	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.
MORT30 (SAS Only)	30-Day Mortality Indicator	Numeric	0 – Did not die within 30-days from admission 1 – Died within 30-days from admission	Use is optional, but must be present in data (set to missing if data element not available)
DNR (SAS Only)	Do Not Resuscitate Indicator	Numeric	0 – No "Do Not Resuscitate" Indicator 1 – "Do Not Resuscitate" Indicator	Use is optional, but must be present in data (set to missing if data element not available)
ATYPE	Admission Type	Numeric 1 2 3 4 5 6	Emergency Urgent Elective Newborn Trauma Center[3] Other	Not used by the IQI or PQI programs. The values 3 and 4 are referenced by the PDI and PSI code (to identify elective surgeries and newborn admissions). PDI 8 and 9; PSI 10, 11, 13, and 17 will be affected if ATYPE values are missing.
ASOURCE	Admission Source	Numeric 1 2 3 4 5	ER Another hospital Another facility including LTC Court/law enforcement Routine/birth/other	The values 2 and 3 are referenced by the QI code (to identify transfers from another hospital or facility).
LOS	Length of Stay	Numeric	Number of days from admission to discharge	Not used by the IQI program.
APR_DRG	APR-DRG category	Numeric	APR-DRG from 3M™ software.	Although program options allow the IQI module to operate without these variables, users should run APR-DRG software on their raw data to

[2] If HOSPID is not numeric, the user must modify the PRD*XX*P44.TXT file(s) and the *XX*SASP3.SAS programs to accommodate character values in this field, since the SAS code is written to handle numeric HOSPID values by default.

[3] The ATYPE value "5" was used to indicate delivery only in the 1988 to 1997 HCUP data files. The UB standards currently use "5" to indicate Trauma Center.

Variable name	Description	Format	Value description	Comments
				assign this variable to each case. See Section 5.3 on page 29. 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.
APRDRG_ RISK_ MORTALITY	APR-DRG Mortality Score	Numeric	APR-DRG Risk of Mortality Score from 3M™ software.	See Section 5.3 on page 29. 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.
XPRDRG_ RISK_ MORTALITY	APR-DRG Mortality Score with POA	Numeric	APR-DRG Risk of Mortality Score from 3M™ Software using POA information.	See Section 5.3 on page 29. 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.
DRG[4]	Diagnosis Related Group	Numeric	DRG from federal (CMS) DRG Grouper	
DRGVER	Diagnosis Related Group Version	Numeric	DRG Version of federal (CMS) DRG Grouper	e.g., Version 29 for FY2012
MDC	Major Diagnostic Category	Numeric	MDC from federal (CMS) DRG grouper	
DISCWT	Weight to assign to discharge	Numeric	Format as "nn.nnn"	Cases with missing values are assigned a value of 1. Assigning a weight of zero has the effect of removing the case from the analysis.
DX1 – DX30[5]	ICD-9-CM diagnosis codes. DX1 is the principal diagnosis, DX2-DX30 are secondary diagnoses.	String, 3, 4 or 5 characters (do not include decimal point)	Diagnosis codes	Users with more or fewer secondary diagnoses must modify the number of diagnoses in the parameter &NDX in CONTROL_*XX*I.SAS programs.
DXPOA1-DXPOA30-	Present on admission indicator for each diagnosis code	String	1 = present at the time of inpatient admission	These data will be used in risk adjustment and smoothing if the alternative parameter files of risk-adjustment covariates and population rates are specified.
			('Y','W','E','1')	
			0 = not present at the time of inpatient admission	
			('N','U','0',' ')	

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[4] See http://hcup-us.ahrq.gov/toolssoftware/comorbidity/comorbidity.jsp.

[5] Note: If e-codes are separated from secondary diagnoses in the input data file, the variable should be renamed and included as a secondary diagnosis variable (e.g., e-codes would be labeled as DX10 in a data file where the last secondary DX field is DX9).

Variable name	Description	Format	Value description	Comments
PR1 – PR30	ICD-9-CM procedure codes. PR1 is the principal procedure, PR2-PR30 are secondary procedures.	String, 3 or 4 characters (do not include decimal point)	Procedure code	Users with more or fewer secondary procedures must modify the parameter &NPR in CONTROL_XXI.SAS to reflect the number of procedures.
POINTOFORIGINUB04	Point of Origin	~~Numeric~~String, 1 character	4 Transfer from a hospital 5 Transfer from a skilled Nursing Facility (SNF) or Intermediate Care Facility (ICF) 6 Transfer from another health care facility	Only these values are used by the QI programs.
			IF ATYPE = 4 (Newborn)	
			5 Born inside this hospital	
			6 Born outside of this hospital	
PRDAY1 – PRDAY30	Days from admission to procedure. PR1 is the principal procedure, PR2-PR30 are secondary procedures.	Numeric	Days from Admission to Procedure[6]	Not used by the PQI program. If not present in the input data file it is not necessary to create a placeholder variable for this module. Necessary variables if the user sets the &PRDAY parameter in CONTROL_XXI.SAS (for PDI, IQI, and PSI) to equal one. In this case, it is expected that the number of PRDAY variables agrees with the number of Procedure codes present. (See note below for method of calculation). These variables are not needed if the user sets the &PRDAY parameter in CONTROL_XXI.SAS to equal zero, indicating that there is no procedure day information available.
YEAR	Year of discharge. 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 2012.	

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[6] Variables PRDAY1 to PRDAY30 are defined as the number of days from date of admission to date of procedure for each procedure. For example, if the patient was admitted on June 15th and had two procedures - the principal procedure on June 15th and a second procedure on June 18th – then the value of PRDAY1 would be zero (0) and the value of PRDAY2 would be three (3). For more information, consult the HCUP data documentation at http://www.hcup-us.ahrq.gov/db/vars/prdayn/nisnote.jsp.

Variable name	Description	Format	Value description	Comments
DQTR	Quarter of discharge. The calendar quarter of the patient's discharge. For example, a patient discharged on July 7, 2004 would have a discharge quarter of '3.'	Numeric	1 January-March 2 April-June 3 July-September 4 October-December	

Appendix D: SAS Output Data Dictionaries

SAS IQI Output Data Dictionary

SAS IQI Provider Output

Column Heading	Description	Format	Comments
Obs	Observation 1 (with HOSPID = ".") 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 provider in the dataset.	Text	Up to 12 characters
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, incl. HMO ; 4 = Self-pay ; 5 = No charge ; 6 = Other
RACECAT	Race stratification category	Numeric	1 = White ; 2 = Black ; 3 = Hispanic ; 4 = Asian or Pacific Island ; 5 = Native American ; 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 provider'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

Column Heading	Description	Format	Comments
LPIQnn	The lower confidence bound of the risk adjusted rate	Numeric	
UPIQnn	The upper confidence bound of the risk adjusted rate	Numeric	
SPIQnn	The smoothed rate calculated using multivariate signal extraction (MSX)	Numeric	
XPIQnn	Standard error of smoothed rate	Numeric	
VPIQnn	Variance for respective indicators	Numeric	

SAS IQI Area Output

Column Heading	Description	Format	Comments
Obs	Observation 1 (with HOSPID = ".") is the overall average for the entire dataset (TYPELVLP = 0). The remaining observations are individual providers, or hospitals (TYPELVLP = 16).	Numeric	
AREA	Identifier in the dataset for area	Text	
TAIQnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric	
PAIQnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric	
OAIQnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric	
RAIQnn	The estimated rate calculated by adjusting to an "average" case-mix	Numeric	When stratifications other than hospital or area are selected, the RAIQnn variables and their confidence intervals are observed/expected ratios to avoid confounding with risk adjustment variables
SAIQnn	The smoothed rate calculated using multivariate signal extraction (MSX)	Numeric	

SAS PDI Output Data Dictionary

SAS PDI Provider Output

Column Heading	Description	Format	Comments
Obs	Observation 1 (with HOSPID = ".") 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 provider in the dataset.	Text	Up to 12 characters
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, incl. HMO ; 4 = Self-pay ; 5 = No charge ; 6 = Other
RACECAT	Race stratification category	Numeric	1 = White ; 2 = Black ; 3 = Hispanic ; 4 = Asian or Pacific Island ; 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 provider'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	

Column Heading	Description	Format	Comments
UPPDnn	The upper confidence bound of the risk adjusted rate	Numeric	
SPPDnn	The smoothed rate calculated using multivariate signal extraction (MSX)	Numeric	
XPPDnn	Standard error of smoothed rate	Numeric	
VPPDnn	Variance for respective indicators	Numeric	

SAS PDI Area Output

Column Heading	Description	Format	Comments
Obs	Observation 1 (with HOSPID = ".") is the overall average for the entire dataset (TYPELVLP = 0). The remaining observations are individual providers, or hospitals (TYPELVLP = 16).	Numeric	
AREA	Identifier in the dataset for area	Text	
AGECAT	Age stratification category	Numeric range	
SEXCAT	Gender stratification category	Numeric	
PAYCAT	Payer 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	
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
SAPDnn	The smoothed rate calculated using multivariate signal extraction (MSX)	Numeric	

SAS PQI Output Data Dictionary

SAS PQI Area Output

Column Heading	Description	Format	Comments
Obs	Observation 1 (with HOSPID = ".") is the overall average for the entire dataset (TYPELVLP = 0). The remaining observations are individual providers, or hospitals (TYPELVLP = 16).	Numeric	
AREA	Identifier in the dataset for area	Text	
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 (MSX)	Numeric	
XAPQnn	Standard error of smoothed rate	Numeric	
EAPQnn	Rate calculated by assuming an "average" performance for each patient group based on the reference population, but with the provider's actual case-mix	Numeric	

SAS PSI Output Data Dictionary

SAS PSI Provider Output

Column Heading	Description	Format	Comments
Obs	Observation 1 (with HOSPID = ".") 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 provider in the dataset.	Text	Up to 12 characters
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, incl. HMO ; 4 = Self-pay ; 5 = No charge ; 6 = Other
RACECAT	Race stratification category	Numeric	1 = White ; 2 = Black ; 3 = Hispanic ; 4 = Asian or Pacific Island ; 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 provider'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
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 (MSX)	Numeric	

Column Heading	Description	Format	Comments
XPPSnn	Standard error of smoothed rate	Numeric	
VPPSnn	Variance for respective indicators	Numeric	

SAS PSI Area Output

Column Heading	Description	Format
Obs	Observation 1 (with HOSPID = ".") is the overall average for the entire dataset (TYPELVLP = 0). The remaining observations are individual providers, or hospitals (TYPELVLP = 16).	Numeric
AREA	Identifier in the dataset for area	Text
TAPSnn	The number of discharge records included in the numerator (outcome of interest) as defined for the indicator	Numeric
PAPSnn	The number of discharge records included in the denominator (population at risk) as defined for the indicator	Numeric
OAPSnn	The rate (observed numerator/observed denominator) as defined for the indicator	Numeric