

IQI, PSI, and PDI RATES GENERATED BY THE AHRQ SAS PROGRAMS

Guidance for Using the SAS Programs and an Example of Output for One Hospital

What is the purpose of this tool? To work with the Inpatient Quality Indicators (IQIs), Patient Safety Indicators (PSIs), and Pediatric Quality Indicators (PDIs) for assessing its own performance, a hospital needs to calculate rates for these Indicators, using the SAS programs provided by the Agency for Healthcare Research and Quality (AHRQ). This tool provides three sets of information to help you work with the SAS programs to calculate rates for your hospital and use the output from those programs:

- An outline of the steps and programs used to calculate rates for the IQIs, PSIs, and PDIs.
- Notes for analysts and programmers on issues to manage in working with the SAS programs.
- An example of the output from the SAS programs for one hospital.

Who are the target audiences? The primary audience for this tool is the programmers or analysts who will calculate IQI, PSI, and PDI rates.

How can the tool help you? The examples and guidance provided by this tool should help you work more easily with the SAS programs used to calculate the IQIs, PSIs, and PDIs for your hospital, and to read and use the output from the programs.

How does this tool relate to others? This tool should be used together with the B.1 tool on *Applying the Quality Indicators to Hospital Data*, which explains the different types of rates calculated for the IQIs, PSIs, and PDIs.

Note: The current version of the AHRQ QI software does not have risk-adjustment capabilities when using ICD-10ⁱ data. However, this tool includes information about risk adjustment that will be relevant when looking at past performance (using ICD-9 codes and software) and when future versions of the AHRQ QI software with risk adjustment capabilities are released.

Also note that this tool was updated based on the test software available at the time of the QI Toolkit revision (as of March 2016). Refer to AHRQ's QI software Web site (<http://www.qualityindicators.ahrq.gov/software>) for the most updated information on the software.

ⁱICD-10 = International Classification of Diseases, 10th Revision. ICD-9 is the 9th Revision.

Indicator Data Generated by the SAS Programs

The following steps are taken to produce the rates for the IQIs, PDIs, and PSIs:

1. Identify outcomes in inpatient records.
2. Identify populations at risk.
3. Calculate observed (raw) indicator rates.
4. Risk adjust the indicator rates (where applicable).
5. Create smoothed rates using multivariate signal extraction (where applicable).

Note: Programs for risk adjustment, calculation of smoothed rates, and calculation of composite measures are expected to be available in a future version of the ICD-10 software.

The SAS programs provided by AHRQ for calculation of the IQIs, PSIs, and PDIs, as well as documentation on how to use the programs, can be found in zip files on the AHRQ QI Web site: <http://www.qualityindicators.ahrq.gov/software/>.

The documentation is provided in a guide for the IQIs, PSIs, and PDIs. The guide includes instructions for calculating observed rates for the indicators.

Rates for the IQIs, PSIs, and PDIs are calculated using the same programming steps, each of which uses a separate SAS program. The names and descriptions of the SAS programs involved are summarized in the following table.

IQI Program	PSI Program	PDI Program	Program Description
IQI_CONTROL.SAS	PSI_CONTROL.SAS	PDI_CONTROL.SAS	Contains SAS statements that the user will modify to run the remaining module programs. Specify path names for input and output here.
IQI_FORMATS.SAS	PSI_FORMATS.SAS	PDI_FORMATS.SAS	Defines a format library that contains the diagnosis and procedure screens necessary for assigning outcomes for each indicator.
IQI_MEASURES.SAS	PSI_MEASURES.SAS	PDI_MEASURES.SAS	Processes hospital discharge abstract data and flags records if they contain the outcomes of interest for each indicator.
IQI_PROVIDER_1.SAS	PSI_PROVIDER_1.SAS	PDI_PROVIDER_1.SAS	Calculates the observed (raw) rates for the provider-level indicators. Allows stratification by any combination of provider, sex, age, race, and payer.
IQI_PROVIDER_2.SAS*	PSI_PROVIDER_2.SAS*	PDI_PROVIDER_2.SAS*	Calculates expected rates, risk-adjusted rates, and smoothed rates for each indicator.
IQI_COMPOSITE.SAS*	PSI_COMPOSITE.SAS*	PDI_COMPOSITE.SAS*	Calculates the composite rate for the set of indicators (PSIs, PDIs, or mortality IQIs).
		PDI_STRATIFIED.SAS	The PDI_STRATIFIED program calculates the observed rates for the provider-level PDI, using the data derived in a previous step

IQI Program	PSI Program	PDI Program	Program Description
			(PDI_MEASURES). These observed rates are stratified by risk group categories that are specific to each indicator.
IQI_AREA_1.SAS	PSI_AREA_1.SAS	PDI_AREA_1.SAS	Calculates the observed rates for the area-level QI. These observed rates can be stratified by combinations of area, sex, age, and race categories.
IQI_AREA_2.SAS*	PSI_AREA_2.SAS*	PDI_AREA_2.SAS*	Calculates age and sex risk-adjusted rates for each area-level QI (overall rates and rates by area) and then calculates smoothed rates.

*These programs are not available when using ICD-10 data in v6.0 of the ICD-10 QI software but will be available in a future version of the ICD-10 QI software.

**Program POPFILE (pop95t14.txt) is not included in the zip file due to size constraints.

Notes for Analysts and Programmers

The documentation provides guidance on how to set up the files and run the programs. However, as is usually the case when applying new programs to a data file, several issues have been identified that you will need to manage as you work with the AHRQ SAS programs. The identified issues are discussed here to help ease your first application of the programs to your data. Once you have run the programs successfully, any use of them on subsequent data should proceed smoothly.

One issue that affects the ability to begin to use the programs is the need to obtain a file that is not included in the zip files with the other AHRQ QI SAS programs. This is the population file, POPFILE (pop95t14.txt), which is located in a compressed folder (1995-2014 Population Files.zip) on the AHRQ QI Web site: <http://www.qualityindicators.ahrq.gov/software/>. The text file includes both the PDIs and PQIs and does not neatly fit within one module.

Getting Your Data Ready

When preparing data for the SAS PSI, IQI, and PDI software programs, you should be aware that a few steps are essential for running the programs without errors.

1. Format and structure your dataset so that it matches the structure specified in the documentation. If you try to run the program without first structuring and formatting the data to the exact specifications listed, the program will not run properly. All numeric variables must be specified as numeric, and all character variables must be specified as character.
2. In some cases, you may not have a variable in your dataset that is required by the program. If it is not essential for calculating the rates, you may create an empty variable so that the program will run (e.g., AGEDAY, DQTR, and PAY2 may be created and set to missing).
3. The KEY variable is the unique case identifier. It is important that this variable be a unique numeric identifier for each record. You may create this variable in SAS using the built-in case counter (KEY = _n_;

4. **Please note that this step is not applicable for ICD-10 using currently available (v6.0) software, but may still be applicable if you are looking retrospectively at ICD-9 data.** For the IQI programs, to obtain risk-adjusted rates, you must run APR-DRG software first and indicate this with the flag variables APR_DRG, APRDRG_RISK_MORTALITY, and XPRDRG_RISK_MORTALITY. If you are not interested in obtaining risk-adjusted rates, you may adjust these variables so that the program will still run without errors. Specific directions are listed in the IQI documentation (Section 5.3).

Modifying the AHRQ SAS Programs

The control files used to specify the programs' parameters are IQI_CONTROL.SAS, PSI_CONTROL.SAS, and PDI_CONTROL.SAS. Each command in this file is preceded by a comment and brief instructions. For some of the commands, the control file states that the user "MUST modify" the code. In other cases, the control file states that the user "MAY modify" the code. However, depending on the structure of your data, sometimes you *must* address these seemingly optional modifications. This is not clearly explained in the code.

For example, the number of diagnosis codes (Dx) or procedures *must* be changed if it does not match your data exactly. If you have 20 diagnosis code variables, the default number of diagnosis codes (30) must be changed or the program will not run properly.

Errors may not appear until you run the IQI_PROVIDER_1.SAS, PSI_PROVIDER_1.SAS, or PDI_PROVIDER_1.SAS files. When troubleshooting, check the structure of the data and the control file first.

Example of SAS Program Output

An example of the output from the SAS programs for the PSI rates is provided on the following pages. This output was generated in March 2016 using an alpha version of the AHRQ SAS QI software v6.0 provided by AHRQ, based on the data adapted from a hospital that participated in the first field test of the QI Toolkit. The program was run on a large set of discharge records that would have the best chance of finding events for the numerators in the observed rates. Even in this case, however, you will see that zero events were found for some of the Indicators.

This output consists of tables generated by the PSI_PROVIDER_1.SAS program. PSI_PROVIDER_1.SAS now generates three tables for the indicators. The first contains the number of events or numerator for each of the indicators, the second displays the population or denominator for the indicators, and the third displays the observed rate for each indicator. We do not currently provide output for the expected, risk-adjusted, and observed rates given that the software cannot generate these rates for ICD-10 at this time.

Refer to tool B.1 (Applying the AHRQ QIs to Hospital Data) for definitions of the four types of rates.

The values reported on each line are the minimum, maximum, mean, and sum for each measure (numerator, population, rate). Because this output is for one hospital, all the values on each line

are the same. If the programs had been run for a group of hospitals, these values would differ because the results would be for a distribution of results across hospitals.

In the example below:

TPPS = number of events for a given indicator (identified by the PSI number)

PPPS = the number of individuals in the population at risk for the event

OPSS = the observed rate of a given event

Getting Help From AHRQ

If you have problems getting the software installed or questions about the AHRQ Quality Indicators, you may contact AHRQ's technical support. The support e-mail address for the AHRQ Quality Indicators is QIsupport@ahrq.hhs.gov.

AHRQ also has a "frequently asked questions" page that may be useful: http://qualityindicators.ahrq.gov/FAQs_Support/.

PSI_PROVIDER_1.SAS (PSI_COMPOSITE.SAS not currently available)

PROGRAM: PSI_PROVIDER_1
AHRQ PATIENT SAFETY INDICATORS: CALCULATE OBSERVED PROVIDER RATES
SUMMARY OF PATIENT SAFETY PROVIDER-LEVEL INDICATOR OVERALL NUMERATOR (SUM) WHEN _TYPE_=16

The MEANS Procedure

Variable	N	N Miss	Minimum	Maximum	Mean	Sum
TPPS02	1	0	8	8	8	8
TPPS03	1	0	5	5	5	5
TPPS04	1	0	3	3	3	3
TPPS04A	1	0	0	0	0	0
TPPS04B	1	0	0	0	0	0
TPPS04C	1	0	1	1	1	1
TPPS04D	0	1	.	.	.	.
TPPS04E	1	0	1	1	1	1
TPPS05	0	1	.	.	.	.
TPPS06	1	0	0	0	0	0
TPPS07	1	0	9	9	9	9
TPPS08	1	0	0	0	0	0
TPPS09	1	0	2	2	2	2
TPPS10	0	1	.	.	.	.
TPPS11	0	1	.	.	.	.
TPPS12	1	0	3	3	3	3
TPPS13	0	1	.	.	.	.
TPPS14	1	0	0	0	0	0
TPPS15	1	0	6	6	6	6
TPPS16	0	1	.	.	.	.
TPPS18	0	1	.	.	.	.
TPPS19	0	1	.	.	.	.

PROGRAM: PSI_PROVIDER_1
AHRQ PATIENT SAFETY INDICATORS: CALCULATE OBSERVED PROVIDER RATES
SUMMARY OF PATIENT SAFETY PROVIDER-LEVEL INDICATOR OVERALL DENOMINATOR (SUM) WHEN _TYPE_=16

The MEANS Procedure

Variable	N	N Miss	Minimum	Maximum	Mean	Sum
PPPS02	1	0	132	132	132	132
PPPS03	1	0	1147	1147	1147	1147
PPPS04	1	0	18	18	18	18
PPPS04A	1	0	4	4	4	4
PPPS04B	1	0	8	8	8	8
PPPS04C	1	0	4	4	4	4
PPPS04D	0	1	.	.	.	.
PPPS04E	1	0	2	2	2	2
PPPS05	0	1	.	.	.	.
PPPS06	1	0	4777	4777	4777	4777
PPPS07	1	0	7007	7007	7007	7007
PPPS08	1	0	425	425	425	425
PPPS09	1	0	750	750	750	750
PPPS10	0	1	.	.	.	.
PPPS11	0	1	.	.	.	.
PPPS12	1	0	785	785	785	785
PPPS13	0	1	.	.	.	.
PPPS14	1	0	346	346	346	346
PPPS15	1	0	5071	5071	5071	5071
PPPS16	0	1	.	.	.	.
PPPS18	0	1	.	.	.	.
PPPS19	0	1	.	.	.	.

PROGRAM: PSI_PROVIDER_1
AHRQ PATIENT SAFETY INDICATORS: CALCULATE OBSERVED PROVIDER RATES
SUMMARY OF PATIENT SAFETY PROVIDER-LEVEL INDICATOR AVERAGE RATES(MEAN) WHEN _TYPE_=16

The MEANS Procedure

Variable	N	N Miss	Minimum	Maximum	Mean	Sum
OPPS02	1	0	0.060606	0.060606	0.060606	0.060606
OPPS03	1	0	0.004359	0.004359	0.004359	0.004359
OPPS04	1	0	0.166667	0.166667	0.166667	0.166667
OPPS04A	1	0	0	0	0	0
OPPS04B	1	0	0	0	0	0
OPPS04C	1	0	0.25	0.25	0.25	0.25
OPPS04D	0	1	.	.	.	.
OPPS04E	1	0	0.5	0.5	0.5	0.5
OPPS05	0	1	.	.	.	.
OPPS06	1	0	0	0	0	0
OPPS07	1	0	0.001284	0.001284	0.001284	0.001284
OPPS08	1	0	0	0	0	0
OPPS09	1	0	0.002667	0.002667	0.002667	0.002667
OPPS10	0	1	.	.	.	.
OPPS11	0	1	.	.	.	.
OPPS12	1	0	0.003822	0.003822	0.003822	0.003822
OPPS13	0	1	.	.	.	.
OPPS14	1	0	0	0	0	0
OPPS15	1	0	0.001183	0.001183	0.001183	0.001183
OPPS16	0	1	.	.	.	.
OPPS18	0	1	.	.	.	.
OPPS19	0	1	.	.	.	.