

**HCUP Quality Indicators:  
Software User's Guide, Version 1.3**

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## Abstract

The value of information on health care quality has never been so widely recognized, yet many organizations lack the resources and/or expertise to build a quality information program from the ground up. Recognizing this, the Healthcare Cost and Utilization Project Quality Indicators (HCUP QIs) were initiated specifically to meet the short-term needs for information on health care quality using standardized, user-friendly methods and existing sources of data.

The HCUP QIs were designed to capitalize on the availability of administrative data on inpatient stays to produce information about: **avoidable adverse outcomes** (e.g., in-hospital mortality following common surgical procedures, complications such as post-surgical pneumonia); **utilization** of specific inpatient procedures thought to be over-, under-, or misused (e.g., hysterectomy); and **access** to care in the community, as reflected in hospitalizations for ambulatory-care-sensitive conditions (conditions amenable to management in an ambulatory setting, e.g., pediatric asthma).

This report is the user's guide for the HCUP QI software Version 1.3, which is provided on the AHCPR Web site. The software was developed in two languages, SAS and SPSS, for use on a personal computer. By making these tools available, we hope to assist others in producing information on health care quality more cost effectively.

## Acknowledgments

The HCUP Quality Indicators Working Group acknowledges the contributions of Michael Boyson and the Colorado Hospital Association in allowing us to feature data from Colorado hospitals in the development and presentation of the HCUP Quality Indicators, in reviewing early drafts of the methods, and in volunteering to serve as a test site for the methods. We are grateful for their encouragement and generosity. We are grateful also to the representatives of the original 12 States participating in the HCUP databases. Their advice helped shape the priorities for the project from its earliest stages.

In addition, we thank the other individuals and organizations who have adopted the HCUP QIs for use with their own databases. Their comments, concerns, and problems have been invaluable in helping us improve this user's guide.

We also acknowledge the excellent efforts of Marguerite Barrett, Devi Katikineni, David Naden, Sophie Nemirovsky, Åse Sewall, and Sandy Smoot of Social and Scientific Systems (SSS), Bethesda, Maryland, who wrote and tested the HCUP QI software, and other SSS staff, who ably support our efforts to convert data into information.

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# **HCUP Quality Indicators, Software User's Guide, Version 1.3: Outcome, Utilization, and Access Measures for Quality Improvement**

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## **Introduction**

This report describes the software for implementing the Healthcare Cost and Utilization Project Quality Indicators (HCUP QIs) Version 1.1 and highlights features of the analytic approach of particular interest to new users. The development and uses of the HCUP QIs are documented in another Research Note, *HCUP Quality Indicators, Methods, Version 1.1: Outcome, Utilization, and Access Measures for Quality Improvement*.<sup>1</sup>

The software consists of a series of computer programs that:

- ▶ Assign and calculate HCUP QIs from inpatient data and
- ▶ Print HCUP QI results in tables that are relatively easy to import into word processing documents, spreadsheets, or graphics software, at the user's option.


This report includes:

- ▶ A discussion of the data elements necessary to produce the HCUP QIs and the uniform coding conventions recommended for those elements.
- ▶ Instructions on user options for customizing the HCUP QI analysis.
- ▶ Descriptions of the HCUP QI processing steps in nontechnical language.
- ▶ Benchmark time estimates comparing the performance of SAS and SPSS on PC platforms to assist users in making informed choices about computer language.

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\*Formerly of the Agency for Health Care Policy and Research.

- ▶ Detailed descriptions of the functions of each HCUP QI program in SAS and SPSS.

*Throughout, critical user information is highlighted with this symbol:* 


## **Computer platforms and languages**

The HCUP QI software was developed in two languages for two computer platforms. The original development used the Statistical Analysis System (SAS), version 6.07, on an IBM 370 MVS System mainframe computer at the National Institutes of Health, Division of Computer Resources and Technology.


To make the software useful and accessible to a wider audience, it is being distributed in the following formats:

- ▶ SAS, version 6.10 or later.
- ▶ SPSS, version 4.1 or later.

## Data elements and coding conventions – Input for HCUP QIs


 *The HCUP QI software accepts input data files in SAS or SPSS format.*

For ease of use, the input data file should contain a specific set of variables coded in specific ways. For example, the HCUP QI software expects a numeric data element named SEX with values coded 1 for male and 2 for female.

 *We recommend that users recode data elements in their input files to be consistent with the coding expected by the software. This will minimize the number of internal changes that will be necessary in the HCUP QI software.*

For example:

Recoding the SEX data element in the input file to be consistent with the coding described above is easier than modifying all uses of the SEX element in the HCUP QI programs.

 *Users may need to derive some required data elements from other elements present in their data.*

For example:

PRDAY1 (the number of days from admission to the principal procedure) may be derived from admission date and date of principal procedure.


Input data elements, their characteristics, and values expected by the software are described in Table 1 (see page 6). Not every value for every data element is referenced by the HCUP QI software. For example, admission source (ASOURCE) values are used only to identify transfers. However, we include the complete set of HCUP values to assist users of uniform HCUP data from the Nationwide Inpatient Sample (NIS) or the State Inpatient Database (SID).

## Types of data elements

There are four types of data elements:

### 1. *Required elements*

These data elements are required for assignment of outcomes and populations at risk, as defined in Chapter 4 of the HCUP QI methods report.<sup>1</sup>


 *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 dummy element should be provided. Failure to provide a dummy element will result in errors during the execution of the HCUP QI programs.*

For example, HCUP QIs for complications among surgical patients require PRDAY1, a data element representing the number of days from admission to principal procedure. PRDAY1 is necessary because the populations at risk (denominators) for these HCUP QIs include certain major surgery and invasive vascular procedures performed on day 1 or 2 of the inpatient stay. If PRDAY1 is not available:

- A data element called PRDAY1 should be present in the input data file with all its values set to missing *and*
- As a result, zero cases will be counted in the denominators for complications among surgical patients, which rely on PRDAY1.

### 2. *Desirable elements*

Procedure days for secondary procedures (PRDAY2-PRDAY $n$ , where  $n$  is the maximum number of procedures) are desirable elements but not required. The ability to define denominators for complications among surgical patients is improved by having PRDAY2-PRDAY $n$ , but our tests have shown that PRDAY1 is adequate for most applications.

 *When you do not have a procedure day variable for each procedure, create a variable PRDAY $n$  for each procedure (PR $n$ ) in your data. When you do not have data for these elements, set each PRDAY $n$  equal to missing. This will help minimize the number of internal changes necessary to the software.*

### 3. *Stratifiers*

The data elements noted as stratifiers in Table 1 are those used by the developers at the Agency for Health Care Policy and Research (AHCPR) to stratify HCUP QI results.



☞ *Stratifiers can be modified or added at the user's option. To minimize internal changes to the software, stratifier names already present in the software can be redefined to reflect the user's option.*

For more information about stratifiers and user modifications to the HCUP QI software, see page 10.

#### 4. *Optional elements*

These are data elements included only for convenience (e.g., SEQ, a unique record identifier). They are not used to define a HCUP QI measure or a stratifier.

### **Coding of diagnoses, procedures, and DRGs**

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


☞ *Validity flags must be present for each diagnosis and procedure to identify it as a valid ICD-9-CM value. If validity flags are not available in the input data, dummy elements should be provided with values set to zero.*

Diagnosis-related groups (DRGs) are those derived from the Health Care Financing Administration's Medicare grouper (the "HCFA grouper").<sup>2</sup> Version 1.3 and version 1.2 expect that you will be using the DRG effective on the discharge date. This includes versions 10, 11, 12, 13, 14, and 15, which is effective through FY98. The software now refers to data elements DRG and MDC. Your data should be coded accordingly. [Both Versions 1.0 and 1.1 of the software were written to use version 10 HCFA DRGs.] 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.

### **Diagnosis, procedure, and DRG updates**


☞ Version 1.3 of the software accounts for ICD-9-CM and DRG coding effective through September 30, 1999. Version 1.2 of the software covered ICD-9-CM and DRG coding effective through September 30, 1998. Version 1.1 covered ICD-9-CM and DRG coding changes through September 30, 1994.

## Missing values

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

HCUP coding of numeric data elements uses special SAS missing "dot" values: missing data (.), invalid data (.A), data unavailable from the source (.B), and inconsistent data (.C). Both the SAS and SPSS programs assume that all dot values are negative. Therefore, missing values in the HCUP QI input data can be represented by a single value – missing data (.) for numeric variables and blank (' ') for alphanumeric (or character) variables.


**Table 1. Data elements and coding conventions: HCUP Quality Indicators Software Version 1.3** [n refers to numeric values; a refers to alphanumeric values]

Data element	Data element description	Value	Value description
<b>Clinical information</b>			
 <i>Clinical data elements are required. They are used to define outcomes and populations at risk.</i>			
DRG	Diagnosis-related group	nnn	DRG from HCFA grouper
MDC	Major diagnostic category	nn	MDC from HCFA grouper
DX1	Principal diagnosis	annnn	Diagnosis code
		blank	Missing
DXV1	Principal diagnosis validity flag	0	Valid code
		1	Invalid code
		.	Diagnosis code is blank
		.C	Inconsistent
DX2-DXn	Secondary diagnoses	annnn	Diagnosis code
		blank	Missing
DXV2-DXVn	Secondary diagnoses validity flags	0	Valid code
		1	Invalid code
		.	Diagnosis code is blank
		.C	Inconsistent
NDX	Number of non-missing diagnoses on this discharge record	0-n	Number of non-missing diagnoses (counts principal and all secondaries)
PR1	Principal procedure	nnnn	Procedure code
		blank	Missing
PRV1	Principal procedure validity flag	0	Valid code
		1	Invalid code
		.	Procedure code is blank
		.C	Inconsistent

**Table 1. Data elements and coding conventions: HCUP Quality Indicators Software Version 1.3** [n refers to numeric values; a refers to alphanumeric values]

<b>Data element</b>	<b>Data element description</b>	<b>Value</b>	<b>Value description</b>
PR2-PRn	Secondary procedures	nnnn blank	Procedure code Missing
PRV2-PRVn	Secondary procedures validity flags	0 1 .C	Valid code Invalid code Procedure code is blank Inconsistent
NPR	Number of non-missing procedures for this discharge	0-n	Number of non-missing procedures (counts principal and all secondaries)

### Days

 *Day of principal procedure is a required data element; days of secondary procedures are desirable but not required (see page 3).*

PRDAY1	Day of principal procedure	nn .A .B .C	Number of days from admission to principal procedure. If PR1 is performed on the day of admission, PRDAY1 = 0; if PR1 is performed prior to admission, PRDAY1 is negative Missing Invalid Unavailable from source Inconsistent
PRDAY2- PRDAYn	Day of secondary procedure	nn .A .B .C	Number of days from admission to secondary procedure. If PR (PR2-PRn) is performed on the day of admission, PRDAY (PRDAY2-PRDAYn) = 0; if PR (PR2-PRn) is performed prior to admission, PRDAY (PRDAY2-PRDAYn) is negative Missing Invalid Unavailable from source Inconsistent

**Table 1. Data elements and coding conventions: HCUP Quality Indicators Software Version 1.3** [n refers to numeric values; a refers to alphanumeric values]

<b>Data element</b>	<b>Data element description</b>	<b>Value</b>	<b>Value description</b>
<b>Patient demographics</b>			
<i>☞ Age and sex are required to define populations at risk (see page 14).</i>			
AGE	Age in years at admission	0-124	Age in years . Missing .A Invalid .B Unavailable from source .C Inconsistent
SEX	Sex	1 2 . Missing .A Invalid .B Unavailable from source .C Inconsistent	Male Female
<b>Admission/discharge status</b>			
<i>☞ Admission source and discharge status are required to define transfers (in and out). Discharge status defines in-hospital mortality.</i>			
ASOURCE	Admission source	1 2 3 4 5 . Missing .A Invalid .B Unavailable from source	Emergency dept Another hospital Other health facility inc LTC Court/law enforcement Routine, birth and other
DISP	Disposition of patient	1 2 3 4 5 6 7 20 . Missing .A Invalid .B Unavailable from source	Routine Short-term hospital Skilled nursing facility Intermediate care facility Another type of facility Home health care Against medical advice Died


**Table 1. Data elements and coding conventions: HCUP Quality Indicators Software Version 1.3** [n refers to numeric values; a refers to alphanumeric values]

Data element	Data element description	Value	Value description
<b>Hospital identifier</b>			
☞ <i>A hospital identifier is required. It is used both as a stratifier and as the basis for casemix adjustment. For more information, see page 12.</i>			
DSHOSPID	Data source hospital number		Hospital ID number
<b>Stratifiers</b>			
☞ <i>Stratifiers may be changed or redefined at the user's option (see page 10).</i>			
HOSPSTCO	Hospital location (FIPS <sup>†</sup> State/county code)	nnnnn	Modified FIPS State/county code
RACE	Race/ethnicity	1 2 3 4 5 6 . . .A .B	White Black Hispanic Asian or Pacific Islander Native American Other Missing Invalid Unavailable from source
PAY1	Expected primary payer, uniform	1 2 3 4 5 6 . . .A .B	Medicare Medicaid Private insurance inc. HMO Self pay No charge Other Missing Invalid Unavailable from source
<b>Record identifier</b>			
☞ <i>A record identifier is optional.</i>			
SEQ	Sequence number		Unique record number
<sup>†</sup> Federal Information Processing Standard, as defined by the U.S. Department of Commerce, National Institute of Standards and Technology (formerly National Bureau of Standards).			

## User options

The HCUP QI software reflects the development and implementation of the HCUP QIs in data available to AHCPR. Our 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, we expect and encourage users of the software to consider whether and how to modify the HCUP QI software to better serve their local conditions or interests. The HCUP QI software was designed with this option in mind.

Certain features of the software are designed to be modified to suit the user's environment. The following section highlights patient and hospital characteristics that can be used to stratify HCUP QI analysis. Stratifiers defined by AHCPR and included in the HCUP QI software are described specifically. We encourage users of the HCUP QI software to redefine these categories or develop different stratifiers, at their option.

 *Modifications to the definitions of outcomes of interest or populations at risk are possible but not desirable. Maintaining consistent definitions is important. Once definitions are altered, the ability to make comparisons of HCUP QIs based on original definitions is lost. We encourage users to identify ways to improve the HCUP QI methodology and to share their suggestions with us for future updates.*

### Stratifiers – Patient subgroups

Examining variations in HCUP QI rates across patient subpopulations is a useful analytic technique. HCUP QI users are encouraged to determine what characteristics of patients are meaningful for their population. If specific characteristics of interest (e.g., severity of illness) are not available in administrative data systems, data elements that *are* available may provide acceptable substitutes. For example, among the data elements commonly present in administrative data systems, payer is one of the most useful because it relates to so many other differences among patients.

In the HCUP QI software, patients are classified into subgroups based on two characteristics: expected primary payer and race/ethnicity.

*Expected primary payer* is classified into five groups:

- Medicare.
- Medicaid.
- Private insurance.
- Self pay.
- All other.

"All other," which includes miscellaneous payer types and missing values, is excluded from the final rates files because it is a miscellaneous category.

These payer categories are collectively termed *PAYCAT* in the HCUP QI software.

*Patient race/ethnicity* is classified into four groups:

- White.
- Black.
- Hispanic.
- All other.

"All other," which includes other races and missing values, is excluded from the final rates files.

These race/ethnicity categories are collectively termed *RACECAT* in the HCUP QI software.

### **Stratifiers – Hospital peer subgroups**

Comparison of hospitals to their peers – that is, hospitals grouped by some meaningful characteristic in common – is another attractive analytic option. We encourage users to adopt characteristics to define peer groups that are meaningful for their circumstances.

The HCUP QI software was developed using inpatient data from the Colorado Hospital Association. For Colorado, substate regions were adopted as a proxy method of defining hospital peer groups by market area. This method is only illustrative. User-defined peer groups may be easily substituted for these regional definitions. In fact, the Colorado hospital groupings (collectively termed *METRO* in the HCUP QI software) can be used as a template for assigning hospitals into different peer groupings.

To define Colorado substate regions, Colorado hospitals were grouped based on their county of location (from the American Hospital Association Annual Survey of Hospitals) and official Federal definitions of metropolitan statistical areas (MSAs) and consolidated metropolitan statistical areas (CMSAs). Metropolitan areas containing fewer than six hospitals were combined with neighboring areas to protect the identities of hospitals.

The substate regions of Colorado were defined as:

- *Denver-Ft. Collins* – all hospitals in the Denver-Boulder-Greeley CMSA and the Fort Collins-Loveland MSA.
- *CO Springs-Pueblo* – all hospitals in the Colorado Springs and Pueblo MSAs.
- *Non-metro* – all hospitals in Colorado not located in designated MSAs.

## **Hospital identifiers**

The use of hospital identifiers in the HCUP QI software bears special mention. By law, AHCPR is prohibited from reporting information that identifies hospitals. Because of this, steps to conceal the identities of hospitals figure prominently in the methodology adopted at AHCPR. Yet the hospital identifier is used extensively in the HCUP QI software.

The hospital is a most useful stratifier for assessments of intrastate variations and as the basis for defining peer groups (discussed above). As noted, we encourage users to modify the software to redefine stratifiers based on the hospital identifier. In Chapter 3 of the HCUP QI methods report<sup>1</sup> we discuss ways of using HCUP QIs defined at the hospital level while protecting the identity of the institutions.

Unlike other stratifiers, the hospital identifier also serves other functions in the HCUP QI software. Specifically, the hospital serves as the unit of analysis for:

- ▶ Aggregation of HCUP QI outcomes and populations.
- ▶ Adjustment for casemix differences by standardization.

Modifications to these uses of the hospital identifier are also possible, with important caveats. Changes to the aggregation routines, which rely on a hospital-level framework, are the least desirable because that would alter the most basic structure of the HCUP QI software. On the other hand, changes to the standard populations used to adjust for casemix differences at the hospital level may be necessary and very desirable, especially when comparability of results (e.g., across multiple States) is the principal concern.



## Processing steps

Each HCUP QI is expressed as a rate, simply defined as:

$$(\text{Outcome of interest} \div \text{Population at risk}) \times 100$$

Conceptually, five steps are necessary to produce the HCUP QI rates. The following describes the steps and how the software performs them.

### ***1. Identify outcomes and populations at risk in inpatient records***

Inpatient records are marked to indicate whether they are included in the outcome of interest (numerator) and/or the population at risk (denominator) for each of the HCUP QI measures.

This is done by setting a series of 0/1 (binary) indicator variables, which correspond to the numerator and denominator for each HCUP QI. If the inpatient record meets the conditions for inclusion in the population at risk for QI<sub>i</sub>, then the population indicator for QI<sub>i</sub> is set to 1. If a record included in the population at risk also meets the conditions for inclusion in the outcome for QI<sub>i</sub>, then the outcome indicator for QI<sub>i</sub> is set to 1.

FIGURE 1 illustrates how the populations at risk (the denominators for calculating the HCUP QI rates) are derived from the complete set of inpatient records. The numbers in brackets, which are explained in the legend (page 15), refer to the numbering of the HCUP QIs in the software. The numbers are not sequential because some indicators were dropped during development.

This step requires one pass through the discharge-level data and outputs a discharge-level data file containing the original input variables and 0/1 indicator variables for the outcomes and populations at risk for each HCUP QI.

Populations at risk as described in definitions of HCUP Quality Indicators Version 1.1

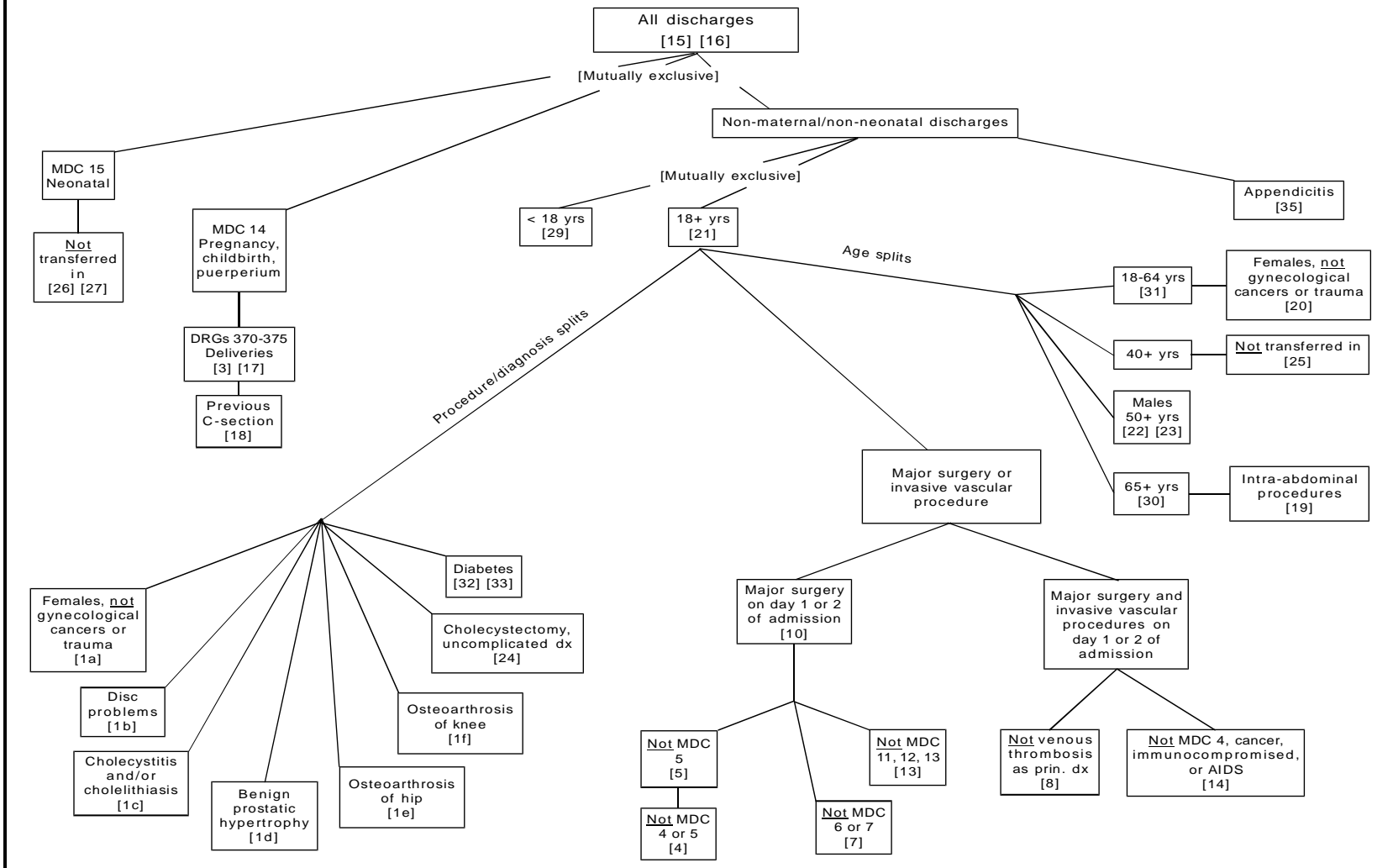


FIGURE 1

### Legend

Quality Indicator	Reference number	Quality Indicator	Reference number
<b>Outcomes</b>		<b>Utilization</b>	
In-hospital mortality following common elective procedures:		Obstetrical:	
Hysterectomy .....	1a	Cesarean section delivery .....	17
Laminectomy/spinal fusion .....	1b	Successful vaginal birth after cesarean section (VBAC) .....	18
Cholecystectomy .....	1c	Other procedures:	
Transurethral prostatectomy .....	1d	Incidental appendectomy among elderly .....	19
Hip replacement .....	1e	Hysterectomy .....	20
Knee replacement .....	1f	Laminectomy and/or spinal fusion .....	21
Coded complications:		Transurethral prostatectomy .....	22
Obstetrical complication .....	3	Radical prostatectomy .....	23
Wound infection .....	15	Laparoscopic cholecystectomy .....	24
Adverse effects and iatrogenic complications .....	16	Coronary artery bypass graft (CABG) .....	25
Complications among surgical patients:		<b>Access to Primary Care</b>	
Pulmonary compromise after major surgery .....	4	Obstetrical:	
Acute myocardial infarction after major surgery .....	5	Low birthweight .....	26
Gastrointestinal hemorrhage or ulceration after major surgery .....	7	Very low birthweight .....	27
Venous thrombosis or pulmonary embolism after major surgery/invasive vascular procedure .....	8	Pediatric:	
Mechanical complications due to device, implant, or graft (excluding organ transplant) .....	10	Pediatric asthma discharges .....	29
Urinary tract infection after major surgery .....	13	Prevention:	
Pneumonia after major surgery/invasive vascular procedure .....	14	Immunization-preventable pneumonia and influenza among the elderly .....	30
		Cerebrovascular disease among non-elderly adults .....	31
		Internal medicine:	
		Diabetes, short-term complications .....	32
		Diabetes, long-term complications .....	33
		Surgical:	
		Perforated appendix .....	35

## 2. *Summarize outcomes and populations at risk across stratifiers*

The 0/1 indicators are then summarized for the State overall and by different stratifiers. The stratifiers developed by AHCPR (and therefore included in the software) include:

- Source-specific hospital identifier.
- Hospital peer group (e.g., substate region).
- Third-party payer categories.
- Patient race/ethnicity.
- Substate regions.


This step requires a second pass through the discharge-level data and outputs a file aggregated for the entire dataset (i.e., for the State) and to the level of the stratifiers alone (e.g., hospital, substate region, expected primary payer, race/ethnicity) and in combinations (payer by hospital, payer by region, payer by race/ethnicity, race/ethnicity by hospital, etc.).

This step produces aggregations for *all* combinations of stratifiers. Combinations of little analytic interest are dropped in subsequent steps.

## 3. *Calculate HCUP QI rates*

Using the aggregated file, HCUP QI rates are calculated for the entire State and for combinations of the stratifiers.

This step requires a pass through the aggregated file.

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

In work at AHCPR, we do not report rates based on 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.

**4. *Standardize a subset of HCUP QI rates***

Certain HCUP QIs – complications among surgical patients, for which the populations are based on major surgery and invasive vascular procedures – have very heterogeneous populations. Therefore, these rates are standardized to adjust the measures for differences in casemix across hospitals.

This step requires a pass through the aggregated file.


**5. *Display results***

The final step is to print selected results from the HCUP QI procedures.

The prints are structured to produce tables for each HCUP QI that are relatively easy to import into word processing documents, spreadsheets, or graphics software, at the user's option.

These five steps reflect HCUP QI production in a nutshell. The remainder of this report describes the specifics of each component of the HCUP QI software.

## Deciphering HCUP QI variable names

 The software follows a systematic naming convention for all HCUP QI-related data elements, beginning with the assignment of the 0/1 indicators for outcomes of interest and populations at risk and ending with the HCUP QI rates.

Each variable name consists of a base (prefix) that identifies the particular indicator. Table 2 (page 19) lists the variable name prefixes used for each indicator.

The base names are then modified: A suffix is added to identify the stage of processing for the indicator. Table 3 (page 21) lists the variable name suffixes that, in combination with the prefixes, form the names for all the HCUP QI data elements.

For example:

- ▶ All HCUP QI variables relating to obstetrical complications begin with the prefix *OBCOMP*.
- ▶ When 0/1 indicator variables are created to mark the outcomes and populations at risk for each inpatient record, the 0/1 indicators for obstetrical complications are named *OBCOMP\_T* for the outcome and *OBCOMP\_P* for the population at risk.
- ▶ When these indicators are summarized, the summary measures are named *OBCOMPST* (for the sum of *OBCOMP\_T*), *OBCOMPSP* (for the sum of *OBCOMP\_P*), and *OBCOMPMT* (for the mean of *OBCOMP\_T*).

The information in Tables 2 and 3 can be used to decipher all of the important HCUP QI-related data elements used by the SAS and SPSS software programs.

Table 2. Naming convention for HCUP QI variables: Variable name prefixes	
Quality indicator	Prefix
<b>Outcomes</b>	
In-hospital mortality following common elective procedures:	
Hysterectomy . . . . .	MRTPra
Laminectomy/spinal fusion . . . . .	MRTPrB
Cholecystectomy . . . . .	MRTPrC
Transurethral prostatectomy . . . . .	MRTPrD
Hip replacement . . . . .	MRTPrE
Knee replacement . . . . .	MRTPrF
Coded complications:	
Obstetrical complication . . . . .	OBCOMP
Wound infection . . . . .	WOUND
Adverse effects and iatrogenic complications . . . . .	ADVEFF
Complications among surgical patients:	
Pulmonary compromise after major surgery . . . . .	CDRPUL
Acute myocardial infarction after major surgery . . . . .	CDRAMI
Gastrointestinal hemorrhage or ulceration after major surgery . . . . .	BLDGIH
Venous thrombosis or pulmonary embolism . . . . .	BLDTH
After major surgery . . . . .	BLDTH1
After invasive vascular procedure . . . . .	BLDTH2
Mechanical complications due to device, implant, or graft (excluding organ transplant) . . . . .	CMPDEV
Urinary tract infection after major surgery . . . . .	INFUTI
Pneumonia . . . . .	INFPN
After major surgery . . . . .	INFPN1
After invasive vascular procedure . . . . .	INFPN2
<b>Utilization</b>	
Obstetrical:	
Cesarean section delivery . . . . .	OBCSEC
Successful vaginal birth after cesarean section (VBAC) . . . . .	OBVBAC

Table 2. Naming convention for HCUP QI variables: Variable name prefixes	
Quality indicator	Prefix
<b>Utilization (continued)</b>	
Other procedures:	
Incidental appendectomy among elderly . . . . .	PRAPPN
Hysterectomy . . . . .	PRHYST
Laminectomy and/or spinal fusion . . . . .	PRLAMI
Transurethral prostatectomy . . . . .	PRTURP
Radical prostatectomy . . . . .	PRRADP
Laparoscopic cholecystectomy . . . . .	PRLAPO
Coronary artery bypass graft (CABG) . . . . .	PRCABG
<b>Access to Primary Care</b>	
Obstetrical:	
Low birthweight . . . . .	OBLBWT
Very low birthweight . . . . .	OBVBWT
Pediatric:	
Pediatric asthma discharges . . . . .	PEDAST
Prevention:	
Immunization-preventable pneumonia and influenza among the elderly .	PRVPNE
Cerebrovascular disease among non-elderly adults . . . . .	PRVCVD
Internal medicine:	
Diabetes, short-term complications . . . . .	IMDIAS
Diabetes, long-term complications . . . . .	IMDIAL
Surgical:	
Perforated appendix . . . . .	SRGAPP



Table 3. Naming convention for HCUP QI variables: Variable name suffixes	
HCUP QI components	Suffix
<b>0/1 indicators for outcomes and populations at risk</b>	
Defined in QISAS2, QISPS1:	
Outcome ( <u>T</u> op, numerator) . . . . .	_T
Population at risk ( <u>P</u> op, denominator) . . . . .	_P
<b>Outcomes and populations at risk, summarized across stratifiers</b>	
Defined in QISAS3, QISPS2:	
<u>T</u> op, <u>S</u> ummarized across stratifiers . . . . .	ST
<u>P</u> op, <u>S</u> ummarized across stratifiers . . . . .	SP
<u>M</u> ean (of <u>T</u> op) . . . . .	MT
<b>Variables used in standardization of HCUP QI rates of complications among surgical patients</b>	
Defined in QISAS4, QISPS3:	
<u>T</u> otal <u>P</u> opulation . . . . .	TP
<u>S</u> tate <u>R</u> ate . . . . .	SR
<u>S</u> tate <u>W</u> eight . . . . .	SW
Defined in QISAS5, QISPS4:	
Com <u>B</u> ination of major surgery and invasive vascular, <u>T</u> ops . . . . .	BT
Com <u>B</u> ination of major surgery and invasive vascular, <u>P</u> ops . . . . .	BP
<u>M</u> DC-specific <u>R</u> ate, substitute State rate if cell < 30 . . . . .	DR
Product, <u>R</u> a <u>T</u> e x State weight . . . . .	RT

## HCUP QI software: Choosing SAS or SPSS

The original HCUP QI programs were developed in SAS and then translated into SPSS in response to demand by users. The SPSS programs are, for the most part, a direct translation of the SAS programs. This approach served two requirements:

- Easy validation that the programs in the two languages yielded equivalent results.
- Easy maintenance of software in two languages.

However, this approach was not designed to maximize efficiency in SPSS. Some of the Version 1.1 modifications to the SPSS code (Processing Step 2 in Table 4) were implemented specifically to reduce the execution time required for the SPSS programs.

HCUP QI software products for SAS and SPSS are available for the PC platform. Table 4 displays benchmark times (in seconds) comparing the SAS and SPSS versions of the HCUP QI software on the PC platform. The SAS programs used SAS version 6.10. The SPSS programs used SPSS version 4.1. The PC was a Pentium 100 with 16 MB RAM and a 1 gigabyte hard drive running OS/2. The test data file contained approximately 380,000 observations and 37 variables.

<b>Table 4. Benchmark times (in seconds) for SAS and SPSS versions of HCUP QI Software Version 1.3</b>		
<b>Processing Step</b>	<b>Time</b>	
	<b>SAS</b>	<b>SPSS</b>
<b>1. Create format library</b>	157	<sup>(a)</sup>
<b>2. QI data step</b> Assigns 0/1 indicators to all records	833	20,343
<b>3. Create raw rates</b> Summarizes QI indicators over stratifiers	799	1,419
<b>4. Create standardized rates</b> Adjusts certain QIs for differences in casemix across hospitals	93	135
<b>Total</b>	1,882	21,897
<sup>a</sup> The SPSS equivalent of the SAS format step is included in Step 2, QI data step.  <sup>b</sup> On the PC, the Version 1.1 changes to Step 2 resulted in a 31-percent reduction in time (from 29,582 seconds to 20,343 seconds).		

The following sections provide additional information about using the HCUP QI software for users of SAS (page 24) and SPSS (page 35). These sections detail for each program:

- ▶ The functions of the program (in plain English).
- ▶ *Input* - the input file(s).
- ▶ *Output* - the output file(s).
- ▶ *Changes* - a guide to the most common user modifications of the software.

The relationships of the SAS and SPSS programs to the HCUP QI processing steps are outlined in Table 5.

<b>Table 5. SAS and SPSS program relationships: HCUP QI Software Version 1.3</b>		
<b>SAS</b>	<b>SPSS</b>	<b>Purpose</b>
QISAS1	N/A	Creates QI format library for SAS
QISAS2	QISPS1	Assigns indicators (0/1) for presence of HCUP QI outcome and population at risk
QISAS3	QISPS2	Calculates raw rates for HCUP QIs across stratifiers
QISAS3P	QISPS2P	Prints raw rates for HCUP QIs for all stratifier combinations
QISAS4	QISPS3	Calculates MDC-specific weights for HCUP QIs for complications among surgical patients
QISAS5	QISPS4	Standardizes HCUP QIs for complications among surgical patients based on State's MDC-specific casemix
QISAS5P	QISPS4P	Prints standardized HCUP QI rates for complications among surgical patients

## SAS program descriptions

This section describes the seven SAS programs that assign, calculate, and print the HCUP Quality Indicators.

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. These programs were developed using the HCUP Colorado Hospital Association inpatient data. As a result, the programs contain parameters (stratifiers; numbers of diagnoses, procedures, and procedure days) that are specific to the Colorado inpatient data. The changes noted for each program identify pieces of code that need to be modified if those parameters change.

Differences between HCUP QI Versions are noted when applicable.

The print programs, QISAS3P and QISAS5P, were designed to produce tables that are relatively easy to import into word processing documents, spreadsheets, or graphics software, at the user's option. The HCUP QI software does not produce graphical presentations of results.

### Flow of data through the HCUP QI programs

FIGURE 2 and FIGURE 3 illustrate the flow of data through the HCUP QI programs written in SAS. These diagrams show that:

- ▶ QISAS1, QISAS2, QISAS3, and QISAS3P will always be used.
- ▶ QISAS4, QISAS5, and QISAS5P are used *only* if your input data include procedure days – at a minimum, the day of the *principal* procedure.

FIGURE 2

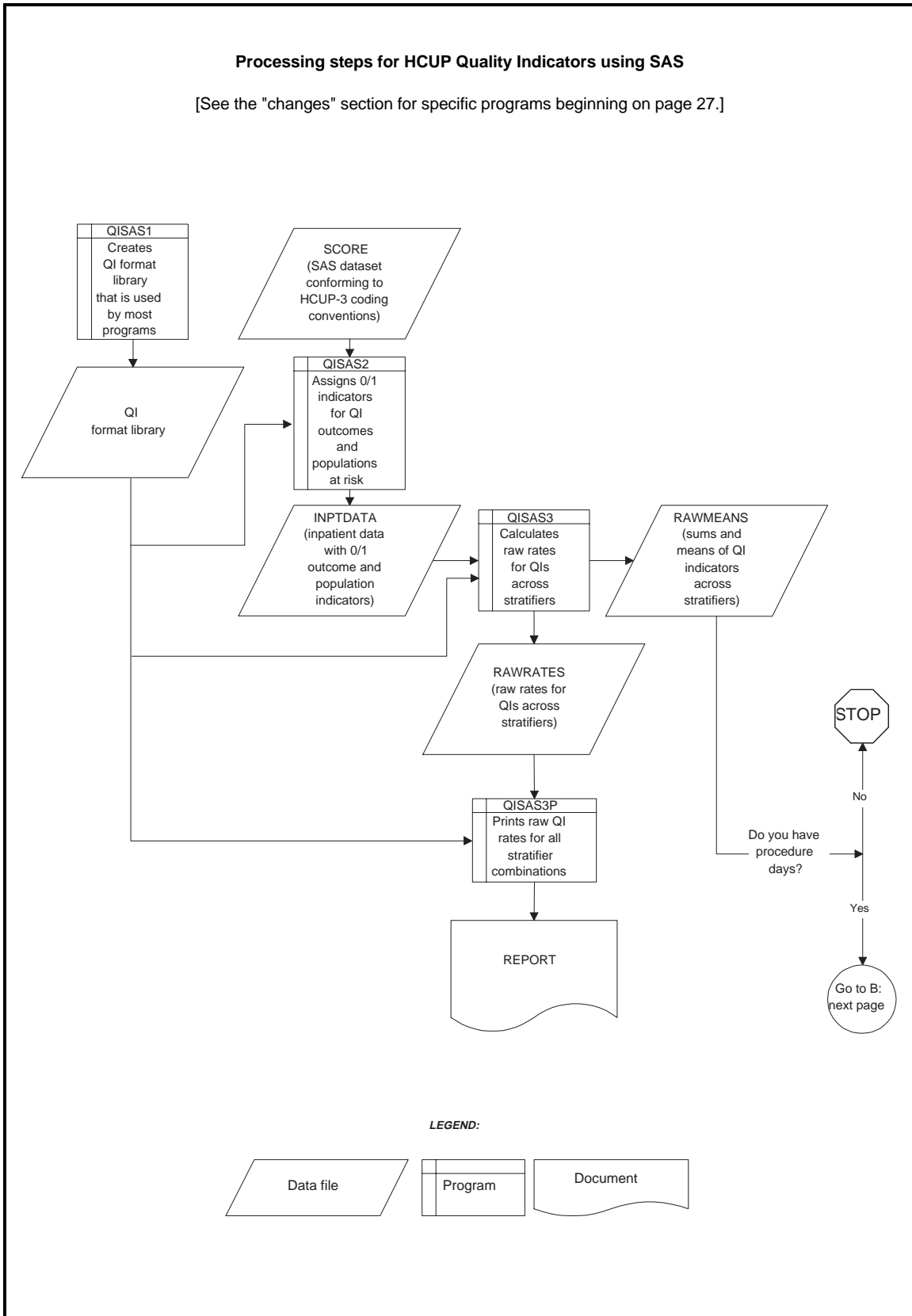
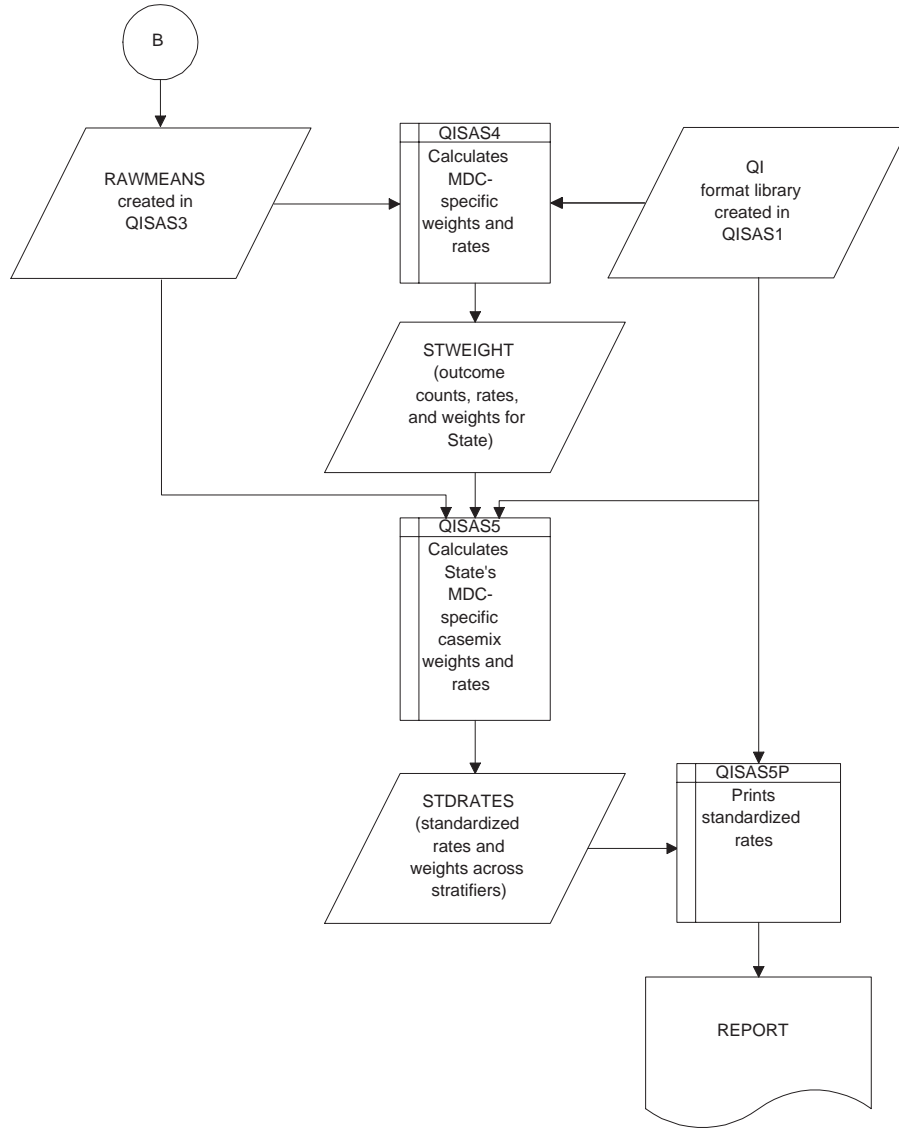


FIGURE 3

**Processing steps for standardization of HCUP QI rates using SAS**

[These steps pertain only to standardization of complications among surgical patients (QIs 4-14), which require procedure day variables. If no procedure day variables are available in the input dataset, these steps should be omitted. If applicable, see the "changes" section for specific programs beginning on page 32.]



**LEGEND:**



## **Program 1: QISAS1**

The QISAS1 program defines a format library, which contains the diagnosis and procedure screens necessary for assigning the outcomes of interest and populations at risk. This format library is used by most of the succeeding programs.

HCUP QI Version 1.3 updates ICD-9-CM and DRG coding through September 30, 1999.

Input: None.

Output: Permanent SAS format library (FMTLIB).

Changes: The first few formats are for the stratifiers. If users wish to change the stratifiers, these formats may need to be changed. The remaining formats are used for the assignment of quality indicators.

The code points to the C: drive for the format library output file. If you use another drive, this code must be changed.

## Program 2: QISAS2

The QISAS2 program assigns 0/1 indicators to the inpatient records for the HCUP QI outcomes of interest and populations at risk. Outcome indicator names have the suffix "\_T" (Top) for the numerator; population indicators have the suffix "\_P" (Pop) for the denominator. Stratifier variables are constructed at the beginning of the program and may be changed as outlined below according to the user's data and reporting requirements.

This program assumes that the input data file SCORE conforms to specific variable names, attributes, and coding conventions. See Table 6 (page 29) for variable names and attributes for the input data file SCORE. See *Data elements and coding conventions* (page 3) and Table 1 (page 6) for details on coding.

Version 1.1 includes a modification to ensure proper handling of records that contain no valid diagnoses.

Input: 1) SAS inpatient data (SCORE) conforming to HCUP coding conventions, and

2) SAS format library (FMTLIB) created from QISAS1 program.

Output: SAS dataset (INPTDATA) containing inpatient records with input variables, stratifiers, and 0/1 indicators for outcomes of interest and populations at risk. PROC CONTENTS of INPTDATA is output to hard copy.

Changes: 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.

2) This program assumes 5 diagnoses, 5 diagnosis validity flags, 5 procedures, 5 procedure validity flags, and 5 procedure days. If these numbers are different in the input inpatient data, then the KEEP and ARRAY statements at the beginning of the program need to be adjusted to accommodate the different number.

3) At the beginning of the program, three stratifiers are defined: substate region (METRO), third-party payer categories (PAYCAT), and patient race/ethnicity categories (RACECAT). These can be modified or replaced as needed. The remaining code assigns the QI flags.



Table 6. Attributes of variables in SCORE input data file for SAS					
Name	Description	Mainframe SAS		PC SAS	
		Type	Length	Type	Length
AGE	Age in years at admission	Num	2	Num	3
ASOURCE	Admission source	Num	2	Num	3
DISP	Disposition of patient	Num	2	Num	3
DRG	DRG, HCFA grouper	Num	3	Num	4
DSHOSPID	Hospital ID number	user-defined		user-defined	
DX1	Principal diagnosis	Char	5	Char	5
DX2-DXn	Secondary diagnosis <sup>a</sup>	Char	5	Char	5
DXV1	Validity flag, principal diagnosis	Num	2	Num	3
DXV2-DXVn	Validity flag, secondary diagnosis <sup>a</sup>	Num	2	Num	3
HOSPSTCO	Hospital State/county FIPS code	Num	4	Num	5
MDC	MDC, HCFA grouper	Num	2	Num	3
NDX	Number of diagnoses recorded on this discharge	Num	2	Num	3
NPR	Number of procedures recorded on this discharge	Num	2	Num	3
PAY1	Expected primary payer	Num	2	Num	3
PR1	Principal procedure	Char	4	Char	4
PR2-PRn	Secondary procedure <sup>a</sup>	Char	4	Char	4
PRDAY1	Number of days from admission to principal procedure	Num	3	Num	4
PRDAY2-PRDAYn	Number of days from admission to secondary procedure <sup>a</sup>	Num	3	Num	4
PRV1	Validity flag, principal procedure	Num	2	Num	3
PRV2-PRVn	Validity flag, secondary procedure <sup>a</sup>	Num	2	Num	3
RACE	Patient race/ethnicity	Num	2	Num	3
SEQ	Unique record identifier	user-defined		user-defined	
SEX	Patient sex	Num	2	Num	3

<sup>a</sup>Number of diagnoses and procedures will vary by user.

### **Program 3: QISAS3**

The QISAS3 program:

- ▶ Summarizes the 0/1 indicators for outcomes of interest ("\_T" variables) and populations at risk ("\_P" variables) by all combinations of stratifiers (e.g., State, hospital, substate region, expected primary payer, and race/ethnicity) and by Major Diagnostic Category, and
- ▶ Calculates the unstandardized HCUP QI rates for certain combinations of stratifiers (State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital). "All other" categories for payer and race/ethnicity are excluded from the file.

Input: 1) SAS format library (FMMLIB) created from QISAS1 program, and

- 2) SAS dataset (INPTDATA) containing inpatient records with input variables, stratifiers, and 0/1 indicators for outcomes of interest and populations at risk created in QISAS2.

Output: 1) SAS dataset (RAWMEANS) containing the sums and the means of indicators for outcomes of interest and populations at risk by all combinations of stratifiers.

- 2) SAS dataset (RAWRATES) containing the unstandardized HCUP QI rates for certain combinations of stratifiers.

Changes: 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.


- 2) The CLASS statement for the PROC MEANS specifies the stratifiers, which may be modified as needed, with one exception. The variable MDC is included in the CLASS statement to produce output required for the standardization programs; it should not be considered a stratifier and should not be modified.

- 3) The SELECT statement in the RAWRATES data step keeps only certain combinations of stratifiers. This can be modified as needed.

#### **Program 4: QISAS3P**

The QISAS3P program prints the unstandardized HCUP QI rates for certain combinations of stratifiers: State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital. "All other" categories for payer and race/ethnicity are excluded from the file.

Each HCUP QI is printed on a new page to facilitate conversion of output into word processing documents, spreadsheets, or other formats.

 *Rates based on only a few cases are printed but should be interpreted with caution.*

Input:

- 1) SAS format library (FMTLIB) created from QISAS1 program, and
- 2) SAS dataset (RAWRATES) containing the unstandardized HCUP QI rates for certain combinations of stratifiers created in QISAS3.

Output: Printed report.

Changes:

- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
- 2) The VAR and LABEL statements for each PROC PRINT identify the stratifiers. These can be modified as needed.

## Program 5: QISAS4

☞ Use this program *only* if your data include procedure days – at a minimum, the day of the *principal* procedure. If your data do not include procedure days, programs QISAS4, QISAS5, and QISAS5P are unnecessary and should be ignored.

The QISAS4 program:

- ▶ Prepares the State's MDC-specific casemix for use in QISAS5 to standardize the HCUP QI rates for complications among surgical patients, and
- ▶ Calculates and prints the State's rates and weights by MDC for complications among surgical patients indicators.

First, the sums of the indicators for outcomes and populations at risk for each indicator are summed across MDCs, and Total Population counts (represented by variables with a suffix of "TP") for the State are created. Then, the State Weights (variables with suffix "SW") and State Rates (variables with suffix "SR") are calculated. For each HCUP QI:

- ▶ State weights are the proportions of cases for each MDC for the State as a whole.
- ▶ State rates are the HCUP QI rates for the State overall, given the State's distribution of cases across MDCs.

Input:

- 1) SAS format library (FMTLIB) created from QISAS1 program, and
- 2) SAS dataset (RAWMEANS) containing the sums and the means of indicators for outcomes of interest and populations at risk by all combinations of stratifiers created in QISAS3.

Output: SAS dataset (STWEIGHT) containing the statewide rates and weights by MDC.

Changes:

- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
- 2) The State's rates and weights are calculated using the overall MDC record type (`_TYPE_ = 8`) from the raw means file (RAWMEANS). If the CLASS statement was changed in program QISAS3, the selection of `_TYPE_` needs to be appropriately adjusted in the first data step.

## Program 6: QISAS5

☞ Use this program *only* if your data include procedure days – at a minimum, the day of the *principal* procedure. If your data do not include procedure days, programs QISAS4, QISAS5, and QISAS5P are unnecessary and should be ignored.

The QISAS5 program standardizes the HCUP QIs for complications among surgical patients based on the State's MDC-specific casemix (created in QISAS4). Standardized HCUP QI rates are calculated for certain combinations of stratifiers (State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital). "All other" categories for payer and race/ethnicity are excluded from the file.

- Input:
- 1) SAS format library (FMTLIB) created from QISAS1 program, and
  - 2) SAS dataset (RAWMEANS) containing the sums and the means of indicators for outcomes of interest and populations at risk by all combinations of stratifiers created in QISAS3, and
  - 3) SAS dataset (STWEIGHT) containing the State rates and weights by MDC created in QISAS4.

Output: SAS dataset (STDRATES) containing the population counts and standardized rates for certain combinations of stratifiers.

- Changes:
- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
  - 2) The standardized rates are calculated only for certain combinations of stratifiers (State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital). To do this, different record types must be selected from the raw means files (RAWMEANS). If the CLASS statement was changed in program QISAS3, the selection of record types needs to be appropriately adjusted in a number of data steps.

## Program 7: QISAS5P

☞ Use this program *only* if your data include procedure days – at a minimum, the day of the *principal* procedure. If your data do not include procedure days, programs QISAS4, QISAS5, and QISAS5P are unnecessary and should be ignored.

The QISAS5P program prints the standardized HCUP QI rates for complications among surgical patients for certain combinations of stratifiers: State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital. "All other" categories for payer and race/ethnicity are excluded.

Each HCUP QI is printed on a new page to facilitate conversion of output into word processing documents, spreadsheets, or other formats.

☞ *Rates based on only a few cases are printed but should be interpreted with caution.*

Input:

- 1) SAS format library (FMTLIB) created from QISAS1 program, and
- 2) SAS dataset (STDRATES) containing the population counts and standardized rates for certain combinations of stratifiers created in QISAS5.

Output: Printed report.

Changes:

- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
- 2) The VAR and LABEL statements for the PROC PRINTs identify the stratifiers. These can be modified as needed.

## SPSS program descriptions

This section describes the six SPSS programs that assign, calculate, and print the HCUP Quality Indicators.

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. These programs were developed using the HCUP Colorado Hospital Association inpatient data. As a result, the programs contain parameters (stratifiers; numbers of diagnoses, procedures, and procedure days) that are specific to the Colorado inpatient data. The changes noted for each program identify pieces of code that need to be modified if those parameters change.

Differences between HCUP QI Versions are noted when applicable.

The print programs, QISPS2P and QISPS4P, were designed to produce tables that are relatively easy to import into word processing documents, spreadsheets, or graphics software, at the user's option. The HCUP QI software does not produce graphical presentations of results.

### Flow of data through the HCUP QI programs

FIGURE 4 and FIGURE 5 illustrate the flow of data through the HCUP QI programs written in SPSS. These diagrams show that:

- ▶ QISPS1, QISPS2, and QISPS2P will always be used.
- ▶ QISPS3, QISPS4, and QISPS4P are used *only* if your input data include procedure days – at a minimum, the day of the *principal* procedure.

FIGURE 4

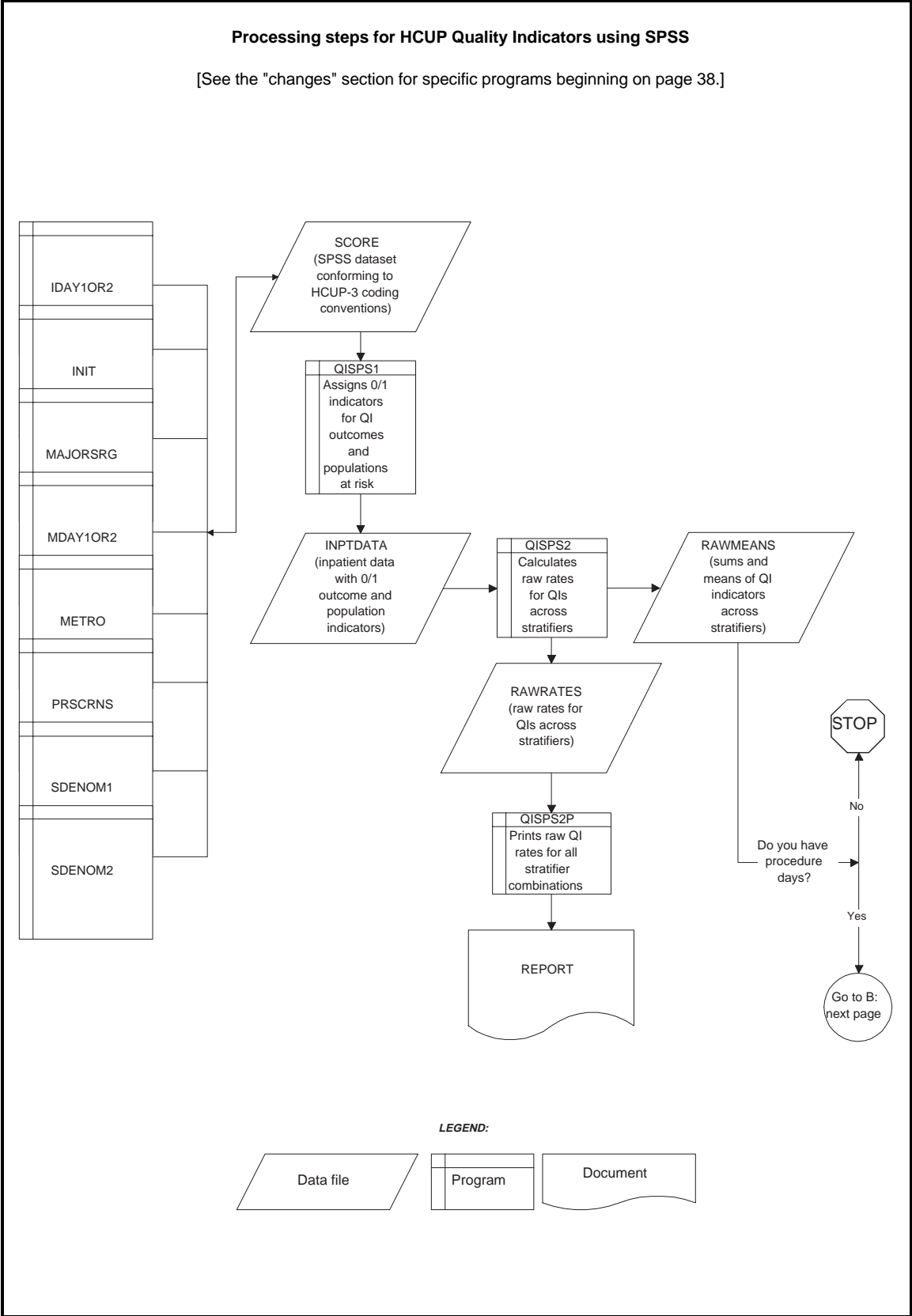
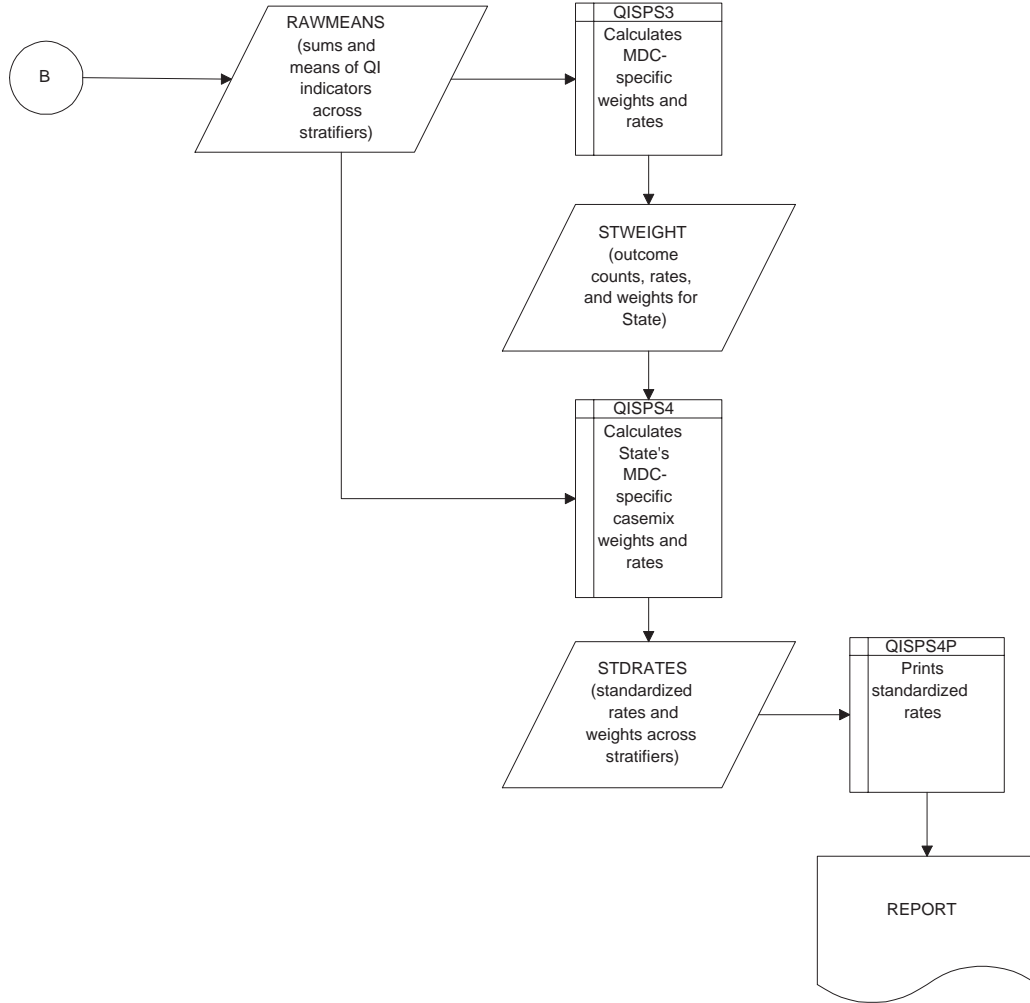




FIGURE 5

**Processing steps for standardization of HCUP QI rates using SPSS**

[These steps pertain only to standardization of complications among surgical patients (QIs 4-14), which require procedure day variables. If no procedure day variables are available in the input dataset, these steps should be omitted. If applicable, see the "changes" section for specific programs beginning on page 43.]



**LEGEND:**



## Program 1: QISPS1

QISPS1 is equivalent to QISAS1 and QISAS2.

The QISPS1 program assigns 0/1 indicators to the inpatient records for the HCUP QI outcomes of interest and populations at risk. Outcome indicator names have the suffix "\_T" (Top) for the numerator; population indicators have the suffix "\_P" (Pop) for the denominator.

QISPS1 uses eight subprograms (Table 7) to define stratifiers and assign indicators for outcomes and populations at risk. Stratifier variables are constructed in the METRO subprogram and may be changed as outlined below according to the user's data and reporting requirements.

Table 7. SPSS subprograms	
SPSS subprogram	Purpose
IDAY1OR2	Invasive cardiac procedures assigned from DRG selection
INIT	Initialize variables
MAJORSRG	Define major surgery and invasive vascular procedures using DRGs
MDAY1OR2	Define population: major surgery procedure on day 1 or 2
METRO	Define stratifiers for Colorado metropolitan areas, third-party payer categories, and race/ethnicity categories
PRSCRNS	Selection by procedure screen (outcomes)
SDENOM1	Define major surgery denominators
SDENOM2	Exclude transfers, adjust indicators, ensure that invasive vascular procedure does not overlap major surgery

This program assumes that the input data file SCORE conforms to specific variable names, attributes, and coding conventions. See Table 8 (page 40) for variable names and attributes for the input data file SCORE. See *Data elements and coding conventions* (page 3) and Table 1 (page 6) for details on coding.

Version 1.3 updates ICD-9-CM and DRG coding through September 30, 1999. In addition, Versions 1.1-1.3 includes improvements in efficiency for some computations (e.g., MDAY1OR2).

Input: SPSS inpatient data (SCORE) conforming to HCUP coding conventions. Variable names and attributes are provided in Table 8.

Output: SPSS dataset (INPTDATA) containing inpatient records with input variables, stratifiers, and 0/1 indicators for outcomes of interest and populations at risk.

- Changes:
- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
  - 2) This program assumes 5 diagnoses, 5 diagnosis validity flags, 5 procedures, 5 procedure validity flags, and 5 procedure days. If these numbers are different in the input inpatient data, then the KEEP and VECTOR statements at the beginning of the program need to be adjusted to accommodate the different number.
  - 3) Three stratifiers are defined in the METRO subprogram. They are substate region (METRO), third-party payer categories (PAYCAT), and patient race/ethnicity categories (RACECAT). These can be modified or replaced as needed. The remaining code assigns the HCUP QI flags.

<b>Table 8. Attributes of variables in SCORE input data file for SPSS</b>			
<b>Name</b>	<b>Description</b>	<b>Print format</b>	<b>Write format</b>
AGE	Age in years at admission	F8.2	F8.2
ASOURCE	Admission source	F8.2	F8.2
DISP	Disposition of patient	F8.2	F8.2
DRG	DRG, HCFA grouper	F8.2	F8.2
DSHOSPID	Hospital ID number	user-defined	user-defined
DX1	Principal diagnosis	A5	A5
DX2-DXn	Secondary diagnosis <sup>a</sup>	A5	A5
DXV1	Validity flag, principal diagnosis	F8.2	F8.2
DXV2-DXVn	Validity flag, secondary diagnosis <sup>a</sup>	F8.2	F8.2
HOSPSTCO	Hospital State/county FIPS code	F5	F5
MDC	MDC, HCFA grouper	F8.2	F8.2
NDX	Number of diagnoses recorded on this discharge	F8.2	F8.2
NPR	Number of procedures recorded on this discharge	F8.2	F8.2
PAY1	Expected primary payer	F8.2	F8.2
PR1	Principal procedure	A4	A4
PR2-PRn	Secondary procedure <sup>a</sup>	A4	A4
PRDAY1	Number of days from admission to principal procedure	F8.2	F8.2
PRDAY2-PRDAYn	Number of days from admission to secondary procedure <sup>a</sup>	F8.2	F8.2
PRV1	Validity flag, principal procedure	F8.2	F8.2
PRV2-PRVn	Validity flag, secondary procedure <sup>a</sup>	F8.2	F8.2
RACE	Patient race/ethnicity	F8.2	F8.2
SEQ	Unique record identifier	user-defined	user-defined
SEX	Patient sex	F8.2	F8.2

<sup>a</sup>Number of diagnoses and procedures will vary by user.

## **Program 2: QISPS2**

QISPS2 is equivalent to QISAS3.

The QISPS2 program:

- ▶ Summarizes the 0/1 indicators for outcomes of interest ("\_T" variables) and populations at risk ("\_P" variables) by all combinations of stratifiers (e.g., State, hospital, substate region, expected primary payer, and race/ethnicity) and by Major Diagnostic Category, and
- ▶ Calculates the unstandardized HCUP QI rates for certain combinations of stratifiers (State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital). "All other" categories for payer and race/ethnicity are excluded from the file.

Input: SPSS dataset (INPTDATA) containing inpatient records with input variables, stratifiers, and 0/1 indicators for outcomes of interest and populations at risk created in QISPS1.

- Output:
- 1) SPSS dataset (RAWMEANS) containing the sums and the means of indicators for outcomes of interest and populations at risk by all combinations of stratifiers.
  - 2) SPSS dataset (RAWRATES) containing the unstandardized HCUP QI rates for certain combinations of stratifiers.


- Changes:
- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
  - 2) The BREAK statement for the AGGREGATE procedures identifies the stratifiers, which may be modified as needed, with one exception. The variable MDC is included in the BREAK statement to produce output required for the standardization programs; it should not be considered a stratifier and should not be modified.

### **Program 3: QISPS2P**

QISPS2P is equivalent to QISAS3P.

The QISPS2P program prints the unstandardized HCUP QI rates for certain combinations of stratifiers: State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital. "All other" categories for payer and race/ethnicity are excluded.

Each HCUP QI is printed on a new page to facilitate conversion of output into word processing documents, spreadsheets, or other formats.

 *Rates based on only a few cases are printed but should be interpreted with caution.*

Input: SPSS dataset (RAWRATES) containing the unstandardized HCUP QI rates for certain combinations of stratifiers created in QISPS2.

Output: Printed report.

Changes: 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.

2) The VARIABLES statement in each REPORT procedure identifies the stratifiers. These can be modified as needed.

## Program 4: QISPS3

☞ Use this program *only* if your data include procedure days – at a minimum, the day of the *principal* procedure. If your data do not include procedure days, programs QISPS3, QISPS4, and QISPS4P are unnecessary and should be ignored.

QISPS3 is equivalent to QISAS4.

The QISPS3 program:

- ▶ Prepares the State's MDC-specific casemix for use in QISPS4 to standardize the HCUP QI rates for complications among surgical patients, and
- ▶ Calculates and prints the State's rates and weights by MDC for complications among surgical patients indicators.

First, the sums of the indicators for outcomes and populations at risk for each indicator are summed across MDCs, and Total Population counts (represented by variables with a suffix of "TP") for the State are created. Then, the State Weights (variables with suffix "SW") and State Rates (variables with suffix "SR") are calculated. For each HCUP QI:

- ▶ State weights are the proportions of cases for each MDC for the State as a whole.
- ▶ State rates are the HCUP QI rates for the State overall, given the State's distribution of cases across MDCs.

Input: SPSS dataset (RAWMEANS) containing the sums and the means of indicators for outcomes of interest and populations at risk by all combinations of stratifiers created in QISPS2.

Output: SPSS dataset (STWEIGHT) containing the State rates and weights by MDC.

- Changes:
- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
  - 2) If the stratifiers are changed in QISPS2, then corresponding adjustments are needed to the AGGREGATE procedures in this program as well.

## Program 5: QISPS4

☞ Use this program *only* if your data include procedure days – at a minimum, the day of the *principal* procedure. If your data do not include procedure days, programs QISPS3, QISPS4, and QISPS4P are unnecessary and should be ignored.

QISPS4 is equivalent to QISAS5.

The QISPS4 program standardizes the HCUP QIs for complications among surgical patients based on the State's MDC-specific casemix (created in QISPS3). Standardized HCUP QI rates are calculated for certain combinations of stratifiers (State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital). "All other" categories for payer and race/ethnicity are excluded from the file.

- Input:
- 1) SPSS dataset (RAWMEANS) containing the sums and the means of indicators for outcomes of interest and populations at risk by all combinations of stratifiers created in QISPS2, and
  - 2) SPSS dataset (STWEIGHT) containing the State rates and weights by MDC created in QISPS3.

Output: SPSS dataset (STDRATES) containing the population counts and standardized rates for certain combinations of stratifiers.

- Changes:
- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
  - 2) The standardized rates are calculated only for certain combinations of stratifiers (State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital). If stratifiers in QISPS2 were changed, then appropriate adjustments need to be made in this program.



## Program 6: QISPS4P

☞ Use this program *only* if your data include procedure days – at a minimum, the day of the *principal* procedure. If your data do not include procedure days, programs QISPS3, QISPS4, and QISPS4P are unnecessary and should be ignored.

QISPS4P is equivalent to QISAS5P.

The QISPS4P program prints the standardized HCUP QI rates for complications among surgical patients for certain combinations of stratifiers: State, hospital, substate region, expected primary payer, payer by hospital, race/ethnicity, and race/ethnicity by hospital. "All other" categories for payer and race/ethnicity are excluded.

Each HCUP QI is printed on a new page to facilitate conversion of output into word processing documents, spreadsheets, or other formats.

☞ *Rates based on only a few cases are printed but should be interpreted with caution.*

Input: SPSS dataset (STDRATES) containing the population counts and standardized rates for certain combinations of stratifiers created in QISPS4.

Output: Printed report.

Changes:

- 1) The code points to the C: drive for input and output files. If you use another drive, this code must be changed.
- 2) The VARIABLES statement in the REPORT procedures identifies the stratifiers. These can be modified as needed.

## References

<sup>1</sup>Ball, J.K., Elixhauser, A., Johantgen, M., et al. (1998). *HCUP Quality Indicators, Methods, Version 1.1: Outcome, Utilization, and Access Measures for Quality Improvement*. (AHCPR Publication No. 98-0035). Healthcare Cost and Utilization Project (HCUP-3) Research Note. Rockville, MD: Agency for Health Care Policy and Research.

<sup>2</sup>3M Health Information Systems. (1992). *DRGs: Diagnosis Related Groups Definitions Manual, Version 10.0*. Document No. 92-054 Rev. 00.

## **HCUP Quality Indicators**

### **User Support**

We would like to receive your feedback on the HCUP Quality Indicators.

Our Internet address for user feedback is:

HCUPNIS2@ahcpr.gov

For technical assistance related to the HCUP QI software, first refer to the appropriate section in this document and to the documentation embedded in the HCUP QI programs. If you need further assistance or would like more information about the HCUP QIs, contact:

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