Inpatient Quality Indicators:

Application of the AHRQ Module to New Jersey Data

Office of Health Care Quality Assessment
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Introduction

The Health Care Quality Assessment (HCQA) program of the New Jersey Department of Health and Senior Services assesses health care quality through collecting and analyzing qualitative and quantitative data reported by hospitals and other sources to support performance monitoring. Specifically, the HCQA group produces consumer reports on cardiac surgery and hospital performance; collects and reviews confidential reports and root cause analyses of serious medical errors; and maintains specialized databases to support licensure requirements. In an effort to enhance the information the Department makes available to the public on hospital care, HCQA staff has applied analytical tools developed by the Federal Agency for Healthcare Research and Quality (AHRQ) to New Jersey hospital inpatient discharge data.

This report is based on an application of the AHRQ Inpatient Quality Indicator (IQI) module (Version 2.1, Revision 3) to the 2003 New Jersey hospital discharge (or Uniform Billing) data. The report is organized into the following sections: *Background of the AHRQ Modules; Inpatient Quality Indicators; Interpretation of IQI Measures Presented in this Report; Inpatient Quality Indicator Analysis Results; State-Level Aggregate IQI Measures; and Summary of findings.* Definitions of Inpatient Quality Indicators and a guide to interpreting the software generated rates are provided in Appendices 1-2.

Background on the AHRQ Quality Indicators

AHRQ designed its quality assessment tools to employ Uniform Billing (UB) data, since this data set is readily available for large numbers of patients, thus increasing the statistical power of the analysis while avoiding the high cost of separately collecting data. The UB form is nationally standardized and contains a rich array of data. Each UB data submission contains information on the patient's primary and secondary diagnoses, procedures performed on the patient, whether the patient died or, if discharged alive, the discharge destination (e.g. home, to another hospital, to a skilled nursing facility, etc.), length of stay, charges billed, and patient demographic information, such as age, gender, race and ethnicity. In New Jersey a record of every hospital inpatient discharge, which is essentially a copy of the claim submitted to insurers for payment, is collected by the State and used for a wide variety of public health purposes. Over one million hospital inpatient UB records are collected each year in New Jersey. Additionally, because the UB is a standardized form and because AHRQ collects UB data from more than 40 states through its Healthcare Cost and Utilization Project (HCUP) State Inpatient Database (SID), application of these indicators permits computation of national rates that may be used for comparative, benchmarking purposes.

There are, however, well-recognized limitations to UB data sets for health research purposes. Although derived from medical records, UB data is developed by hospitals primarily for administrative billing purposes rather than clinical use. Not all clinically relevant data is included on the UB form, and the accuracy of data fields not most relevant to billing concerns, e.g. demographic data or discharge destination, has been questioned. Despite the limitations, however, UB data have been used by researchers for many important studies, including studies that focus on health care quality, access to care, health care costs, health disparities, and outcome studies. A recent Yale University study conducted under contract with the Centers for Medicare & Medicaid Services (CMS) found a strong correlation between UB and medical abstract data and demonstrated that models using UB data can be developed that have properties that would make them suitable for public reporting and meet the criteria necessary for statistical credibility.

It is clear that health care quality should not be judged solely on the basis of UB data. In fact, AHRQ emphasizes that no single source of information can be used to determine the quality of care in a hospital. Many factors affect the selection of a hospital, and quality indicators generated from application of the AHRQ modules are only one source of information to consider. Other factors that may affect a consumer's selection of a hospital include services a health plan covers, convenience, hospital where the doctor practices, and recommendations from family and friends. Nonetheless, AHRQ believes that information available in UB data can contribute to an assessment of hospital performance. Consumers can use the information provided in this report, along with other sources of information from the Department, such as the Hospital Performance Report and the Cardiac Surgery report, to talk with their doctor and take a more active role in making health care decisions.

Since the development in the early 1990's of the initial HCUP Quality Indicators, there has been considerable change in the field of health care service quality measurement. Risk-adjustment methods have become more readily available and new measures have been developed. In 2001, AHRQ funded a project to refine and further develop the HCUP Quality Indicators modules, utilizing the expertise of the University of California at San Francisco (UCSF)-Stanford Evidence-based Practice Center (EPC). The result is the current set of AHRQ QIs.

The AHRQ QIs are a set of quality indicators organized into three modules, each of which measures quality associated, by and large, with patient care that occurred in an outpatient or inpatient setting. These are:

- **Prevention Quality Indicators (PQI)** or ambulatory care sensitive conditions: These indicators identify hospital admissions that evidence suggests could have been avoided, at least in part, through high-quality primary care;

- **Inpatient Quality Indicators (IQI):** These indicators reflect quality of care inside hospitals. The indicators include five groups of measures, namely: *i) volume of procedures for which there is evidence that a higher volume of procedures is associated with lower mortality; ii) inpatient mortality for* *medical conditions; iii) inpatient mortality for surgical procedures; iv) hospital-level utilization of procedures for which there are questions of overuse, underuse, and misuse; and v) area-level (county-level) utilization of procedures.*

- **Patient Safety Indicators (PSI):** These indicators reflect quality of care inside hospitals with focus on potentially preventable and other iatrogenic events, resulting from exposure to the health care system.

According to AHRQ, the QIs are developed to:

- Help hospitals and hospital systems to compare their performance with other hospitals or statewide and national averages. For example, they would easily find answers to such questions as: *'How does our hospital's cesarean section rate compare to the statewide or the national rate?'*; *'Do other hospitals have similar mortality rates following hip replacement as our hospital?'*; *'How does the volume of coronary artery bypass graft in our hospital compare with other hospitals?'; etc.*

- Allow State agencies and community health partnerships to ask questions that would help provide initial feedback about clinical areas appropriate for further, more in-depth analysis. For example, a community health partnership would be able to find helpful feedback by asking such questions as: *'How does the hysterectomy rate in our county compare with other counties, the State and the national average?'; 'Where does our county stand in terms of its CABG rate?'; etc.*

- Help state hospital associations, managed care organizations, business-health coalitions, and others to do assessment of health care quality by providing answers to such questions as: *'Can we design community interventions in areas surrounding hospitals with high rates of diabetes complications?'; 'Which quality indicators can be incorporated into performance management initiatives for our member hospitals?', etc.*

This report presents findings resulting from the application of the Inpatient Quality Indicators to the 2003 New Jersey hospital discharge data. Results of the Prevention Quality Indicators and the Patient Safety Indicators modules will be presented separately in future reports.

The performance of the hospitals covered in this report can be affected by factors that are not within the hospital's control, such as patient or physician preferences, stage of illness, age, or other accompanying illnesses or conditions. While the data analysis method adjusts for some of these factors, it does not account for all possible factors.

Physicians direct the medical care that is delivered at hospitals, providing diagnoses and prescribing tests and treatments, including medications, surgical procedures, etc. This report does not separate the effect of the physician from the effect of the hospital. The quality of care provided in a hospital is dependent not only upon the skill of individual physicians, but also on how well the physicians, nurses, pharmacists, technicians, support staff and management work together, as well as on what technology and other resources are available in the facility. If a major change affecting one or more of these factors occurs - such as the departure of a key surgeon or the addition of new technology - the impact on care may be dramatic and quite sudden.

Inpatient Quality Indicators

The IQI module contains 34 indicators that reflect the in-hospital quality of inpatient care. These indicators are grouped into three major categories: *volume indicators, mortality indicators and utilization indicators*.

- **Volume indicators show the volume of cases for selected inpatient procedures for which there is a demonstrated link between the number of procedures performed and the outcomes, such as mortality or complication rates.**

Volume Indicators:

01. Esophageal Resection
02. Pancreatic Resection
03. Pediatric Heart Surgery
04. Abdominal Aortic Aneurysm
05. Coronary Artery Bypass Graft (CABG)
06. Percutaneous Transluminal Coronary Angioplasty (PTCA)
07. Carotid Endarterectomy

- **Mortality indicators measure death rates for selected common surgical procedures or medical conditions.**

Surgical Procedures:

08. Esophageal Resection
09. Pancreatic Resection
10. Pediatric Heart Surgery
11. Abdominal Aortic Aneurysm
12. Coronary Artery Bypass Graft (CABG)
13. Craniotomy (Surgical opening of the skull)
14. Hip Replacement
30. Percutaneous Transluminal Coronary Angioplasty
31. Carotid Endarterectomy

Medical Conditions:

15. Acute Myocardial Infarction (AMI)
16. Congestive Heart Failure
17. Acute Stroke
18. Gastrointestinal (GI) Hemorrhage
19. Hip Fracture
20. Pneumonia
32. AMI, Without Transfer Cases

- **Utilization indicators focus on the volume of selected procedures for which research has suggested issues of overuse, underuse, or misuse.**

Hospital-level:
21. Cesarean Section Delivery
22. Vaginal Birth after Cesarean, Uncomplicated
23. Laparoscopic Cholecystectomy
24. Incidental Appendectomy in the Elderly
25. Bi-lateral Cardiac Catheterization
33. Primary Cesarean Delivery
34. Vaginal Birth after Cesarean, All

Area-level:
26. Coronary Artery Bypass Graft (CABG)
27. Percutaneous Transluminal Coronary Angioplasty (PTCA)
28. Hysterectomy
29. Laminectomy or Spinal Fusion

The IQI module software produces *observed rates*, *risk-adjusted rates*, and *smoothed rates* for mortality and utilization indicators. This report focuses on the hospital-level risk-adjusted rates for each indicator. However, a brief explanation of all the rates outputted by the model and how they are interpreted is given in Appendix 2.

Observed Rates - An observed mortality rate is defined as the number of patient deaths for a specific condition or surgical procedure divided by the total number of patients admitted for the condition or surgical procedure being treated. Similarly, an observed utilization rate is defined as the number of patient cases for a specific procedure divided by the total number of patients admitted for the condition being treated. Consumers can consider observed rates as crude measures of performance. When compared to the risk-adjusted rates, consumers can see the impact of patient case-mix on that hospital's performance.

Risk-adjusted rates - In order for provider performance profiles to present an accurate indicator of quality of care, the data must be adjusted to account for differences in patients' severity of illness and risk of mortality. "All Patient Refined Diagnosis Related Groups" ("APR-DRGs") is a proprietary tool of the 3M Health Information Systems Corporation designed to use UB data to adjust for these patient differences. The AHRQ quality indicators methodology requires use of APR-DRGs in the analysis of UB data. APR-DRG variables take advantage of available UB data on patient co-morbidities and non-operating room procedures and allow the interaction of the patient's secondary diagnoses, principal diagnosis, and age to influence the assignment of that patient to one of four classes of severity and risk of mortality classes: low, moderate, high and very high. This risk adjustment enables comparisons among hospitals, counties, and/or states with different mixes of patients.

AHRQ's risk-adjusted rates are derived from applying to the observed rates the average case-mix of a baseline data file derived from the 2002 HCUP State Inpatient Data (SID) from 35 states. The risk-adjusted rate is the best estimate of what the hospital's rates would have been if the hospital had a mix of patients identical to a national-average patient mix for that year. The risk-adjusted rates reflect the age and sex distribution as well as the APR-DRG distribution of the data in the baseline file.

Interpretation of IQI measures presented in this report

- Data tables are arranged alphabetically by hospital name.
- The information in this report should be combined with that of other reports, including the Department of Health and Senior Services' annual Hospital Performance report, which focuses on how often hospitals apply proven processes of care in the treatment of certain conditions, and the Cardiac Surgery report, which measures isolated bypass mortality.
    - Please note that the Cardiac Surgery report is based on a more detailed clinical data on New Jersey open heart surgery patients collected separately from the UB data collection system. There are also differences in the type of open-heart procedures reviewed in this report and the Department's Cardiac Surgery report. Despite such data and methodology differences, consistency is expected between the measures derived from either approach.
    - Differences in data and methodology might also lead to conflicting hospital performance levels for the Hospital Performance Report and the AHRQ Inpatient Quality Indicators. This reinforces the need to consider a wide range of information on hospital performance.

Inpatient Quality Indicator Analysis Results

Volume Indicators

There are seven volume indicators for inpatient surgical procedures for which there is evidence that a higher volume of procedures is associated with lower mortality. These indicators are considered indirect or 'proxy' measures of quality, in that the volume of procedures is often related to outcome measures such as post-operative mortality and complications. Volume is simply the count of admissions during the year on which surgical procedures were performed. Definitions of the seven volume indicators are provided in Appendix 1. For each volume indicator, two types of thresholds have been established by AHRQ based on extensive review of literature related to each of the selected volume indicators. Threshold 1 represents the lowest annual volume of procedures performed by a hospital considered necessary to relate volume with achievement of better healthcare outcomes, while Threshold 2 represents a higher desired volume level. Annual volume indicator thresholds associated with each indicator are:

Volume Indicators	Threshold 1	Threshold 2
Esophageal resection	6	7
Pancreatic rescetion	10	11
Pediatric heart surgery	100	-
AAA repair	10	32
CABG	100	200
PTCA	200	400
Carotid endarterectomy	50	101

Table 1 presents volume of procedures performed by New Jersey hospitals. Where the cell entry is missing (.), it means that the hospital did not perform that particular procedure. Color shades indicate whether the hospital meets Threshold 1 or the count is a possible coding error.

Table 1. Volume of Procedures

Hospital Code	Esophageal Resection	Pancreatic Resection	Pediatric Heart	AAA Repair	CABG	PTCA*	Carotid Endarterectomy
(Volume Threshold 1):	*6*	*10*	*100*	*10*	*100*	*200*	*50*
(Volume Threshold 2):	*7*	*11*	*NA*	*32*	*200*	*400*	*101*
Statewide	**37**	**105**	**219**	**508**	**8,663**	**24,031**	**3,537**
a	.	.	.	4	.	5	9
aa	.	.	.	2	212	560	30
b	.	1	.	.	.	.	5
ba	.	.	.	2	.	.	13
c	.	.	.	1	.	.	27
ca	.	.	.	.	.	.	.
d	.	.	.	5	.	.	2
da	.	.	.	3	.	.	11
e	.	.	.	4	.	.	37
ea	.	.	.	1	.	.	1
f	1	.	.	2	646	2,142	35
fa	.	.	.	.	.	.	48
g	.	1	.	12	.	.	35
ga	.	.	.	1	.	.	25
h	.	.	.	4	.	.	41
ha	.	.	.	2	.	.	5
i	.	.	.	36	.	.	226
ia	.	3	4	8	299	836	54
j	.	.	49	21	587	1,450	93
ja	.	.	.	1	.	.	.
k	4	3	.	5	184	460	87
ka	.	.	.	.	.	.	.
l	7	5	.	23	812	2,462	199
la	.	.	.	1	.	.	.
m	.	1	.	3	.	.	43
ma	.	.	.	.	.	.	8
n	.	.	.	2	.	.	1
na	1	1	.	.	.	.	.
o	.	1	.	2	725	2,303	84
oa	.	4	.	21	.	.	107
p	1	.	.	.	.	.	5
pa	.	2	.	5	.	.	35
q	.	.	.	4	.	.	22
qa	.	.	.	5	.	.	34
r	.	1	.	1	.	.	6
ra	.	.	.	.	.	.	1
s	.	.	.	1	.	.	7
sa	.	.	6	1	.	1	102
t	6	9	4	40	1,121	2,246	185
ta	.	.	.	6	.	41	26
u	1	1	.	6	.	39	35
ua	1	.	119	6	536	1,531	37
v	.	.	.	1	.	.	.
va	.	.	.	12	.	1	68
w	1	.	.	14	549	2,131	136
wa	.	5	.	4	1	48	38

Table 1. Volume of Procedures

Hospital Code	Esophageal Resection	Pancreatic Resection	Pediatric Heart	AAA Repair	CABG	PTCA*	Carotid Endarterectomy
(Volume Threshold 1):	*6*	*10*	*100*	*10*	*100*	*200*	*50*
(Volume Threshold 2):	*7*	*11*	*NA*	*32*	*200*	*400*	*101*
x	.	1	.	1	.	.	15
xa	.	4	.	3	.	.	42
y	.	.	.	11	309	534	61
ya	.	.	.	1	.	.	12
z	.	.	.	3	.	.	16
za	.	.	.	2	.	.	25
zb	10	17	1	16	975	2,553	145
zc	.	.	.	4	.	65	49
zd	.	.	.	6	.	.	46
ze	.	.	.	3	.	.	62
zf	.	1	.	9	.	31	59
zh	.	.	.	3	.	.	12
zi	.	1	.	8	.	.	20
zj	.	.	.	.	.	.	37
zk	.	.	.	19	.	.	92
zl	.	8	5	16	354	852	47
zm	.	.	.	10	.	1	73
zn	.	.	.	.	.	.	.
zo	.	1	.	11	204	665	43
zp	.	.	30	6	340	1,094	73
zq	.	1	.	2	.	.	20
zr	2	.	.	5	.	.	19
zs	.	.	.	1	.	.	6
zt	1	.	.	16	.	1	56
zu	.	.	.	2	.	8	33
zv	.	11	.	4	152	479	9
zw	1	1	.	8	.	1	114
zx	.	1	.	.	.	.	19
zy	.	.	.	3	.	.	61
zz	.	16	.	21	657	1,488	74
zza	.	2	.	21	.	.	107
zzb	.	.	.	1	.	.	4
zzc	.	.	.	10	.	.	40
zzd	.	2	1	6	.	.	56
zze	.	.	.	3	.	3	23
zzf	.	.	.	1	.	.	4

(yellow) = Possible coding error
(orange) = Meets Threshold 1

* PTCA includes Primary PTCA. UB does not distinguish between interventional PTCA and Primary PTCA. Hence, hospitals that perform Primary PTCA are included.

Missing (.) indicates that the hospital did not perform the procedure during the year in question, hence hospital that perform primary PTCA are included.

AHRQ has conducted literature survey to find out the most commonly recommended threshold levels for each volume indicator. The lowest threshold level reported in the literature is set to be Threshold 1, while the highest threshold level reported is set as Threshold 2. Providers exceeding these thresholds are considered high volume providers. Volume thresholds for each indicator represent procedures performed by a given hopsital, in a year.

- Esophageal resection was performed by 15 hospitals in New Jersey in 2003, of which three met the minimum threshold, and two of these met the higher volume threshold as well. Almost 62 percent of the 37 total statewide esophageal resection procedures performed during the year were in these three hospitals.

- Three of 28 hospitals performing pancreatic resection in 2003 met both thresholds for the procedure. As a group, these three hospitals performed close to 42 percent of the statewide total of 105 procedures.

- There were 219 pediatric open heart surgeries in 2003. One hospital met the threshold standard of 100 cases by performing 119 procedures. It should be noted that only four hospitals in New Jersey are licensed to perform pediatric open heart surgery. The other hospitals shown as having pediatric heart surgery cases may reflect coding errors or may have performed cases that do not strictly qualify as pediatric open heart surgery cases according to New Jersey licensure standards.

- 72 hospitals performed a total of 508 abdominal aortic aneurism (AAA) repairs, but only eighteen met the minimum threshold volume of 10 cases, and of these, only two hospitals met the higher volume threshold of 32 cases.

- All seventeen New Jersey hospitals licensed in 2003 to perform cardiac surgery met the minimum standard of 100 coronary artery bypass graft surgery (CABG) cases, and all but two met the higher 200 case standard. Note that the State licensure minimum volume standard is 350 cases, and that hospitals that fall below this level are subjected to an alternative, outcomes-based assessment.

- There were 24,031 PTCA procedures performed by 23 hospitals in 2003, seventeen of which were licensed to perform both emergency and elective PTCA. The remaining six were licensed only to perform emergency PTCA on patients in the middle of a heart attack, for which the State licensure standards set a minimum volume of 36 cases per year within one year of start-up. All seventeen comprehensive PTCA centers met both AHRQ threshold volumes, and all of the six emergency angioplasty centers met the State standards. (Note: there are now 24 hospitals licensed to perform emergency angioplasty.)

- 75 hospitals performed a total of 3,537 carotid endarterectomies, with twenty-four meeting the minimum threshold of 50 cases. Of this group, nine hospitals met the higher threshold.

Mortality Indicators

There are 16 inpatient mortality indicators for surgical procedures and for medical conditions whose mortality rates vary substantially across hospitals and for which, according to AHRQ, evidence suggests that higher mortality rates may be associated with deficiencies in the quality of care. In general, a mortality rate is defined as the number of deaths divided by the number of patients admitted for a given procedure or condition, after adjusting for risk factors that AHRQ has built in the model. Nine of these indicators are for mortality due to surgical procedures, while the other seven are for in-hospital mortality due to medical conditions. Two of the nine indicators for mortality due to surgical procedures - PTCA and carotid endarterectomy - are recommended by AHRQ to be reviewed only in conjunction with the corresponding volume measures. Definitions for each of the 16 mortality indicators are provided in Appendix 1.

Mortality Rates for Surgical Procedures

Table 2 presents hospital-level risk-adjusted mortality rates for the nine indicators of mortality due to surgical procedures. Esophageal resection, pancreatic resection, and pediatric heart surgery are comparatively rare procedures; the other procedures, although more common on a statewide basis, may also be rare within a given hospital. It is very difficult, if not impossible, to achieve reliable results from a statistical analysis of small numbers, since any one case can have a large impact on the analysis. Nevertheless, risk-adjusted hospital-level data is presented in this table. Therefore, the hospital-specific results presented here should be viewed with great caution.

Table 2. Risk Adjusted Mortality Rates for Surgical Procedures (Deaths per 100 procedures)

Hospital Code	Esophageal Resection	Pancreatic Resection	Pediatric Heart	AAA Repair	CABG	PTCA*	Carotid Endarte-	Cranio-tomy	Hip Replace-
Statewide	**13.8**	**6.6**	**3.7**	**13.6**	**3.5**	**1.6**	**0.7**	**8.6**	**0.0**
a	.	.	.	76.2	.	.	0.0		.
aa	.	.	.	.	1.5	1.2	0.0		0.0
b	.	.	.	.	.	.	0.0	.	.
ba	.	.	.	.	.	.	0.5		
c	.	.	.	.	.	.	0.1		
ca	.	.	.	.	.	.	.	.	.
d	.	.	.	0.0	.	.	.	.	0.0
da	.	.	.	21.9	.	.	0.0		
e	.	.	.	1.1	.	.	0.0		0.0
ea	.	.	.	.	.	.	.	.	
f	.	.	.	.	3.9	2.0	3.0	.	.
fa	.	.	.	.	.	.	0.5	.	1.3
g	.	.	.	4.1	.	.	2.7		0.0
ga	.	.	.	.	.	.	0.3	.	
h	.	.	.	26.4	.	.	2.4		0.0
ha	.	.	.	.	.	.	0.0	.	
i	.	.	.	10.6	.	.	1.9		0.0
ia	.	0.4	.	0.0	6.8	1.2	0.2	14.5	0.0
j	.	.	3.9	7.4	4.2	1.7	0.3	.	.
ja	.	.	.	.	.	.	.	.	
k	39.5	23.8	.	8.4	2.3	1.4	1.7	6.2	0.6
ka	.	.	.	.	.	.	.	.	.
l	7.1	5.3	.	22.3	1.4	1.3	0.6	7.4	0.0
la	.	.	.	.	.	.	.	.	
m	.	.	.	9.4	.	.	0.2		0.0
ma	.	.	.	.	.	.	0.6		0.0
n	.	.	.	.	.	.	.	.	
na	.	.	.	.	.	.	.		
o	.	.	.	.	3.1	1.3	0.0	16.1	0.0
oa	.	0.0	.	23.4	.	.	0.2	4.8	0.0
p	.	.	.	.	.	.	0.0	.	
pa	.	.	.	0.0	.	.	0.4	.	
q	.	.	.	0.0	.	.	0.6	.	
qa	.	.	.	17.6	.	.	0.5	.	
r	.	.	.	.	.	.	0.7		
ra	.	.	.	.	.	.	.	.	
s	.	.	.	.	.	.	0.0	.	
sa	.	.	.	.	.	.	0.4	9.8	0.0
t	4.9	19.1	.	13.4	2.8	1.5	0.6		0.0
ta	.	.	.	36.0	.	1.6	0.4		0.0
u	.	.	.	18.5	.	5.8	0.3		0.0
ua	.	.	4.2	10.6	2.7	1.1	0.0		
v	.	.	.	.	.	.	.	.	0.0
va	.	.	.	25.6	.	.	0.4		0.1
w	.	.	.	6.9	4.7	2.1	0.1		0.0
wa	.	4.0	.	16.2	.	3.6	0.1	8.4	0.0

Table 2. Risk Adjusted Mortality Rates for Surgical Procedures (Deaths per 100 procedures)

Hospital Code	Esophageal Resection	Pancreatic Resection	Pediatric Heart	AAA Repair	CABG	PTCA*	Carotid Endarte-	Cranio-tomy	Hip Replace-
x	.	.	.	.	.	.	0.0		
xa	.	4.3	.	20.9	.	.	0.3		0.0
y	.	.	.	11.1	4.1	1.0	0.2	3.6	
ya	.	.	.	.	.	.	0.0	.	
z	.	.	.	0.0	.	.	0.0		
za	.	.	.	.	.	.	4.3	3.1	0.2
zb	21.1	0.0	.	15.2	3.7	1.7	0.5	8.4	0.0
zc	.	.	.	9.5	.	3.0	0.0		0.1
zd	.	.	.	3.0	.	.	0.0		
ze	.	.	.	0.0	.	.	0.3		0.0
zf	.	.	.	3.9	.	1.9	0.6	5.9	0.0
zh	.	.	.	18.7	.	.	0.0	20.8	0.0
zi	.	.	.	3.7	.	.	0.5	12.9	
zj	.	.	.	.	.	.	0.3		
zk	.	.	.	3.5	.	.	0.6	.	
zl	.	23.9	.	17.4	3.1	1.4	2.2	8.4	0.0
zm	.	.	.	19.4	.	.	0.3	10.6	1.3
zn	.	.	.	.	.	.	.	.	.
zo	.	.	.	15.9	3.5	1.8	0.1		
zp	.	.	2.5	17.0	3.3	1.5	1.5	13.7	0.0
zq	.	.	.	.	.	.	0.5	.	0.0
zr	.	.	.	4.4	.	.	0.3		
zs	.	.	.	.	.	.	0.0	.	
zt	.	.	.	9.0	.	.	0.1		0.0
zu	.	.	.	.	.	1.2	5.8		
zv	.	5.0	.	27.5	6.4	3.1	0.0	8.1	
zw	.	.	.	17.3	.	.	1.4	.	0.0
zx	.	.	.	.	.	.	0.4		0.0
zy	.	.	.	0.0	.	.	0.3		0.0
zz	.	12.5	.	13.7	4.2	1.2	0.5		0.3
zza	.	.	.	10.4	.	.	0.2		0.0
zzb	.	.	.	.	.	.	0.0	.	.
zzc	.	.	.	2.2	.	.	0.7		0.0
zzd	.	.	.	17.8	.	.	0.2	.	
zze	.	.	.	0.0	.	.	0.6	.	
zzf	.	.	.	.	.	.	0.0	.	

= Meets Volume Threshold 1.

= Rate suppressed because denominator is less than 30 (rate suppression is not applied on those that are also volume indicators where the threshold criteria is used for validity).

* PTCA includes Primary PTCA. UB does not distinguish between interventional PTCA and Primary PTCA. Hence, hospitals that perform Primary PTCA are included.

Missing (.) indicates that the hospital did not perform the procedure during the year in question; or it did less than 3 procedures (risk-adjusted rates are not computed when the denominator is less than 3).

- For AAA repair, and carotid-endarterectomy, the range of risk-adjusted mortality rates was narrower among those hospitals that met the minimum threshold compared to the range for all hospitals performing these procedures. For example, the range of risk adjusted mortality for AAA repair surgery was 0.0% to 76.2%. However, the range for those hospitals that met the minimum threshold of 10 cases was 2.2% to 25.6%. Similarly, the overall range for carotid-endarterectomy was 0.0% to 5.8% while the range for those that met the minimum threshold of 50 cases was 0.1% to 1.7%. There is no clear relationship between risk-adjusted rate and meeting the volume threshold for esophageal resection, pancreatic resection and pediatric heart surgery, as the hospitals that performed these procedures are very few, and a majority of them did not even meet the minimum thresholds.

- Risk-adjusted mortality rates for CABG surgery, where all hospitals with cases met the minimum volume threshold, ranged from a low of 1.5% to a high of 6.8%.

- The risk-adjusted mortality rate for PTCA ranged from 0.0% to 5.8%. However, when hospitals that are allowed to perform only the higher-risk emergency angioplasty are reviewed as a group, the risk-adjusted mortality rate ranged from 1.2% to 5.8%, while the range for hospitals performing both elective and emergency angioplasty ranged from 1.0% to 3.1%. It is not surprising that mortality rates would be higher in a group of patients in the middle of a heart attack compared to a group mixing emergency and elective patients

- Mortality from surgical procedures of carotid-endarterectomy and hip replacement is relatively low. There were 3,522 carotid-endarterectomy cases in New Jersey in 2003, with 18 deaths, for an observed mortality rate of 0.5%. Likewise, there were 4,482 hip replacement cases, with 15 deaths, for an observed mortality rate of 0.0%. The statewide risk-adjusted mortality rates for carotid-endarterectomy and hip replacement are 0.7% and 0.0%, respectively. Note that state-level rates include all hospital-level data that are suppressed due to low volume.

- Comparison of a specific hospital-level IQI rate to the statewide average for the same indicator is another way to see how well a hospital does among its peers. Note, however, that small numbers make it difficult to determine if the difference between an individual hospital's rate and the statewide average is significant.

- The data shows that, by and large, there is little consistency in a hospital's performance compared to the statewide average across the indicators.

Mortality Rates for Medical Conditions

Table 3 presents hospital-specific risk-adjusted mortality rates for selected medical conditions, i.e. *acute myocardial infarction (AMI) or heart attack, AMI excluding cases transferred into the hospital from another hospital, congestive heart failure, stroke, gastrointestinal hemorrhage, hip fracture, and pneumonia.* In contrast with surgical procedures, these medical conditions are much more common and there are many fewer instances where hospital-specific data are suppressed due to low volume. Nevertheless, hospital-specific volumes can still present reliability concerns because of small numbers.

- There were 17,473 AMI cases in New Jersey in 2003, with 1,770 deaths, for an observed mortality rate of 10.1%. The statewide risk-adjusted AMI mortality rate was 10.9% while the rate for AMI without transfer cases was 11.9%. On a hospital-specific basis, the risk-adjusted rate for AMI ranged from a low of 4.9% to a high of 21.4%. Statewide, there were 12,299 AMI without transfer cases, with 1,216 deaths, for an observed mortality rate of 12.3% and a risk-adjusted mortality rate of 11.9% (see Appendix 6 for all numerators, denominators and observed rates). Hospital-specific AMI risk-adjusted mortality rates ranged from 4.9% to 21.4%.

- There were 39,677 patients treated for congestive heart failure in New Jersey in 2003, of whom, 1,975 died, resulting in an observed mortality rate of 5.0% and a risk-adjusted mortality rate of 4.3%. On a hospital-specific basis, the risk-adjusted rate ranged from a low of 0.9% to a high of 7.9%.

- Of the 14,820 stroke patients treated in New Jersey hospitals in 2003, 1758 died, for an observed mortality rate of 11.8% and a risk-adjusted rate of 11.2%. Hospital-specific risk-adjusted stroke mortality rates ranged from a low of 2.5% to a high of 16.8%.

- There were 36,922 pneumonia patients in New Jersey hospitals, of whom 3,152 died, for an observed mortality rate of 8.5%. The statewide pneumonia risk-adjusted mortality rate was 10.6%. The hospital-specific risk-adjusted pneumonia mortality rate ranged from 6.4% to 19.8%.

- Once again, there appears to be little consistency across conditions when a hospital's mortality rate is compared to the statewide average.

Table 3. Risk Adjusted Mortality Rates for Medical Conditions (Deaths per 100 Conditions)

Hospital Code	AMI	AMI, without	Congestive Heart Failure	Stroke	GI Hemorrage	Hip Fracture	Pneumonia
Statewide	**10.9**	**11.9**	**4.3**	**11.2**	**0.0**	**3.8**	**10.6**
a	14.0	14.8	4.5	14.0	0.0	1.5	6.4
aa	11.0	12.0	4.8	9.6	0.0	3.0	12.7
b			3.9	2.5	0.0		9.2
ba	13.8	14.6	5.4	13.3	0.0	5.3	12.6
c	9.1		4.6	10.0	0.0	8.8	11.0
ca	16.3	17.1	1.4		0.0		13.1
d	15.7	16.5	3.8	10.7	0.0	1.8	8.7
da	16.7	17.5	4.8	11.9	1.7	2.5	10.3
e	8.3	9.2	4.8	6.5	0.1	7.5	9.8
ea			5.3	5.0	0.0		10.8
f	12.1		3.8	7.3	2.9		13.4
fa	13.7	14.5	4.7	11.3	0.0	1.9	10.5
g	12.9	13.7	5.1	7.6	0.0	3.8	13.6
ga	18.6	19.5	7.5	13.8	0.0	7.8	13.7
h	18.1	18.9	3.8	7.0	0.0	4.3	9.0
ha			4.8	9.5	0.0		12.7
i	13.6	14.4	5.1	14.1	0.0	3.1	9.9
ia	11.8	11.7	2.3	13.8	0.0	1.1	11.4
j	9.8		1.1	.	.	.	6.9
ja	9.0		5.6	8.7	0.9		11.2
k	12.5	13.1	4.4	13.0	3.3	1.7	14.2
ka			7.9	11.2	0.0		9.3
l	8.8	9.1	2.9	9.9	0.0	3.0	8.9
la	6.6	7.4	3.0	11.3	0.9	1.7	10.7
m	9.6		3.8	8.8	0.0	2.8	11.1
ma	9.6	10.5	0.9	5.8	0.0	1.7	9.2
n			4.0	11.5	0.6		11.1
na	11.0	11.9	5.3	16.8	1.4	3.3	8.0
o	10.4		3.6	12.2	0.0	3.2	11.0
oa	9.7	10.5	3.8	7.3	0.3	3.7	7.7
p	6.8	7.7	3.7	10.9	2.9	1.4	11.9
pa	8.4	9.3	2.8	10.8	5.3	5.1	8.5
q	13.2	14.1	3.1	16.0	3.4	3.3	7.0
qa	8.2	9.0	5.5	14.1	0.0	3.7	7.3
r	13.9	14.7	3.8	12.4	2.2	3.7	12.4
ra			5.8	8.8	3.3		19.8
s	5.6	6.4	3.6	9.9	0.0	1.1	7.3
sa	5.3	6.1	1.4	5.6	0.0	3.0	7.2
t	10.0	11.6	4.5	15.4	0.0	1.9	9.4
ta	12.3	13.2	6.0	9.7	0.0	2.9	10.8
u	7.9	8.8	4.2	10.6	0.0	4.3	10.2
ua	9.8	12.7	3.9	12.4	0.0		10.1
v	10.8	11.6	4.8	11.9	0.9	5.2	11.0
va	7.8	8.6	5.2	11.3	0.3	2.7	11.2
w	10.9	11.8	3.5	10.9	0.0	4.6	11.5
wa	13.6	14.5	3.8	13.9	0.1	4.9	10.1
x	10.6	11.4	6.5	11.4	0.0	6.7	13.7
xa	11.8	12.6	3.6	16.4	0.0	0.6	11.1

Table 3. Risk Adjusted Mortality Rates for Medical Conditions (Deaths per 100 Conditions)

Hospital Code	AMI	AMI, without	Congestive Heart Failure	Stroke	GI Hemorrage	Hip Fracture	Pneumonia
y	11.1	12.1	4.9	8.5	0.0	2.7	10.1
ya	4.9	5.7	3.7	6.4	1.9	5.0	8.8
z	8.8	9.7	5.9	15.4	0.6	4.5	10.0
za	10.9	11.8	4.7	10.0	1.0	4.8	11.0
zb	10.5	12.5	4.4	7.8	2.0	3.3	8.3
zc	6.3	7.2	3.0	8.6	1.3	5.1	10.1
zd	9.0	9.8	4.4	13.1	0.3	2.5	8.6
ze	9.4	10.2	3.6	16.2	1.1	6.6	14.8
zf	10.1	11.0	3.5	9.8	0.0	2.8	11.4
zh			5.4	15.3	1.1	3.1	11.2
zi	5.6	6.4	5.6	8.1	0.1	3.4	12.4
zj	12.2	13.0	4.4	14.7	0.7	4.0	12.8
zk	18.8	19.6	5.4	14.6	4.0	2.8	11.2
zl	9.3	10.3	4.0	9.6	0.7	4.0	12.2
zm	12.1	13.0	4.8	12.3	0.0	3.8	11.5
zn			4.5				11.8
zo	9.3	10.4	3.2	8.0	0.8	1.4	6.7
zp	12.3	13.5	5.3	14.1	0.0	3.2	12.3
zq	11.3	12.2	5.4	8.5	0.0	4.2	13.4
zr	21.4	22.5	6.3	9.5	0.0	5.1	10.3
zs			7.0		0.0	3.2	9.7
zt	11.6	12.5	2.6	8.3	0.0	5.6	10.6
zu	16.3	17.3	6.2	14.0	2.4	3.7	13.4
zv	14.3	14.2	2.6	12.8	4.3	2.0	9.7
zw	19.7	20.5	3.6	10.0	0.0	3.0	11.1
zx	12.3	13.1	3.4	11.7	2.8	4.6	10.0
zy	11.1	12.0	4.1	9.7	0.0	4.7	9.5
zz	9.7	10.0	3.6	10.7	0.0	3.8	10.6
zza	8.3	9.1	4.3	12.5	0.0	5.1	13.0
zzb	8.7	9.5	3.3	12.9	0.0	4.8	11.0
zzc	18.8	19.6	5.7	14.7	0.0	4.7	10.9
zzd	11.5	12.3	4.2	11.5	0.0	5.7	11.0
zze	6.5	7.3	2.5	6.6	0.0	5.7	9.6
zzf			3.6	12.2	0.0	6.4	9.6

= Rate suppressed because denominator is less than 30.

Missing (.) indicates that the hospital did not have admissions with that particular condition during the year in question; or it did have less than 3 admissions (risk-adjusted rates are not computed when the denominator is less than 3).

Utilization Indicators

There are seven hospital-specific utilization indicators of surgical procedures where the research literature suggests there is significant potential for overuse, underuse, or misuse. When measured at a hospital level, high or low rates of utilization could suggest inappropriate or inefficient delivery of care by hospitals, leading to worse outcomes, increased cost, or both. These indicators are measured as rates, such as the number of Cesarean-sections per birth in a hospital, the number of laparoscopic cholecystectomy per admission (with cholecystectomy), etc. It should be noted that there is no clear clinical consensus on appropriate utilization levels for these procedures, and that use of these indicators is likely to provoke debate among physicians.

Most of the utilization indicators are potentially overused procedures. The exceptions are VBAC and laparoscopic cholecystectomy, which are potentially underused. For most of these procedures there are no “right rates,” meaning there are no gold standards by which to measure performance. Very high rates could indicate an inappropriate overuse of procedure utilization while very low rates could signal inappropriate underutilization of procedures. Thus, peer group averages may be the best comparison available. Notable exceptions are bi-lateral cardiac catheterization and incidental appendectomy, where the appropriate rates are likely to be very small, and cesarean delivery and Vaginal Birth After Cesarean (VBAC) rates, which have established national Healthy People 2010 goals (15 cesarean deliveries per 100 births for first-time cesareans, and 37 VBACs per 100 births in women with previous cesarean section)[1]. However, the expert opinion on appropriate indications for C-section is very unsettled, and there are disagreements as to whether New Jersey’s high C-section rate ought to be a matter for concern.

Most provider-level utilization indicators are risk-adjusted using age, sex, and APR-DRGs. However, a few indicators cannot be adjusted this way, since the population at risk is characterized by a single APR-DRG without severity classification. For example, cesarean section delivery, primary cesarean delivery and VBAC rates are risk-adjusted by age only. Likewise, laparoscopic cholecystectomy rate is risk-adjusted by sex only. The risk-adjusted C-section and laparoscopic cholecystectomy rates imply that hospitals have higher or lower risk of receiving the procedure due to the demographic composition of the population in their service area, for example, younger population in the case of C-section, or a greater proportion of the lower-risk gender for laparoscopic cholecystectomy.

There are also four utilization quality indicators based on a geographic area, which AHRQ defines as a county or a Metropolitan Statistical Area. Since this analysis focuses on hospital-specific and statewide performance, county-level indicators are excluded from this report.

[1] Additional information on the Healthy People 2010 Maternal, Infant and Child Health Goals is available at http://www.healthypeople.gov/document/html/volume2/16mich.htm#_Toc494699664.

Hospital-level Utilization Rates

Table 4 presents the seven hospital-level risk-adjusted procedure utilization rates. The indicators used are cesarean section delivery, primary cesarean delivery, vaginal birth after cesarean (VBAC) - uncomplicated; vaginal birth after cesarean (VBAC) - all, laparoscopic cholecystectomy (gall bladder removal), incidental appendectomy in the elderly, and bi-lateral cardiac catheterization.

- The national observed cesarean delivery rate increased from 5.5% in 1970 to 24.7% in 1988, and fell to 20.7% in 1996. More recent data show that cesarean delivery rate was 27.5% in 2003 and 29.1% in 2004. There is considerable debate as to whether the increase has been driven by changing clinical indications, by concerns with potential malpractice suits, or by patient and physician preference for scheduled births.

- The statewide risk-adjusted cesarean section delivery rate for New Jersey in 2003 was 26.1%. Table 6 shows that hospital-specific risk-adjusted rates ranged from a low of 13.4% to a high of 35.7%.

- Because laparoscopic, or minimally invasive, cholecystectomy is identified as an underused procedure compared to traditional cholecystectomy, a higher hospital-specific rate is presumed to represent a better quality of care. The hospital-specific risk-adjusted laparoscopic cholecystectomy rate ranged from 71.4% to 95.8%.

- A lower incidental appendectomy rate is presumed to represent a better quality of care. The procedure is not recommended in the elderly because they have both a lower risk for developing appendicitis and a higher risk of complications after surgery. The statewide risk-adjusted incidental appendectomy utilization rate was 1.6%, meaning that, on average, only 1.6 of every 100 patients aged 65 or older in New Jersey who had an intra-abdominal procedure also had their appendix removed at the same time. Hospital-specific rates ranged from 0.0% to 9.0%.

- Bi-lateral cardiac catheterization is considered appropriate only in the presence of certain clinical indications, such as suspected pulmonary hypertension or significant right-sided valvular abnormalities, congestive heart failure, congenital heart disease, pericardial disease, and cardiac transplantation. The American College of Cardiology (ACC) and the American Heart Association (AHA) published expert consensus guidelines for cardiac catheterization laboratories stating that "without specific indications, routine right-side catheterizations are unnecessary." As a result, higher levels of bi-lateral cardiac catheterization may be an indicator of overuse. The statewide risk-adjusted bi-lateral cardiac catheterization rate was 10.2% in 2003. Hospital-specific rates ranged from 0.4% to 26.9%.

Table 4. Risk Adjusted Hospital-level Procedure Utilization Rates (Procedures per 100 Admissions)

Hospital Code	Cesarean Section	Primary Cesarean	Vaginal Birth After	Vaginal Birth After	Laparo-scopic	Incidental Appendectomy	Bi-lateral Cardiac
Statewide	**26.1**	**16.6**	**13.4**	**13.7**	**86.7**	**1.6**	**10.2**
a	31.9	21.6	13.9	14.7	88.5	0.0	
aa	26.5	15.9	5.0	5.5	91.3	2.2	25.3
b	34.1	19.7	4.7	5.7	72.1		
ba	34.8	20.7	2.3	1.9	83.9	1.8	5.2
c					93.2	0.0	1.8
ca						.	
d	23.8	15.2	7.9	9.2	83.8	0.0	
da					71.4	0.1	
e	16.7	9.6	30.1	31.4	88.0	0.0	5.7
ea	33.1	22.1	6.1	5.7	92.4	3.1	
f					77.8		6.5
fa	27.0	17.4	12.1	11.8	91.1	0.9	.
g	22.6	14.8	15.8	14.6	91.5	2.3	14.7
ga	35.7	24.9	8.9	9.0	82.7	4.1	2.6
h	28.3	15.5	9.5	9.6	92.3	0.0	0.4
ha	25.4	15.7	10.9	10.9	88.5	2.6	.
i	33.0	21.6	6.8	6.4	80.7	0.5	4.1
ia	23.1	14.1	25.7	29.2	83.1	2.4	26.9
j					.	.	5.5
ja					76.1		.
k	24.1	16.9	14.4	15.4	92.2	0.4	11.0
ka					70.8		
l	31.0	21.4	9.3	10.1	80.2	1.0	6.6
la	17.6	11.2	18.2	18.3	90.3	3.5	
m	25.6	16.1	13.9	13.7	85.9	2.3	3.4
ma	18.2	11.9	26.9	25.1	93.3	0.0	10.7
n					69.3		
na	28.9	17.2	20.4	22.1	81.5	3.4	3.7
o	26.8	15.5	11.8	12.4	87.8	4.3	6.4
oa	25.5	16.8	12.9	13.3	84.0	1.8	9.2
p					90.1		19.0
pa	25.2	15.8	17.0	16.6	83.4	4.8	
q	28.6	19.7	14.9	14.1	89.8	0.8	
qa	13.4	6.2	37.7	36.7	87.1	0.2	
r	25.3	18.0	16.6	15.5	72.1	2.9	
ra	32.7	20.6	10.1	10.1	93.6		13.6
s	27.3	16.0	3.8	3.4	93.8	0.0	18.6
sa	19.9	12.0	20.8	21.7	93.2	1.7	4.9
t	24.9	16.4	16.7	16.5	90.9	0.2	6.7
ta	31.2	20.8	8.6	8.9	93.8	1.2	9.7
u	16.7	7.7	13.5	13.5	84.7	1.7	7.7
ua	30.8	20.1	11.9	13.0	81.0	1.1	11.2
v	22.4	14.7	18.1	17.6	92.9	3.0	.
va	23.2	15.1	11.9	12.0	86.6	0.3	8.4
w	21.1	10.4	22.9	22.3	82.8	0.0	15.7
wa	28.8	17.7	9.3	9.1	90.2	2.7	3.7

Table 4. Risk Adjusted Hospital-level Procedure Utilization Rates (Procedures per 100 Admissions)

Hospital Code	Cesarean Section	Primary Cesarean	Vaginal Birth After	Vaginal Birth After	Laparo-scopic	Incidental Appendectomy	Bi-lateral Cardiac
x	27.3	17.2	8.1	7.6	89.2	1.5	6.2
xa	25.0	16.5	10.2	9.4	89.7	0.9	11.5
y	31.6	15.1	5.5	5.3	82.3	1.3	14.0
ya					91.8		
z	32.8	19.2	4.2	4.0	88.2	0.0	2.3
za	26.8	16.5	9.8	9.4	91.3	0.0	14.3
zb	23.9	11.1	16.5	17.3	73.9	0.6	10.0
zc	18.1	11.1	19.9	19.6	73.3	2.0	6.6
zd					83.9	0.4	2.8
ze	25.1	17.1	16.7	16.0	91.0	3.3	24.2
zf	26.0	18.4	11.5	11.9	91.2	0.9	8.1
zh	20.4	10.2	9.0	8.5	93.4	2.7	
zi	20.0	17.8	.	.	94.9	0.0	
zj	27.4	17.6	10.6	9.8	91.1	1.3	.
zk	31.0	20.6	14.4	14.0	91.8	9.0	.
zl	32.0	22.3	10.9	11.3	90.3	0.7	7.1
zm	26.0	16.8	13.0	12.4	92.4	3.9	4.9
zn					95.5		
zo					77.6	2.9	7.9
zp	29.5	19.6	8.3	9.0	76.8	5.3	8.0
zq	27.5	11.7	6.8	6.4	82.2	4.3	3.7
zr	28.5	20.5	14.1	13.7	90.6	1.8	
zs	31.5	17.0	1.1	0.9	80.1	3.2	
zt	24.2	15.8	13.8	13.8	89.1	0.5	3.5
zu	22.2	14.2	17.8	16.6	89.1	0.2	8.2
zv	22.6	13.2	26.3	29.8	60.3	0.0	5.6
zw	21.7	13.7	23.3	22.1	86.0	2.1	13.3
zx					89.6	0.1	
zy	20.1	12.8	7.9	8.5	95.8	1.2	6.6
zz	30.1	19.2	8.3	7.9	87.6	1.8	20.5
zza	29.9	19.6	12.9	12.5	85.2	2.2	3.0
zzb					86.5		
zzc					90.3	2.1	8.5
zzd	25.6	16.7	14.2	14.7	85.2	1.4	
zze	23.7	11.5	9.7	8.6	87.6	8.2	6.1
zzf					75.5		

[yellow] = Rate suppressed because denominator is less than 30.

[green] = Rate suppresed because of known coding erros (hospitals were not licensed for Obestetric and catheterization services in 2003)

Missing (.) indicates that the hospital did not perform the procedure during the year in question; or it did less than 3 procedures (risk-adjusted rates are not computed when the denominator is less than 3).

State-level Aggregate IQI Measures

Tables 5 and 6 below present statewide aggregate IQI measures for 2002 and 2003. The IQI measures discussed in this report are derived from the 2003 UB data. However, HCQA had initially analyzed the 2002 UB data and the statewide aggregate measures for 2002 are included in these summary tables. In addition, IQI measures for 2002 for New York, Texas and nationwide are included to show how New Jersey compares. Volume indicator measures are shown in Table 5 while measures for mortality and utilization indicators are presented in Table 6. (Other states now apply AHRQ QI tools to their UB data and publish results on their websites, but complete data from all other states doing this was not available at the time of this analysis. In particular, some states do not publish their actual rates, but rather only whether the rate was better or worse than expected, or better or worse than the statewide average.)

Table 5 presents 1) the number of hospitals in the state performing the surgical procedure; 2) the average number of procedures per hospital; 3) the number of hospitals in the state, meeting at least Threshold 1 for any particular procedure; and 4) percent of hospitals meeting Threshold 1. For national volume measures, the average number of procedures per hospital is presented.

- The average number of Esophageal Resection, Pancreatic Resection, and Pediatric Heart Surgery procedures performed by a hospital in New Jersey is about the same as the national average, while the average for AAA Repair and Carotid-endarterectomy is slightly lower than the national average. Conversely, New Jersey’s average for CABG and PTCA is higher than the nationwide average. For PTCA, however, it is important to note that hospitals performing primary or emergency, PTCA only are excluded from the denominator since the terms of their license limits these hospitals to performing PTCA only on patients in the middle of a heart attack. New Jersey’s licensure standards require a minimum of 36 cases per year for primary PTCA hospitals, compared to 200 cases per year for hospitals that may also perform elective PTCA.

- Percent hospitals meeting the minimum threshold is another way of comparing New Jersey’s performance with that in New York and Texas. In New Jersey, all hospitals that performed CABG and PTCA met the minimum threshold. In New York, on the other hand, only 60% of those that performed PTCA met the minimum threshold. In the case of carotid-endarterectomy, the percent of hospitals meeting the minimum threshold is significantly higher in Texas (80%) than in both New Jersey (33%) and New York (30%).

Table 5. Comparison of State-Level Volume Measures with National and Other States Volume Measures

Categories		Volume Indicators						
		Esophageal Resection	Pancreatic Resection	Heart Surgery	AAA	CABG	PTCA	Endarte-rectomy
National 2002	Average per Hospital	3	4	63	15	365	507	58
Texas 2002	# of Hospitals Performing Procedure	35	64	35	144	114	125	168
	Average per Hospital	2	5	45	11	222	387	59
	# of Hospitals meeting Threshold 1	1	7	6	48	111	118	134
	% hospitals meeting Threshold 1	2.9	10.9	17.1	33.3	97.4	94.4	79.8
New York 2002	# of Hospitals Performing Procedure	44	72	22	135	39	55	161
	Average per Hospital	3	6	56	10	484	738	48
	# of Hospitals meeting Threshold 1	6	9	3	49	34	33	47
	% hospitals meeting Threshold 1	13.6	12.5	13.6	36.3	87.2	60.0	29.2
New Jersey 2002	# of Hospitals Performing Procedure	15	32	3	72	17	17	78
	Average per Hospital	2	3	64	9	536	1,273	49
	# of Hospitals meeting Threshold 1	1	5	1	23	17	17	26
	% hospitals meeting Threshold 1	6.7	15.6	33.3	31.9	100.0	100.0	33.3
New Jersey 2003	# of Hospitals Performing Procedure	13	28	3	71	17	17	75
	Average per Hospital	3	4	66	7	510	1,399	47
	# of Hospitals meeting Threshold 1	3	2	1	18	17	17	24
	% hospitals meeting Threshold 1	23.1	7.1	33.3	25.4	100.0	100.0	32.0

National estimates represent hospital-level averages for 4,289 hospitals in the HCUP data from the 35 states.

For New Jersey, hospitals with known coding errors for Pediatric Heart Surgery, CABG and PTCA, are excluded from calculation of averages. Also, hospitals that perform Primary PTCA only, are excluded from calculating the average for PTCA.

It is important to note that hospitals with coding errors may not have been excluded in the calculation of national averages as well as those of New York and Texas.

Table 6 shows national and State-level IQI risk-adjusted mortality and utilization rates (%) for New Jersey, New York and Texas. It is important to note that several IQI indicators were added by AHRQ subsequent to the publication of the New York and Texas analyses. Thus, for these indicators, ‘NA’ for ‘Not Applicable’ appears on the table.

- Looking at the 2002 data, New Jersey performance was equal to or better than the national average for 13 out of the 16 (81%) mortality indicators. For utilization indicators, making comparison needs some caution. It is important to remember that four of the seven hospital-level utilization indicators (i.e. cesarean section delivery, primary cesarean delivery, incidental appendectomy, and bi-lateral catheterization) are indicators of overuse. For these indicators, lower rate implies better performance. The other three indicators (i.e. vaginal birth after cesarean-all, vaginal birth after cesarean-uncomplicated, and laparoscopic cholecystectomy) are indicators of underuse, and a higher rate for these indicators implies a better performance. Using these criteria, New Jersey is better than the national average for only three out the seven utilization indicators (43%).

- New Jersey’s performance was equal to or better than New York’s for only six out of the thirteen mortality indicators. By contrast, Texas’s performance was better than New Jersey’s on nine out of the thirteen mortality indicators. On the utilization indicators, however, New Jersey performed equal to or better than New York for only 50% of the indicators. By contrast, New Jersey’s performance was better than Texas’ on 4 out of the five indicators (80%).

Table 6. Comparison of State-Level IQI Risk-adjusted Rates (%)* with National and Other States Rates

IQIs (Mortality and Utilization Indicators)	Risk-Adjusted Rates (%)				
	National 2002	Texas 2002	New York 2002	New Jersey 2002	New Jersey 2003
Mortality Indicators for Surgical Procedures					
08. Esophageal Resection	13.3	8.2	6.2	5.6	13.8
09. Pancreatic Resection	9.4	5.0	3.2	8.5	6.6
10. Pediatric Heart Surgery	7.0	3.7	5.2	3.2	3.7
11. Abdominal Aortic Aneurysm	17.1	10.2	11.1	16.7	13.6
12. Coronary Artery Bypass Graft	3.7	3.5	3.2	3.7	3.5
13. Craniotomy	9.3	7.0	6.6	8.4	8.6
14. Hip Replacement	0.5	0.2	0.3	0.0	0.0
30. PTCA	1.9	NA	NA	1.7	1.6
31. Carotid Endarterectomy	1.0	NA	NA	0.9	0.7
Mortality Indicators for Medical Conditions					
15. Acute Myocardial Infarction	15.3	9.7	10.1	12.0	10.9
16. Congestive Heart Failure	5.5	4.2	5.4	4.6	4.3
17. Acute Stroke	11.0	9.8	12.2	12.1	11.2
18. Gastrointestinal Hemorrhage	3.4	2.9	3.7	0.0	0.0
19. Hip Fracture	4.0	2.1	3.5	4.3	3.8
20. Pneumonia	8.0	7.9	10.5	11.4	10.6
32. AMI, Without Transfer Cases	15.4	NA	NA	13.5	11.9
Utilization Indicators for Procedures					
21. Cesarean Section Delivery	23.3	30.4	26.7	24.1	26.1
22. VBAC, Uncomplicated	16.3	11.7	19.0	16.2	13.4
23. Laparoscopic Cholecystectomy	74.2	76.9	76.6	86.2	86.7
24. Incidental Appendectomy	2.7	2.2	1.8	1.8	1.6
25. Bi-lateral Cardiac Catheterization	9.5	6.1	7.1	11.3	10.2
33. Primary Cesarean Delivery	14.4	NA	NA	15.2	16.6
34. VBAC, All	15.8	NA	NA	16.4	13.7

IQI #s 30, 31, 32, 33, and 34 are new additions in the IQI SAS Software, Version 2.1, Revision 3. The National IQI measures and those of Texas and New York were computed prior to the release of Revision 3 in July 2004.

IQI #s 26, 27 28 and 29 which indicate area-level utilization rates are not shown here.

National estimates represent hospital-level averages for 4,289 hospitals in the 2002 HCUP data from the 35 states.

*: Mortality and utilization estimates given in percenatge points are risk-adjusted rates generated by the IQI SAS Software.

Overall Findings

- A number of New Jersey hospitals are performing fewer than the minimum volume threshold of certain surgical procedures, particularly high risk procedures such as esophageal and pancreatic resections and AAA repairs.

- New Jersey appears to have more overutilization than the national average for cesarean section delivery and bi-lateral catheterization.

- Statewide risk-adjusted surgical and medical mortality rates are generally in line with or better than the national average.

- There is considerable hospital-specific variation in the risk-adjusted mortality rates for most indicators, although the often small numbers involved suggest that one cannot draw reliable conclusions from this data.

- When one looks at hospital's performance across all surgical or medical mortality indicators, there is no clearly discernible pattern. In other words, although some hospitals showed some level of consistency across all measures, the majority of hospitals display considerable variation. There is insufficient evidence to conclude whether this lack of consistency across measures reflects the situation within hospitals accurately, or whether it is an indicator of the limitations of measures based on UB data and often involving very small numbers of cases.

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Appendices

Appendix 1. Definitions of Inpatient Quality Indicators

Volume Indicators

01: Esophageal Resection (Surgical removal of the throat): The esophagus is the tube that carries food from the mouth to the stomach. It sometimes has to be removed, usually due to cancer. This procedure is rarely done, and few hospitals do even one such operation in a year. Caution should be used in comparing hospital performance based on these rates. Volume for esophageal resection includes all discharges with ICD-9-CM codes of 4240 through 4242 in any procedure field, and a diagnosis code of esophageal cancer in any field.

02: Pancreatic Resection (Surgical removal of the pancreas): The pancreas is an organ that lies deep in the abdomen and produces important hormones, such as insulin. If cancer develops in the pancreas, removing the organ by surgery may be lifesaving. This procedure is rarely done, and few hospitals do even one such operation in a year. Caution should be used in comparing hospital performance based on these rates. Volume for pancreatic resection includes all discharges with ICD-9-CM codes of 526 or 527 in any procedure field, and a diagnosis code of pancreatic cancer in any field.

03: Pediatric Heart Surgery: This indicator reports the total number of many different types of heart surgeries performed by surgeons in a hospital on patients under age 18. Specifically, volume for pediatric heart surgery includes all discharges with ICD-9-CM procedure codes for either congenital heart disease (1P) in any field or non-specific heart surgery (2P) in any field, and ICD-9-CM diagnosis of congenital heart disease in any field (2D). The relationship with quality is that higher volumes of pediatric heart surgery have been associated with fewer in-hospital deaths.

04: Abdominal Aortic Aneurysm: An aneurysm is a defect or swelling in the wall of a weak or damaged artery. Aneurysms may form in the aorta, the main artery carrying blood from the heart. Aneurysms that occur in the part of the aorta within the abdomen are called abdominal aortic aneurysms. When the vessel swells to a certain size, it is likely to rupture, often causing death. This may be prevented by repair of the swelling before it bursts. In some cases, once the aneurysm has burst, the patient may be saved by emergency surgery to repair the vessel. Volume for AAA includes all discharges with ICD-9-CM codes of 3834, 3844, and 3864 in any procedure field with a diagnosis code of AAA in any field.

05: Coronary Artery Bypass Graft (CABG): A coronary artery bypass graft (CABG) is a surgical procedure to reroute or 'bypass' blockages in the arteries which carry blood to the heart. A CABG may be done to reduce chest pain, prevent heart attack or to treat other heart problems caused by blockages in the coronary arteries. Volume for CABG includes all discharges with ICD-9-CM codes of 3610 through 3619 in any procedure field on patients aged 40 years and older. AHRQ recommends that CABG volume should be used in conjunction with measures of mortality to assess quality. As noted in the literature, higher volumes of CABG have been associated with fewer deaths. However, the American Heart Association (AHA) and the American College of Cardiology (ACC) recommend that since some low-volume hospitals have very good outcomes, other measures besides volume should be used to evaluate individual surgeon's or hospital's performance.

06: Percutaneous Transluminal Coronary Angioplasty (PTCA): This procedure is a catheter-based interventional treatment to open blockages in the arteries that carry blood to the heart muscle. Volume for PTCA includes all discharges with ICD-9-CM codes 3601, 3602, 3605, or 3606 in any procedure field on patients 40 years old or more. The QI software also calculates in-hospital mortality for PTCA, so that the volumes for this procedure can be examined in conjunction with mortality. However, AHRQ states that the mortality measure should not be examined independently, because it did not meet AHRQ's criteria to stand alone as a measure.

07: Carotid Endarterectomy (CEA): The carotid arteries are the major arteries in the neck, which carry blood from the heart to the brain. If blockages develop in these arteries, stroke or other brain problems can result. Carotid endarterectomy is a surgery to remove blockages from these arteries and reduce the chance of stroke. All discharges with ICD-9-CM codes of 3812 in any procedure field are included in the volume for CEA. Generally, higher volume indicates better outcome, but caution is warranted in drawing conclusions about performance solely based on this indicator. The QI software calculates mortality for CEA (see IQI #31), so that the volumes for this procedure can be examined in conjunction with mortality.

Mortality Indicators

Mortality due to Surgical Procedures

08: Esophageal Resection (Surgical removal of the throat): The removal of the esophagus involves manipulation of vital organs in both the chest and the abdomen, together with reconstruction of a way to replace the function of the esophagus. The indicator is measured by the number of deaths per 100 patients with discharge procedure code of esophageal resection (discharges with ICD-9-CM codes of 4240 through 4242 in any procedure field, and a diagnosis code of esophageal cancer in any field).

09: Pancreatic Resection (Surgical removal of the pancreas): Surgical removal of the pancreas may be the only treatment option for those with cancer of the pancreas. The indicator is measured by the number of deaths per 100 patients with discharge procedure code of pancreatic resection (discharges with ICD-9-CM codes of 526 or 527 in any procedure field, and a diagnosis code of pancreatic cancer in any field).

10: Pediatric Heart Surgery: The indicator is defined as the number of deaths per 100 patients (age less than 18 years) with selected discharge procedure code of pediatric heart surgery in any field (ICD-9-CM diagnosis of congenital heart disease). Hospital performance based on pediatric heart surgery outcomes must be taken with caution. Although the mortality rate may be an indicator of the quality of care, some hospitals may limit their surgeries to simpler kinds of pediatric heart surgery, and refer more complex cases with a higher risk of death to other specialized hospitals, which APR-DRG adjustment may not be adequate to account for. Where there is a situation that such hospital disparities occur, AHRQ recommends that this indicator be considered with length of stay, transfer rates, and breakdown in the types of surgeries performed to account for differing discharge practices among hospitals. In New Jersey, there are only four hospitals licensed for pediatric heart surgery.

11: Abdominal Aortic Aneurysm (AAA) Repair: Surgery may be performed to prevent rupture of a ballooning vessel (aneurysm). Patients with a diagnosed AAA are monitored to determine when surgical intervention is required. Patients requiring this procedure usually have disease of other major vessels as well, which may lead to stroke or heart attack during or after the major surgery required to repair the abdominal aorta. This surgery usually is performed by surgeons who specialize in repair of blood vessels, and at hospitals where other specialists are available to deal with the expected complications. The type of aneurysm and other patient-related factors greatly affect the mortality rate for this procedure. The mortality rate is defined as the number of deaths per 100 patients with procedure code of AAA repair (discharges with ICD-9-CM codes of 3834, 3844, and 3864 in any procedure field and a diagnosis code of AAA in any field).

12: Coronary Artery Bypass Graft (CABG): AHRQ states that coronary artery bypass graft is a relatively common procedure that requires proficiency with the use of complex equipment; technical errors may lead to clinically significant complications such as myocardial infarction, stroke, and death. CABG mortality is one of the most widely used and publicized post-procedural mortality indicators. Demographics, comorbidities, and clinical characteristics of severity of disease are important predictors of outcome that may vary systematically by hospital. AHRQ recommends that this indicator be considered with length of stay and transfer rates to account for differing discharge practices among hospitals. The indicator is defined as the number of deaths per 100 patients with procedure code of CABG (discharges with ICD-9-CM codes of 3610 through 3619 in any procedure field).

13: Craniotomy (Surgical opening of the skull): Craniotomy for repair of aneurysms (ballooning or bursting of blood vessels) is a demanding operation that is almost always associated with high risk of disability or death. Nevertheless, it may be the only option available when a blood vessel ruptures deep in the brain. The mortality rate for this operation may be high even in the hands of an extremely experienced neurosurgical team, who are likely receiving the more difficult cases by transfer. The adjustments used in this model to control for risk factors may not fully reflect the many types of risks associated with this complex surgery, which often is performed on an emergency basis. Hence, its use as quality indicator needs caution. In any rate, it represents the number of deaths per 100 patients (age >17) with DRG code for craniotomy (i.e., DRG 001, 002, 528, 529, and 530), with and without comorbidities and complications.

14: Hip Replacement: Planned replacement of a diseased hip joint with an artificial joint is a common procedure to treat disabling pain or improve hip function. It is an elective procedure performed among patients with chronic osteoarthritis, rheumatoid arthritis, or other degenerative processes involving the hip joint. The mortality rate is low for this procedure, as would be expected in a procedure designed to improve function rather than extend life. The patients are often elderly, and many have multiple medical conditions. The indicator is defined as the number of deaths per 100 patients with discharge procedure code of partial or full hip replacement (discharges with diagnosis codes for osteoarthrosis of hip in any field).

30: Percutaneous Transluminal Coronary Angioplasty: The indicator is defined as the number of deaths per 100 patients with PTCA codes in any procedure field (discharges with ICD-9-CM codes 3601, 3602, 3605, or 3606 in any procedure field; age 40 years and older). AHRQ recommends that PTCA mortality rate must be used in conjunction with PTCA volume rather than as a stand-alone indicator.

31: Carotid Endarterectomy (CEA): The mortality rate for CEA is defined as the number of deaths per 100 CEA cases (discharges with ICD-9-CM codes of 3812 in any procedure field). AHRQ recommends that CEA mortality rate must be used in conjunction with CEA volume rather than as a stand-alone indicator.

Mortality due to Medical Conditions

15: Acute Myocardial Infarction (AMI): According to the American Heart Association, if a heart attack victim gets to an emergency room fast enough, prompt care dramatically reduces heart damage. Timely and effective treatments for acute myocardial infarction (AMI), which are essential for patient survival, include appropriate use of revascularization or thrombolytic therapy. The indicator is defined as the number of deaths per 100 patients with a principal diagnosis code of AMI (age 18 years and older).

32: Acute Myocardial Infarction without transfers: This quality measure was added in Revision 3 of the AHRQ IQI Software to reflect the desire of users, to have an alternative method of measuring AMI mortality that excluded patients transferred from another hospital. Hospitals that routinely admit transfer cases from another short-term hospital(s) may see an unusually high AMI mortality rate. Thus, IQI-32 excludes AMI patients transferred-in from another hospital. The negative side of this method is that transferred AMI patients are excluded from any quality measurement (since outgoing transfers are already excluded from transferring-out hospitals. For that reason, some users prefer to use the AMI Mortality Rate (IQI #15) to ensure the inclusion of all AMI patients.

16: Congestive Heart Failure (CHF): CHF is one of the most common and severe heart diseases affecting Americans, and one of the most common reasons for hospitalization. Congestion is the presence of an abnormal amount of fluid in the tissues, usually because of limitations in the body's ability to return the flow of blood from the arms or legs to the heart and lungs. Though CHF has many possible underlying causes, the end result is an inability of the heart muscle to function well enough to meet the demands of the rest of the body. CHF mortality is influenced greatly by other medical problems, including lung disease, high blood pressure, cancer and liver disease. The mortality rate for this measure is defined as the number of deaths per 100 patients with principal diagnosis code of CHF (age 18 years and older).

17: Acute Stroke: A stroke is a disruption in the blood supply to the brain. A stroke occurs when a blood vessel bringing oxygen and nutrients to the brain bursts, or is clogged by a blood clot or some other particle. Treatment for stroke must be timely and efficient to prevent brain tissue death, and differs significantly based on which of the two types of stroke a patient has suffered. For example, clot-busting drugs are appropriate for strokes caused by clots, but could be fatal in the case of a burst blood vessel. Mortality rates will vary based on the cause of the stroke, the severity of the stroke, other patient illnesses, speed of arrival at the hospital, and speed of diagnosis of the type of stroke. Moreover, clinical factors, including use of mechanical ventilation on the first day, may vary by hospital and influence mortality. The mortality rate for Acute Stroke is defined as the number of deaths per 100 patients with principal diagnosis code of stroke (age 18 years and older). Risk adjustment for clinical factors (or at a minimum, APR-DRGs) is recommended.

18: Gastrointestinal (GI) Hemorrhage: GI hemorrhage is the loss of blood from the esophagus, stomach, small intestine or colon. While many cases are relatively minor, some are life-threatening or fatal. The risk of death mostly is related to the reason why the bleeding began, along with patient factors, such as age and other illnesses. Quality of care by providers is reflected in their ability to control and manage severely ill patients with comorbidities. However, the evidence for substantial variance in mortality rates being due to differences in provider performance is weak. Thus, the indicator should be interpreted with caution. The rate is defined as the number of deaths per 100 discharges with principal diagnosis code of GI hemorrhage (age 18 years and older).

19: Hip Fracture: Hip fracture is a common cause for hospitalization in the elderly, and usually happens to individuals with several co-morbid conditions. Many people die in the first six months after hip fracture, and most of these deaths do not occur in the hospital. Older men admitted from nursing homes are the most likely to die of hip fracture in the hospital. The evidence for substantial variance in mortality rates being due to differences in provider performance is limited, and this indicator should be interpreted with caution. The mortality rate is defined as the number of deaths per 100 patients with principal diagnosis code of hip fracture (age 18 years and older).

20: Pneumonia: Pneumonia involves an infection in the lungs. Pneumonia typically is treated with antibiotics, sometimes in an outpatient setting. However, death may occur even when the patient is in the hospital, especially in patients with weakened respiratory systems or other chronic health problems. There is a significant impact on outcomes from patient co-morbid factors as well as physician admitting practices (since there is variation in the criteria physicians use to admit patients for inpatient treatment). In-hospital pneumonia mortality rate is defined as deaths per 100 discharges with principal diagnosis code of pneumonia (age 18 years and older).

Utilization Indicators

Hospital-specific Utilization Indicators

21: Cesarean Section Delivery: Cesarean delivery is the most common operative procedure performed in the United States and is associated with higher costs than vaginal delivery. Cesarean delivery rate for the U.S. has increased from 5.5% in 1970 to a high of 24.7% in 1988 and decreased to 20.7% in 1996. The AHRQ rate based on the 2002 HCUP data from 35 States is 23.3%. Despite a recent decrease in the rate of cesarean deliveries, many organizations have aimed to monitor and reduce the rate. Babies in the breech position, prior c-section(s), the number of previous births, placental or umbilical cord complications, infections, and high or low birth weight are factors that may cause a woman to have a c-section. Hospitals that serve as referral centers for high risk pregnancies, those with intensive care units for very sick babies, and those serving mothers who have not had the benefit of prenatal care can be expected to have higher c-section rates. The relationship to quality is that cesarean delivery has been identified as an overused procedure. As such, lower rates represent better quality of care. The rate is defined as the number of cesarean deliveries identified by DRG, or by ICD-9-CM procedure codes per 100 deliveries.

33: Primary Cesarean Delivery: This represents number of cesarean section deliveries among women with no history of previous cesarean delivery. The relationship to quality is that cesarean delivery has been identified as an overused procedure. As such, lower rates represent better quality. The indicator is defined as the number of cesarean deliveries per 100 deliveries by mothers who had no previous cesarean section (the denominator excludes patients with abnormal presentation, preterm delivery, fetal death, multiple gestation diagnosis codes, breech procedure codes, or a previous cesarean delivery diagnosis in any diagnosis field).

22: Vaginal Birth after Cesarean (VBAC), Uncomplicated: Just because a woman has had one cesarean section delivery does not necessarily mean she must deliver future babies by c-section. Many women have normal deliveries even though they had a c-section in the past. The model provides information on the proportion of vaginal births that occurred to mothers who had delivered previously by cesarean section. The relationship to quality is that VBAC has been identified as a potentially underused procedure. As such, higher rates represent better quality. The indicator is defined as the number of in-hospital vaginal births per 100 births to women with previous history of cesarean delivery (denominator excludes patients with abnormal presentation, preterm delivery, fetal death, multiple gestation diagnosis codes, and breech procedure codes in any diagnosis field).

34: Vaginal Birth after Cesarean (VBAC), All: This indicator includes all vaginal deliveries among women with previous cesarean deliveries. The relationship to quality is that higher VBAC rates represent better quality. The indicator is defined as the number vaginal births in a hospital per 100 births to women with previous cesarean deliveries (the denominator includes all deliveries with a previous cesarean delivery diagnosis in any diagnosis field but excludes patients with abnormal presentation, preterm delivery, fetal death, multiple gestation diagnosis codes, or breech procedure codes in any diagnosis field).

23: Laparoscopic Cholecystectomy: Surgical removal of the gall bladder (cholecystectomy) performed with a laparoscope has been identified as an underused procedure. Laparoscopic cholecystectomy is associated with less morbidity in less severe cases. AHRQ states that cholecystectomy is now performed with a laparoscope in about 75% of uncomplicated cases. In less severe cases, the laparoscopic technique is associated with fewer complications than the traditional open method. However, the laparoscopic technique might not be possible due to patient condition or anatomy. Since the model includes only those cases that are performed on hospital inpatients, it does not present a complete picture of the occurrence of this procedure. Nonetheless, the relationship to quality is that higher rates represent better quality. The utilization rate for this indicator is defined as the number of laparoscopic cholecystectomies per 100 cholecystectomies (the denominator includes all discharges with any procedure code of cholecystectomy in any procedure field).

24: Incidental Appendectomy in the Elderly: Removal of the appendix incidental to other abdominal surgery - such as urological, gynecological, or gastrointestinal surgeries - is intended to eliminate the risk of future appendicitis. However, incidental appendectomy is not recommended in the elderly because they have both a lower risk for developing appendicitis and a higher risk of complications after surgery. As such, lower rates represent better quality. The indicator reports the number of incidental appendectomies per 100 elderly patients (age 65 or older) with intra-abdominal procedure.

25: Bi-lateral Cardiac Catheterization: Cardiac catheterization is a diagnostic test that can show if blood vessels to the heart are narrowed or blocked. This indicator reports the proportion of patients who received right-side coronary catheterization incidental to left-side catheterization. It is usually not recommended unless clinical indications suggest that right-side catheterization be done incidental to left-side catheterization. It is an indicator of procedure overuse. The indicator reports provider-level bilateral cardiac catheterizations (simultaneous right and left heart catheterizations) per 100 discharges with procedure code of heart catheterization (the denominator includes all heart catheterizations in any procedure field).

Area-Level Utilization

26: Coronary Artery Bypass Graft: CABG may be an elective procedure that can be overused. Since no ideal elective CABG rate has been established as a benchmark, AHRQ employs State averages as points of reference. Therefore, rates that are less than the State average are presumed to represent better utilization quality. The indicator reports the number of all CABGs discharges (age 40 years and older) in any procedure field per 100,000 resident county population. For statewide rates, the indicator is defined as the number of CABGs per 100,000 Statewide population.

27. Percutaneous Transluminal Coronary Angioplasty: Elective PTCA has been identified as a potentially overused procedure. Therefore, rates that are lower than the State average are presumed to indicate better quality of utilization. PTCA as an area-level utilization indicator is defined as the number of PTCA procedures per 100,000 resident county population (age 40 years and older).

28. Hysterectomy (Surgical removal of whole or part of the womb): This indicator has been identified as a potentially overused procedure. Hysterectomy is performed on patients with a number of indications, such as recurrent uterine bleeding, chronic pelvic pain, or menopause, usually in some combination. Since no ideal rate for hysterectomy has been established as a benchmark, area-level rates are compared against State averages. Therefore, rates that are lower than the State average are presumed to represent better quality of care. The indicator reports the number of hysterectomies per 100,000 resident county population (age 18 years or older) or per 100,000 Statewide population, in the case of State-level rates.

29. Laminectomy or spinal fusion (Surgical removal of the posterior vertebral arch): Laminectomy is performed on patients with a herniated disc or spinal stenosis (decrease in diameter). Laminectomy has been identified as a potentially overused procedure, although no ideal rate has been established for reference purposes. Therefore, rates that are lower than the State average represent better quality of care. The indicator is defined as the number of hysterectomies per 100,000 resident county population (age 18 years and older).

Appendix 2. Explanation of Rates

Observed Rates

The observed mortality rate is defined as the number of patient deaths for a specific condition or surgical procedure divided by the total number of patients admitted for the condition or surgical procedure being treated, while the observed utilization rate is defined as the number of patient cases for a specific procedure divided by the total number of patients admitted for the condition being treated. Consumers should consider observed rates as crude measures of performance, since they take no account of the variation in patient risk factors among hospitals.

Risk-adjusted rates

In order for provider performance profiles to present an accurate indicator of quality of care, the data must be adjusted to account for differences in patients' severity of illness and risk of mortality. "All Patient Refined Diagnosis Related Groups" ("APR-DRGs") is a proprietary tool of the 3M Health Information Systems Corporation designed to use UB data to adjust for these patient differences. The AHRQ quality indicators methodology requires use of APR-DRGs in the analysis of UB data. APR-DRG variables take advantage of available UB data on patient co-morbidities and non-operating room procedures and allow the interaction of the patient's secondary diagnoses, principal diagnosis, and age to influence the assignment of that patient to one of four classes of severity and risk of mortality classes: low, moderate, high and very high. This risk adjustment enables comparisons among hospitals, counties, and/or states with different mixes of patients.

AHRQ's risk-adjusted rates are derived from applying to the observed rates the average case-mix of a baseline data file derived from the 2002 HCUP State Inpatient Data (SID) from 35 states. The risk-adjusted rate is the best estimate of what the hospital's rates would have been if the hospital had a mix of patients identical to a national-average patient mix for that year. The risk-adjusted rates reflect the age and sex distribution as well as the APR-DRG distribution of the data in the baseline file.

Smoothed rates

Risk adjustment using observed patient factors such as age, sex, or APR-DRG can be made to account for differences in case-mix by hospital or by county. However, there are many other clinical and non-clinical factors that cannot be observed. AHRQ notes that many factors other than quality can influence the observed rate and states that indicators defined on relatively small populations per provider or indicators based on relatively rare events are very noisy measures. The multivariate signal extraction (MSX) method estimates how much of an impact, random differences in these factors across providers or areas have on the observed rate. Smoothed rates are risk-adjusted estimates obtained after removing fluctuations due to random variation over time. Shrinkage factors are applied to the risk-adjusted rates for each IQI in a process called multivariate signal extraction (MSX). These shrinkage factors were calculated from the 2002 HCUP SID on data from 35 states. For each IQI, the shrinkage estimate reflects a 'reliability adjustment' unique to each indicator. The less reliable the IQI over time and across hospitals or areas, the more the estimate 'shrinks' the IQI toward the overall area mean. The resulting rate will appear "smoother" than the observed rate, meaning the year-to-year fluctuations in performance are likely to be reduced.

The model does not calculate smoothed rates for two indicators, *esophageal resection (#08) and carotid endarterectomy (#31)*. These events are so infrequent that analysis based on such rare cases could not detect enough systematic provider-level variation to compute the smoothed rates.

While risk-adjustment eliminates differences among providers by population characteristics, smoothing levels the field by removing random variation that arises over time among providers. In essence, smoothing describes how persistent a provider's rate would be from year to year.

Comparing Observed Rates with Risk-adjusted Rates

The purpose of the analysis determines which rates the user should look at in evaluating the performance of a provider or an area. If the user's primary interest is to focus on a particular provider or area without any comparisons to other providers or areas, simply examine the overall observed rate for the entire provider or area, as well as further breakdowns by age, sex, payer, and race/ethnicity.

If the purpose of the analysis is to compare the performance of a particular provider or area with national, state, or regional averages or performances of other selected providers or areas, then both observed and risk-adjusted rates should be examined. Variation in observed rates across providers or areas is attributable to a variety of factors including differences in patient casemix or population demographics, disparity in access to and quality of care, and other provider or area characteristics ('systematic factors'), and random factors (non-systematic factors or 'noise'). Comparing observed and risk-adjusted rates can reveal if there is any difference between the provider/area's population and the population of other providers/areas. If the difference is minimal, one can compare the observed rate with the overall average across all providers or areas. However, to account for differences in patient casemix or population demographics among different providers or areas, risk-adjusted rates should be used for provider or area-by-area comparisons.

If observed rate > risk-adjusted rate then:

- For mortality indicators - The provider's patient population for the condition or procedure has a *higher* risk of mortality due to its case-mix (for example, older or a greater proportion of a higher-risk APR-DRG).

- For utilization indicators - The provider/area's population has a *higher* risk of receiving the procedure due to its demographic composition (for example, older or a greater proportion of a higher-risk gender).

If observed rate < Risk-adjusted rate then:

- For mortality indicators - The provider's patient population for the condition or procedure has a *lower* risk of mortality due to its casemix (for example, younger or a greater proportion of a lower-risk APR-DRG).
- For utilization indicators - The provider/area's population has a *lower* risk of receiving the procedure due to its demographic composition (for example, younger or a greater proportion of a lower-risk gender).

If observed rate = risk-adjusted rate then:

- For mortality indicators - The provider's patient casemix for the condition or procedure is similar to other providers', suggesting that patient composition is not a contributing factor to the provider's performance for the mortality indicator.
- For utilization indicators - The provider/area's population is similar to other providers/areas' in demographic composition.