Measuring The Quality Of Pennsylvania's Commercial HMOs

CALENDAR YEAR 2005

TECHNICAL REPORT

THE PENNSYLVANIA HEALTH CARE COST CONTAINMENT COUNCIL

April 2007

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Copies of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report and this document, the *Technical Report*, can be obtained by contacting the Council, or can be accessed electronically via the Council's Web site.

The Pennsylvania Health Care Cost Containment Council
225 Market Street, Suite 400
Harrisburg, PA 17101

Phone: (717) 232-6787
Fax: (717) 232-3821

Web site: http://www.phc4.org

Office Hours: 8:30 a.m. – 5:00 p.m.

TECHNICAL REPORT

MEASURING THE QUALITY OF PENNSYLVANIA'S COMMERCIAL HMOS CALENDAR YEAR 2005

OVERVIEW

This technical supplement accompanies the calendar year 2005 version of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report. Included in this *Technical Report* are detailed descriptions of the data and their sources, explanations for the adjustments to the data, and presentation of the methodology used for risk adjustment of the utilization and clinical outcomes data. Also included are detailed explanations for data collection and verification procedures, selection of clinical conditions and outcomes for study, and other comparative measures. Descriptions of the ratings of HMOs by members and plan profile information are further explained.

The *Measuring the Quality of Pennsylvania's Commercial HMOs* report provides information related to the quality of health care services received by members of commercial Health Maintenance Organizations (HMOs), Gatekeeper Preferred Physician Organizations (GPPOs) and related Point of Service (POS) plans licensed by the Department of Health to do business in Pennsylvania. Throughout this report, the term HMO represents HMO, GPPO and POS data unless otherwise specified. The report brings together information from several sources that are of interest to purchasers, consumers, payors, and providers. This collection of information and data allows all interested readers to make comparisons among HMOs based upon a comprehensive set of data.

Utilization and outcome measures are provided for specific clinical conditions/treatments included in the report. The research methodology that yielded utilization and outcome ratings was complex and differs for all clinical conditions. Methodology development was based upon state-of-the-art research practice. This development included a review of the current medical outcome literature, discussions with practicing medical professionals, and careful examination and approval by the Council's Technical Advisory Group. Each clinical condition was selected because:

- it is of high importance to purchasers and consumers,
- it is generally a high-volume, high-risk, or high cost condition/procedure, and
- its management by HMOs and their providers can reasonably be expected.

DATABASES

The databases used to analyze each of the clinical conditions were derived from discharge data submitted to PHC4 by Pennsylvania hospitals.

The Statewide database was comprised of cases where the patient:

- was under 65 years of age (except for diabetes in which the age interval was 18 years through 75 years),
- met the clinical inclusion criteria for one of the conditions investigated (see Appendix A: "Description of Study Population"), and
- was discharged from a Pennsylvania *general acute care* (GAC) or *specialty GAC* hospital (or received care in an inpatient or ambulatory surgical setting for mastectomy or neck and back procedures) between January 1, 2005 and December 31, 2005.

The HMO database was derived from the statewide database and included:

- aggregate hospitalizations for members of all commercial HMOs included in this report.

The "Fee-for-Service" Sample (Convenience) database was derived from the statewide database and included:

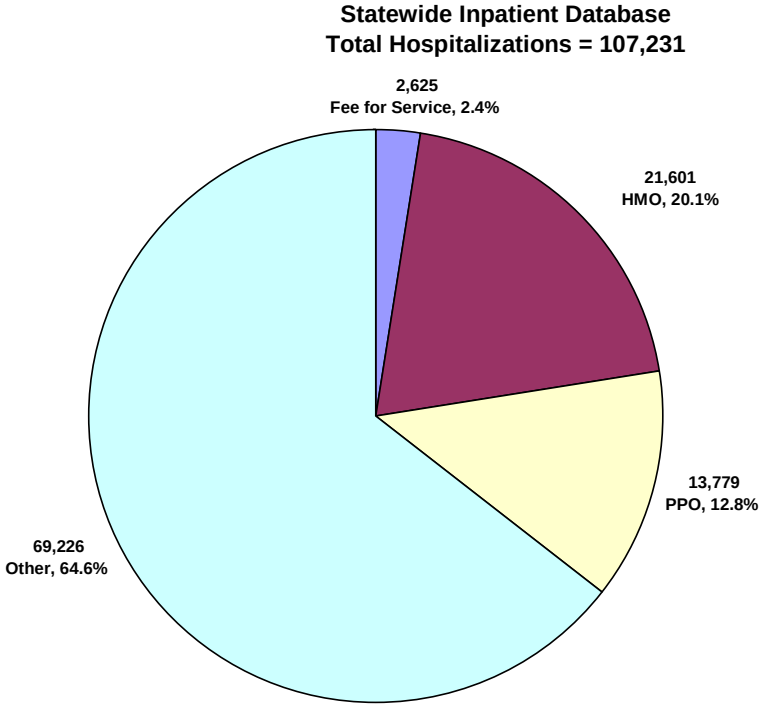
- aggregate hospitalizations for members of commercial, traditional "fee-for-service" plans (this group included only those patients who were clearly identified in a hospital record and verified by the plans as members of one of the larger fee-for-service plans in Pennsylvania). Hospitalization rates per member are not reported for this group because detailed enrollment data by plan were not available.

The "Preferred Provider Organization" sample was derived from the statewide database and included:

- aggregate hospitalizations for members of PPO plans (this group included only those patients who were clearly identified in a hospital record and verified by the plans as members of one of the larger PPO plans in Pennsylvania). Hospitalization rates per member are not reported for this group because detailed enrollment data by plan were not available.

The "Other" group in the statewide database included:

- Hospitalizations where the payor was Medicare, Medicaid, or self-pay, as well as those records where the payor could not be identified.



Databases Used in the Risk Adjustment Process

Depending upon the condition under study, individual HMO plan data was compared to the statewide database, the HMO, fee-for-service and PPO sample databases combined, or the HMO database alone. Table 1 lists the comparative databases that were used to determine expected percents for each appropriate PHC4 measure (where actual percents were compared to expected percents), and to risk adjust each PHC4 measure that involved risk adjustment. For example, the statewide database for neck and back procedures included those cases where the patients met the definition criteria for neck and back procedures and were under age 65 but over age 17. This statewide database was then used as the comparative standard when determining the risk-adjusted length of stay for each HMO plan for neck and back procedures.

Results are presented in the public report in a manner that allows the reader to visually compare the results for individual HMO plans and the HMO state total/average. When the comparative reference was the statewide database or the HMO, fee-for-service, and PPO sample combined database, summary data are also shown for the fee-for-service and PPO samples.

Table 1. *Comparative References*

Reported Measure	Database Used
Hospitalization/Procedure Rate	
▪ Pediatric Ear, Nose and Throat Infections	HMO Hospitalizations (members 28 days – 17 years)
▪ Adult Ear, Nose and Throat Infections ▪ High Blood Pressure	HMO Hospitalizations (members 18 – 64 years)
▪ Gastrointestinal Infections ▪ Kidney/Urinary Tract Infections	HMO Hospitalizations (members 28 days – 64 years)
▪ Chronic Obstructive Pulmonary Disease	HMO Hospitalizations (members 18 – 64 years)
▪ Pediatric Asthma	HMO Hospitalizations (members 28 days – 17 years)
▪ Adult Asthma	HMO Hospitalizations (members 18 – 64 years)
▪ Diabetes	HMO Hospitalizations (members 18 – 75 years with diabetes)
▪ Hysterectomy ▪ Mastectomy ▪ Neck and Back Procedures	HMO Hospitalizations (members 18 – 64 years)
Length of Stay	
▪ Chronic Obstructive Pulmonary Disease	HMO, PPO and Fee-for-Service Sample Hospitalizations (members 18 – 64 years)
▪ Pediatric Asthma	HMO, PPO and Fee-for-Service Sample Hospitalizations (members 28 days – 17 years)
▪ Adult Asthma	HMO, PPO and Fee-for-Service Sample Hospitalizations (members 18 – 64 years)
▪ Diabetes	HMO, PPO and Fee-for-Service Sample Hospitalizations (members 18 – 75 years with diabetes)
▪ Hysterectomy ▪ Mastectomy ▪ Neck and Back Procedures	Statewide Hospitalizations (age 18 – 64 years)
Rehospitalization Rating –180 days	
▪ Chronic Obstructive Pulmonary Disease ▪ Asthma (adult only)	HMO, PPO and Fee-for-Service Sample Hospitalizations (members 18 – 64 years)
▪ Diabetes	HMO, PPO and Fee-for-Service Sample Hospitalizations (members 18 – 75 years with diabetes)
In-Hospital Complications	
▪ Hysterectomy ▪ Mastectomy ▪ Neck and Back procedures	Statewide Hospitalizations (age 18 – 64 years)

DATA SOURCES, COLLECTION, AND VERIFICATION

The data utilized in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report were obtained from: 1) discharge data submitted to PHC4 by Pennsylvania health care facilities, and 2) the National Committee for Quality Assurance (NCQA) through the purchase of *Quality Compass®*. Pennsylvania hospitals verified data used to generate utilization measures and clinical outcomes, and HMO plans verified payor information listed in the hospital-submitted records. A more detailed explanation of the data and data sources follows.

PHC4: Hospital-Submitted Data and HMO Verification of Payor

Data specific to the clinical conditions in this report were submitted to PHC4 by licensed Pennsylvania health care facilities. Refer to Appendix A: "Description of Study Population" for a listing of the diagnosis and procedure codes that defined each clinical condition in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report.

The process used by PHC4 to identify specific HMO payors for hospitalizations relied upon several different data fields in the discharge record:

- the payor type code, which indicates the type of payor and type of product,
- the National Association of Insurance Commissioners (NAIC) code, which identifies the company that paid for the claim, and
- the payor name field, which is a free-form text field filled by the hospital staff.

All records that clearly identified an HMO plan as the principal payor by these fields were directly assigned to that respective HMO for verification. In addition, a record was sent to an HMO plan if any part of a discharge record pointed to that particular HMO plan as the payor. This was necessary to assure inclusion of all appropriate records.

Records that were identified through this process as belonging to an HMO were then sent to the respective HMO plan for verification. The HMO plan could then either agree that the claim was paid for by the plan (accept the record), or disagree (reject the record).

Rejection of records by HMOs occurred for one of three primary reasons: 1) the patient was not a member of the HMO at the time of the hospitalization, 2) the HMO was not the primary payor, or 3) the patient was a member of the HMO, but under a line of business not eligible for this study (e.g., a Medicare HMO enrollee). A fourth reason for rejecting a record was specific to diabetes records in which the patient did not meet the diabetes population-specific criteria.

Also, plans could provide additional records that were not originally identified as belonging to them during the payor identification process. These added records were included in the analysis only if PHC4 was able to match them to valid records in the study population that had not yet been attributed to other plans.

Every HMO, GPPO and related POS plan that received a file for verification from PHC4 reviewed, verified, and returned the data.

National Committee for Quality Assurance (NCQA)

NCQA is a private, not-for-profit organization dedicated to assessing and reporting on the quality of managed care plans. NCQA collects data via the Health Plan Employer Data and Information Set® (HEDIS) and the Consumer Assessment of Health Plans Study® (CAHPS) survey. These instruments assess health plan performance and member satisfaction with their HMO. These data, available collectively in NCQA's *Quality Compass®* (the central repository of data collected nationally from the NCQA accreditation surveys), are then available for purchase. Select outcome measures from NCQA's *2006 Quality Compass* (2005 measurement year) are included in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report and are described below.

HEDIS Measures

HEDIS is a health plan performance tool developed by NCQA and is a component of the NCQA accreditation process. The "HMO State Average" for each measure (derived from the *Quality Compass* database and weighted by HMO enrollment) was calculated by PHC4. The *HEDIS Technical Specifications Manual* provides a detailed description of the calculations used to determine the numerator and denominator for these measures. The HEDIS "Effectiveness of Care" and "Use of Services" measures reported include:

Comprehensive Diabetes Care is a composite measure used to examine the frequency and results of certain tests for HMO members with diabetes. The measure evaluates HMO performance on six aspects of diabetes care using a single sample of members age 18 through 75 years of age who have Type 1 or Type 2 diabetes. The six components of the comprehensive diabetes care measure are expressed as a percent of members with diabetes who had each of the following:

- *Poorly Controlled Hemoglobin A1c Levels for Members with Diabetes*: Poor Hemoglobin A1c (HbA1c) control; that is, the most recent HbA1c test level within the calendar year 2005 that was greater than 9.0 percent. If no test was performed, then it was counted as poor HbA1c control.
- *Hemoglobin A1c Blood Tests for Members with Diabetes*: HbA1c tested; that is, at least one HbA1c test conducted during the calendar year 2005.
- *Eye Exams Performed for Members with Diabetes*: Eye exam performed; that is, an eye screening for diabetic retinal disease conducted during the calendar year 2005 or, in certain circumstances, the calendar year 2004.
- *Monitoring Kidney Disease for Members with Diabetes*: Kidney disease monitored; that is, a microalbuminuria screening performed during the calendar year 2005, or previous evidence of kidney disease such as a positive microalbuminuria screening or medical treatment for kidney disease.
- *Cholesterol Screening for Members with Diabetes*: LDL-C screening performed; that is, a low-density lipoprotein cholesterol test conducted during the calendar year 2004 or 2005.
- *"Bad" Cholesterol Controlled for Members with Diabetes*: LDL-C controlled; that is, the most recent low-density lipoprotein cholesterol test performed during the calendar year 2004 or 2005 that was less than 130 mg/dL. If there was no valid LDL-C value within the last two measurement years, it was counted as exceeding the threshold.

As a set, these six aspects of care provide a comprehensive picture of the clinical management of patients with diabetes.

Advising Smokers to Quit is reported as the percent of members 18 years and older who were continuously enrolled during calendar year 2005, who were current smokers, who were seen by a plan practitioner during the measurement year, and who received advice to quit smoking.

Childhood Immunizations is reported as the percent of enrolled children who turned two years old during the calendar year 2005, who were continuously enrolled for 12 months immediately preceding their second birthday, and who were identified as having four DTaP/DT, three IPV, one MMR, three H influenza type B, three hepatitis B, and one chicken pox vaccine (VZV). It is reported as a combination rate.

Timely Initiation of Prenatal Care is reported as the percent of women who delivered a live birth between November 6th of calendar year 2004 and November 5th of calendar year 2005, who were continuously enrolled at least 43 days prior to delivery, and who received a prenatal care visit in the first trimester or within 42 days of enrolling in the HMO.

Screening for Breast Cancer is reported as the percent of women age 52 through 69 years, who were continuously enrolled during the calendar years 2004 and 2005, and who had a mammogram during either of those two years.

Screening for Cervical Cancer is reported as the percent of commercially enrolled women age 21 through 64 years, who were continuously enrolled during the calendar years 2003 through 2005, and who received one or more Pap tests during one of those three years.

Appropriate Medications for Members with Asthma evaluates whether members (age 5 through 56) with persistent asthma are being prescribed medications acceptable as primary therapy for long-term control of asthma. Members with "persistent" asthma were approximated based on services received during the prior year and medication utilization, rather than by a clinical measure of severity. The consistent use of the following medications resulted in a member being added to the numerator: Inhaled Corticosteroids, Cromolyn Sodium and Nedocromil, Leukotrine Modifiers, and Methylxanthines.

Controlling High Blood Pressure is an intermediate outcome measure that assesses whether blood pressure was controlled among adult members with diagnosed hypertension. This measure can only be calculated by using the hybrid method (for further explanation of the hybrid methodology, see the *HEDIS Technical Specifications Volume 2*). For the Controlling High Blood Pressure measure, the hybrid method used membership data and ambulatory claims/encounter data to identify members ages 46 through 85 years of age with a diagnosis of hypertension and a medical record review to confirm the hypertension diagnosis and to assess blood pressure control during the membership year.

Beta Blockers after a Heart Attack is reported as the percent of commercial HMO members age 35 years and older as of December 31, 2005 who were hospitalized and discharged alive from January 1, 2005 through December 24, 2005 with a diagnosis of acute myocardial infarction (AMI) and who received an ambulatory prescription for beta blockers upon discharge. NCQA provides a list of contraindications to allow plans to adjust the number of commercial members who qualify for treatment.

Colorectal Cancer Screening is reported as the percent of adults age 51 through 80 years, who were continuously enrolled during the calendar years 2004 and 2005, and who had appropriate screening for colorectal cancer. Appropriate screenings are defined by any one of the following four criteria; fecal occult blood test (FOBT) during the measurement year, flexible sigmoidoscopy during the measurement year or the four years prior to the measurement year, double contrast barium enema (DCBE) during the measurement year or the four years prior to the measurement year, or colonoscopy during the measurement year or the nine years prior to the measurement year.

HEDIS Rotation Strategy

Beginning with HEDIS 1999, NCQA implemented a measures rotation strategy. The purpose of the strategy is to reduce data collection burdens for the HMOs while still providing relevant and accurate data to consumers. The strategy allows HMOs to skip, for one year, the task of collecting data for certain HEDIS measures, and permits the plans to use the results from the previous year instead. Measures included in the rotation schedule must have been in the measurement set for two years and have stable data collection specifications. The following table provides a summary of all the plans that, per the NCQA guidelines, chose not to collect new data for nine of the HEDIS measures that were included in this year's managed care report:

	Aetna Health Inc	First Priority	Health America & Health Assurance	KHP Central
Cervical Cancer Screening	✓	✓	✓	✓
Controlling High Blood Pressure	✓		✓	✓
Timeliness of Prenatal Care	✓	✓	✓	✓
Poorly Controlled Hemoglobin A1c Levels	✓		✓	
Hemoglobin A1c Blood Tests	✓		✓	
Eye Exams	✓		✓	
Monitoring Kidney Disease	✓		✓	✓
Cholesterol Screening	✓		✓	
"Bad" Cholesterol Controlled	✓		✓	

CAHPS Measures

Another important component of the NCQA accreditation process is the CAHPS survey instrument. Commercial HMOs hire vendors from an NCQA-approved list to administer this member satisfaction survey. The *Measuring the Quality of Pennsylvania's Commercial HMOs* report includes calendar year 2005 CAHPS scores for 8 Pennsylvania plans.

DESCRIPTION OF HOSPITALIZATIONS USED IN ANALYSES

Discharge data submitted to PHC4 by Pennsylvania hospitals is housed in the Database of Record (DBOR). Once the submitted data is verified by the hospitals, the DBOR is analyzed to identify unique patients and their hospitalization histories. This process involves linking the individual hospitalizations of each unique patient, identifying each hospitalization as an index or non-index hospitalization, and creating episodes of care. Accurate construction of hospitalization histories and correct identification of the various components within a hospitalization history is crucial to PHC4 research methodology. The following paragraphs define the components of a hospitalization history and explain their role in the analyses for the clinical conditions included in the report.

Procedures for Linking Hospitalizations

The patient Social Security Number (SSN), sex, and date of birth, as reported by the hospitals, are used to identify patients across hospitalizations. In the vast majority of instances these values are identical for the same patient. Inconsistencies in essential data elements were resolvable if the discrepancy was clearly a typographical error (e.g., October 13 and October 31 of the same year). In this instance both records are assigned to the same patient. Hospitalizations assigned to the same patient are linked to create the hospitalization history.

Index Hospitalizations

After the linking of hospitalizations for unique patients is complete, the index hospitalization for each particular condition represented in that patient's hospitalization history is identified. For any single patient, the index hospitalization is the first hospitalization in the study period that meets the study population inclusion criteria. Therefore, there is only one index hospitalization per patient per condition.

Episode of Care

An episode of care is comprised of the acute care hospitalization(s) associated with a patient's need for inpatient care. Single-hospitalization episodes of care are especially frequent for the preventable hospitalizations such as those in the "Preventing Hospitalization through Primary Care" section of the *CY2005 Measuring the Quality of Pennsylvania's Commercial HMOs* report. Multiple-hospitalization episodes are more frequent for chronic illnesses (i.e., COPD, Asthma, Diabetes). Episodes involving more than one hospitalization are an important aspect of PHC4 methodology in that they account for the intricately related hospitalizations that are typical of the comprehensive care required to treat an illness.

Multiple-hospitalization episodes consist of a string of contiguous acute care inpatient hospitalizations. For two contiguous hospitalizations to be considered part of the same episode, the discharge date of the first hospitalization must be the same date as the admission date of the second hospitalization.

Multiple-hospitalization episodes may be comprised of hospitalizations with identical or differing principal diagnosis or procedure codes. For example, within the same diabetes episode a hospitalization with a principal diagnosis of diabetes may be followed by a hospitalization with a principal diagnosis of COPD.

Hospitalizations and Measures

All utilization and outcome measures for the clinical conditions in the *CY2005 Measuring the Quality of Pennsylvania's Commercial HMOs* report relied on the linking of hospitalizations and the proper identification of index and non-index hospitalizations. Table 3 lists all the measures reported for each clinical condition and details the hospitalizations that were used to extract utilization and/or clinical information for each measure. All episodes in a patient's hospitalization history and all hospitalizations in a multiple-hospitalization episode were not necessarily used for each measure. For example:

- The hospitalization rates for COPD were based upon the number of individual members that were hospitalized for this condition. If a person was hospitalized several times during the study period, only the index hospitalization was counted. Non-index cases were excluded so that a single member was counted in the hospitalization rate analysis rather than individual hospitalizations. Therefore, the number of members hospitalized for COPD was the basis of the hospitalization rate, not the number of hospitalizations for COPD.
- The percent rehospitalized for diabetes was also derived from the index hospitalization of each patient. However, to accurately assess percent rehospitalized across all HMO members hospitalized, the discharge date of the last acute care hospitalization in the diabetes episode was used to determine if the member had been rehospitalized within six months.

Additional hospitalizations were excluded from the analysis if they met certain clinical and procedural exclusion criteria. Refer to subsequent sections of this report that pertain to each clinical condition for detailed descriptions of the particular records excluded for each relevant measure.

Table 3. *Hospitalizations Used for Each Measure and Clinical Condition*

Condition	Data Source	Measure	Hospitalizations[1]
Ear, Nose and Throat Infections	PHC4	*Pediatric and Adult reported separately:* • Hospitalization Rate per 10,000 Members (age & sex-adjusted) • Statistical Rating for Hospitalization Rate	• Index hospitalization only (one per member)[2]
High Blood Pressure	PHC4	• Hospitalization Rate per 10,000 Members (age & sex-adjusted) • Statistical Rating for Hospitalization Rate	• Index hospitalization only (one per member)[2]
	HEDIS	• Controlling High Blood Pressure	Not Applicable
Gastrointestinal Infections	PHC4	• Hospitalization Rate per 10,000 Members (age & sex-adjusted) • Statistical Rating for Hospitalization Rate	• Index hospitalization only (one per member)[2]
Kidney/Urinary Tract Infections	PHC4	• Hospitalization Rate per 10,000 Members (age & sex-adjusted) • Statistical Rating for Hospitalization Rate	• Index hospitalization only (one per member)[2]
Chronic Obstructive Pulmonary Disease	PHC4	• Number of Hospital Admissions • Hospitalization Rate per 10,000 Members (age & sex-adjusted) • Statistical Rating for Hospitalization Rate • Length of Stay (risk-adjusted)	• Index hospitalization only (one per member)[2]
		• Statistical Rating for Rehospitalizations – 180 day	• Index hospitalization (one per member)[2] • Any respiratory-related hospitalization beginning no more than 180 days after the discharge date of the last acute care hospitalization[3] linked to the index hospitalization
Asthma	PHC4	*Pediatric and Adult reported separately:* • Number of Hospital Admissions • Hospitalization Rate per 10,000 Members (age & sex-adjusted) • Statistical Rating for Hospitalization Rate • Length of Stay (risk-adjusted)	• Index hospitalization only (one per member)[2]
		Adult only: • Statistical Rating for Rehospitalizations – 180 day	• Index hospitalization (one per member)[2] • Any respiratory-related hospitalization beginning no more than 180 days after the discharge date of the last acute care hospitalization[3] linked to the index hospitalization
	HEDIS	Appropriate Medications for Members (age 5 – 56; percent)	Not Applicable

[1]Identifies the hospitalizations that were used to extract utilization and/or clinical information for the associated measure.
[2]Records with missing/invalid SSNs cannot be linked to a single member, and therefore were counted as separate members for the hospitalization rate. If records had matching valid social security numbers but had inconsistent birth dates or sex identifiers that could not be resolved, each record was counted as a single index hospitalization.
[3]Non-index hospitalization that may or may not have a principal diagnosis related to condition analyzed.

Table 3. *Hospitalizations Used for Each Measure and Clinical Condition* continued

Condition	Data Source	Measure	Hospitalizations[1]
Diabetes	PHC4	• Number of Members with Diabetes	Not Applicable
		• Number of Hospital Admissions • Hospitalization Rate per 10,000 Members with Diabetes (age & sex-adjusted) • Statistical Rating for Hospitalization Rate • Length of Stay (risk-adjusted) • Percent of Admissions for Short-term Complications of Diabetes	• Index hospitalization only (one per member)[2]
		• Statistical Rating for Rehospitalizations – 180 day	• Index hospitalization (one per member)[2] • Any diabetes-related hospitalization beginning no more than 180 days after the discharge date of the last acute care hospitalization[3] linked to the index hospitalization
	HEDIS	• Poorly Controlled Hemoglobin A1c Levels (percent) • Hemoglobin A1c Blood Tests (percent) • Eye Exam Performed (percent) • Monitoring Kidney Disease (percent) • Cholesterol Screening (percent) • "Bad" Cholesterol Controlled (percent)	Not Applicable
Hysterectomy	PHC4	• Total Hysterectomy Hospital Admissions • Procedure Rate per 10,000 Female Members (age-adjusted) • Statistical Rating for Procedure Rate *Abdominal and Vaginal reported separately:* • Number of Hospital Admissions • Procedure Rate per 10,000 Female Members (age-adjusted) • Statistical Rating for Procedure Rate • Length of Stay (risk-adjusted) • Expected In-Hospital Complications (risk-adjusted; percent) • Actual In-Hospital Complications (percent) • Statistical Rating for In-Hospital Complications	• Index hospitalization only (one per member)[2]
	HEDIS	• Screening for Cervical Cancer (percent)	Not Applicable

[1]Identifies the hospitalizations that were used to extract utilization and/or clinical information for the associated measure.
[2]Records with missing/invalid SSNs cannot be linked to a single member, and therefore were counted as separate members for the hospitalization rate. If records had matching valid social security numbers but had inconsistent birth dates or sex identifiers that could not be resolved, each record was counted as a single index hospitalization.
[3]Non-index hospitalization that may or may not have a principal diagnosis related to condition analyzed.

Table 3. *Hospitalizations Used for Each Measure and Clinical Condition* continued

Data Source		Measure	Hospitalizations[1]
Mastectomy	PHC4	• Total Mastectomy Procedures • Procedure Rate per 10,000 Female Members (age-adjusted) • Percent Performed Inpatient	• Single Encounters [2,3]
		• Length of Stay (risk-adjusted) • Expected In-Hospital Complications (risk-adjusted; percent) • Actual In-Hospital Complications (percent) • Statistical Rating for In-Hospital Complications	• Single Hospitalizations (inpatient only)[3]
	HEDIS	• Screening for Breast Cancer (percent)	Not Applicable
Neck and Back Procedures	PHC4	• Total Neck and Back Procedures • Procedure Rate per 10,000 Members (age & sex-adjusted) *With Fusion and Without Fusion reported separately:* • Number of Procedures • Percent Performed Inpatient	• Single Encounters [2,3]
		• Length of Stay (risk-adjusted) • Expected In-Hospital Complications (risk-adjusted; percent) • Actual In-Hospital Complications (percent) • Statistical Rating for In-Hospital Complications	• Single Hospitalizations (inpatient only)[3]
Other Measures	HEDIS	• Advising Smokers to Quit (percent) • Childhood Immunizations (percent) • Timely Initiation of Prenatal Care (percent) • Colorectal Cancer Screening (percent) • Beta Blockers after a Heart Attack (percent)	Not Applicable

[1]Identifies the hospitalizations that were used to extract utilization and/or clinical information for the associated measure.
[2]Encounter refers to a single patient visit, (impatient or ambulatory).
[3]Over the course of the study period, a single patient may have more than one hospitalization/encounter for said condition. If so, all of the single hospitalization/encounter were analyzed.

RISK ADJUSTMENT METHODOLOGY

Risk Adjustment Approach for Hospitalization/Procedure Rates

Age and Sex Adjustment

Hospitalization and procedure rates are age and sex adjusted to account for differences in the mix of members (by sex or age) in one HMO plan compared to another. For example, older populations often experience more health problems. When this is true, PHC4's system "expected" more health problems in the HMO with an older population and made appropriate adjustments. Sex is often an important risk factor, therefore the system also accounted for differences among HMOs in this category. The hospitalization rate data were adjusted using age and sex cohorts derived from the total membership population of each HMO. These cohorts were constructed with the assistance and review of each HMO. The age cohorts used in the risk adjustment of hospitalization/procedure rates are described in Appendix D.

To standardize hospitalization/encounter data across plans and across age categories, only records for those patients age 64 or younger as of December 31, 2005 were included in the analysis. HMO members were excluded from an analysis if they turned 65 at any point during 2005, even if the individual was age 64 at the time of their hospitalization. Likewise, in conditions involving adults only, records were included for patients who were 18 years or older as of December 31, 2005. As part of the data verification process, HMOs were instructed to follow this same age criterion when adding records to the file of verified data. (Note that diabetes records were included if the patient was 18 years or older and 75 years or younger as of December 31, 2005 and excluded if the patient turned 76 at any time during the 2005 calendar year even if the patient was 75 at the time of the hospitalization.)

Calculation of Adjusted Hospitalization/Procedure Rates

Indirect standardization, using the risk factors of age and sex, was used to compare the hospitalization rates for each HMO plan against the hospitalization rate for the HMO aggregate for each clinical condition (see the "Statistical Ratings" section.) Because enrollment data were not collected from the insurance groups that comprise the "fee-for-service" or PPO samples, hospitalization rates cannot be reported for these samples.

Risk Adjustment Approach for Outcome Measures

Regression techniques were used to construct "risk-adjustment models" for length of stay, rehospitalizations–180 days, and in-hospital complications. These models were used to calculate expected (predicted) results. HMO plans whose membership was characterized by a greater number of risk factors (e.g., severity of illness, comorbidity, demographic factors, socioeconomic factors, etc.) were given "credit" in the system; patients with significant risk factors were expected to have longer lengths of stay and a greater probability of rehospitalization, and/or complications.

The first step in building the risk adjustment models was to identify possible risk-adjustment factors—those factors that potentially contribute to a particular event for a particular condition. In doing so, both clinical and demographic factors identified in the literature were considered. The *Atlas Outcomes*^{TM} Predicted Probability of Death (MQPredDeath) and Predicted Length of Stay (MQPredLOS) scores were also considered. The process for gathering and reporting the Atlas information is explained in the following section.

Atlas Outcomes™ Approach for Risk Adjustment

In a contractual agreement with MediQual Systems®, Inc., a business of Cardinal Health in Marlborough, Massachusetts, acute care hospitals are required to use MediQual's *Atlas Outcomes™* Severity of Illness System to assess each patient's condition from date of admission through the first two days of the hospital stay (or a maximum of 30 hours, based on when the patient was admitted to the hospital). This system represents a summarization of patient risk/severity, characterized as scores such as predicted probability of death (MQPredDeath) or predicted length of stay (MQPredLOS). These scores, determined from objective data abstracted from medical records, were included as potential risk factors in this report. The MQPredDeath is derived from a logistic regression model and has a value from 0.000 to 1.000. The MQPredLOS is derived from a linear regression model and has no bounds.

The *Atlas Outcomes™* system is based on the examination of numerous Key Clinical Findings (KCFs) such as lab tests, EKG readings, vital signs, the patient's medical history, imaging results, pathology, age, sex, and operative/endoscopy findings. Hospital personnel abstract these KCFs during specified timeframes in the hospitalization. Some pre-admission data are also captured (e.g., cardiac catheterization findings), as are some history findings. The KCF results are entered into algorithms that calculate the overall predicted probability of death or the predicted length of stay.

PHC4 Model Selection

Model selection identified those candidate variables that were statistically significant predictors of the relevant event (i.e., length of stay, rehospitalization–180 day, or in-hospital complication). Linear regression models were used for length of stay, while binary logistic regression models were used for rehospitalization and complication outcomes. Forward stepwise model selection methods were used to determine the significant risk factors. Factors were included in the model if they met the $p < 0.10$ significance criteria. Evaluation of model performance for linear regression models was accomplished by considering the R-squared (R^2) values. The measures of model adequacy applied to the binary logistic regression models included the percentage explained, R^2, and the ROC area.

PHC4 Model Coefficients

The coefficients associated with the significant risk factors and their p-values are listed in the following table. (See Appendices D and E for descriptions of the variables.)

Table 4. Coefficients of Significant Predictors

Significant Predictors	Coefficient	p-value
COPD		
Length of Stay		
• Intercept	-0.1662	
• MQPredLOS[1]	0.6065	<.0001
• Age	0.0213	0.0190
• Psychological disorders[2]	0.2746	0.0439
Rehospitalization		
• Intercept	-2.6726	
• MQPredLOS[1]	0.2721	<.0001
Pediatric Asthma		
Length of Stay		
• Intercept	1.0296	
• MQPredLOS[1]	0.3309	<.0001
• Age	0.3756	<.0001
• AsthmaPresentation-Acute Exacerbation	-0.0240	0.0052
• Asthma Presentation-Status Asthmaticus	0.2025	
• AsthmaPresentation-Acute Exacerbation	0.0000	
• Asthma Type- Chr/Obs/Intr/Unspec	-0.2165	0.0150
• Asthma Type- Extrinsic	0.0000	
Adult Asthma		
Length of Stay		
• Intercept	0.5691	
• MQPredLOS[1]	0.6115	<.0001
• Asthma Type- Chronic Obstructive	0.7408	<.0001
• Asthma Type- Extrinsic	-0.0845	
• Asthma Type- Intrinsic/Unspecified	0.0000	
• Asthma Presentation-Acute Exacerbation	0.1157	0.0054
• Asthma Presentation-Status Asthmaticus	0.5224	
• Asthma Presentation- Unspecified	0.0000	
• Female[2]	0.3733	<.0001
• Diabetes[2]	0.3866	0.0006
Rehospitalization		
• Intercept	-2.3121	
• MQPredLOS[1]	0.2000	0.0003
• Asthma Type- Chronic Obstructive	0.3691	0.0087
• Asthma Type- Extrinsic	0.0961	
• Asthma Type- Intrinsic/Unspecified	0.0000	
• Median Household Income	-0.0120	0.0071
• Psychological Disorder[2]	0.3162	0.0162

Significant Predictors	Coefficient	p-value
Diabetes		
Length of Stay		
• Intercept	1.5171	
• MQPredLOS[1]	0.5164	<.0001
• Amputation[2]	2.4911	<.0001
• Renal Dialysis[2]	0.7757	0.0636
• Renal Failure[2]	0.4534	0.0430
• Heart Failure[2]	0.9328	0.0010
• Median Household Income	-0.0119	0.0122
• Alcohol Drug Abuse[2]	0.7847	0.0222
• Psychological Disorder[2]	0.3605	0.0743
Rehospitalization		
• Intercept	-3.0599	
• MQPredLOS[1]	0.0894	0.0015
• Long Term Complications Diabetes	0.5244	0.0015
• Female[2]	0.4693	0.0018
• Alcohol Drug Abuse[2]	0.8352	0.0182
• Psychological Disorder[2]	0.4665	0.0290
• Renal Dialysis[2]	0.7525	0.0285
Abdominal Hysterectomy		
Length of Stay		
• Intercept	0.0999	
• MQPredLOS[1]	0.7847	<.0001
• Poverty Rate	1.9674	<.0001
• PDxGrp[3] - Bleeding/Other PDx	0.0673	0.0014
• PDxGrp[3] -Fibroids/Hyperplasia/etc.	0.0000	
• Radical[2]	0.7748	0.0006
In-Hospital Complications		
• Intercept	-4.5761	
• MQPredLOS[1]	0.7155	<.0001
• Poverty Rate	1.5650	<.0001
Vaginal Hysterectomy		
Length of Stay		
• Intercept	1.3340	
• MQPredLOS[1]	0.4263	<.0001
• Laparoscopic Procedure[2]	-0.2091	<.0001
• Age	-0.0335	<.0012
• Age Square	0.0004	0.0001
• Poverty Rate	1.0791	<.0001
In-Hospital Complications		
• Intercept	-5.2998	
• MQPredLOS[1]	1.3027	<.0001
• Laparoscopic Procedure[2]	-0.2170	0.0652

[1] Atlas Outcomes ™ Predicted Length of Stay
[2] These factors were tested as binary variables.
[3] Principal Diagnosis Group

Table 4. *Coefficients of Significant Predictors* continued

Significant Predictors	Coefficient	p-value
Mastectomy		
Length of Stay		
• Intercept	0.2727	
• Reconstruction – Flap/Graft	2.0765	
• Reconstruction – Implant/ Other	0.4020	<.0001
• Reconstruction – None	0.0000	
• MQPredLOS[1]	0.5867	<.0001
• Poverty Rate	1.7766	<.0001
• Bilateral Procedure[2]	0.2253	0.0009
• Diabetes[2]	0.2133	0.0513
• Psychological Disorder[2]	0.1750	0.0476
In-Hospital Complications		
• Intercept	-3.8431	
• Reconstruction – Flap/Graft	0.9298	
• Reconstruction – Implant/ Other	-0.2118	<.0001
• Reconstruction – None	0.0000	
• MQPredLOS[1]	0.3741	0.0054
• Hypertension[2]	0.4728	0.0432
Neck and Back Procedure With Fusion		
Length of Stay		
• Intercept	2.2496	
• Location – Cervical/Atlas-Axis	-1.6944	
• Location – Dorsal and Dorslumbar	3.0811	<.0001
• Location – Lumbar and Lumbosacral	0.0000	
• MQPredLOS[1]	0.5989	<.0001
• PDxGroup[3] – Disc Degeneration	-0.3379	
• PDxGroup[3] – Disk Displacement	-0.4491	<.0001
• PDxGroup[3] – Narrow Spinal Canal	-0.2939	
• PDxGroup[3] – Other Disk Disorders	0.0000	
• Poverty Rate	1.6174	<.0001
• Alcohol/Drug Abuse[2]	0.7479	<.0001
• Procedure Group- Both	0.3633	
• Procedure Group-Discetomy	-0.1392	<.0001
• Procedure Group-Laminectomy	0.0000	
• Obesity[2]	0.1802	0.0117
In-Hospital Complications		
• Intercept	-2.2205	
• Location – Cervical/Atlas-Axis	-1.5390	
• Location – Dorsal and Dorslumbar	1.1161	<.0001
• Location – Lumbar and Lumbosacral	0.0000	
• MQPredLOS[1]	0.3328	<.0001
• PDxGroup[3] – Disc Degeneration	-0.5487	
• PDxGroup[3] – Disk Displacement	-0.5923	0.0109
• PDxGroup[3] – Narrow Spinal Canal	-0.5933	
• PDxGroup[3] – Other Disk Disorders	0.0000	
• Fusion Technique – Anterior	-0.3455	
• Fusion Technique - Multiple	-0.7135	0.0012
• Fusion Technique - Posterior	0.0000	
• Female[2]	-0.2139	0.0461
• Age	0.0115	0.0461
• Poverty Rate	2.0009	0.0060

Significant Predictors	Coefficient	p-value
Neck and Back Procedure Without Fusion		
Length of Stay		
• Intercept	0.3783	
• MQPredLOS[1]	0.9663	<0.0001
• PDxGroup[3] – Disc Degeneration	-0.3515	
• PDxGroup[3] – Disk Displacement	-0.5909	<.0001
• PDxGroup[3] – Narrow Spinal Canal	-0.4510	
• PDxGroup[3] – Other Disk Disorders	0.0000	
• Alcohol/Drug Abuse[2]	0.7457	<0.0001
• Procedure Group-Disc/Laminectomy	0.0958	
• Procedure Group-Discectomy	-0.2175	<0.0001
• Procedure Group-Laminectomy	0.0000	
• Female[2]	-0.1535	<0.0001
In-Hospital Complications		
• Intercept	-3.4111	
• MQPredLOS[1]	0.2155	0.0002
• Age	0.0203	0.0002
• PDxGroup[3] – Disc Degeneration	-0.1991	
• PDxGroup[3] – Disk Displacement	-0.6699	<0.0001
• PDxGroup[3] – Narrow Spinal Canal	-0.0813	
• PDxGroup[3] – Other Disk Disorders	0.0000	
• Median Household Income	-0.0108	0.0028
• Alcohol/Drug Abuse[2]	0.8092	0.0110
• Hypertension[2]	0.2383	0.0209

[1] Atlas Outcomes [TM] Predicted Length of Stay
[2] These factors were tested as binary variables.
[3] Principal Diagnosis Group

Calculation of Risk-Adjusted Outcomes

Actual and expected rates and statistical ratings (greater than expected, as expected, or less than expected) were calculated for length of stay, rehospitalizion – 180 day, and/or in-hospital complications for each appropriate clinical condition. The expected rate was based on the risk factors of the hospitalizations included. Actual and expected rates could then be compared to determine if differences were statistically significant.

Determining Actual (Observed) Rates

Length of Stay	This value was determined as the arithmetic mean length of stay for the hospitalizations included for a particular condition.
Percent Rehospitalized	This rate was determined by dividing the total number of members rehospitalized (at least once) to a general or specialty acute care hospital within 180 days of discharge (from the last hospitalization in the episode) by the total number of members hospitalized for that particular principal diagnoses.
In-Hospital Complication	This rate was determined by dividing the total number of hospitalizations with at least one complication by the total number of hospitalizations included for that particular condition.

Determining Expected Rates

The models for each outcome used the risk factor values and corresponding coefficients to provide a predicted value (predicted length of stay, probability of rehospitalization, or probability of complication) for each observation after exclusions. The expected rate for an individual HMO plan was the average of these predicted values for all observations associated with the plan.

For both the linear and logistic regression models, the first step to determine these predicted values was to multiply the vector of model coefficients (ß) by the vector of risk factors (X). This value, ßX, is calculated for each patient and equals:

$$ßX = ß_0 + ß_1x_1 + ß_2x_2 + ß_3x_3 \ldots$$

where

$ß_n$ = the relevant model coefficient (see Table 4; $ß_0$ is the intercept)
X_n = the value of the risk factor for this patient

(risk factors that are binary, i.e., yes/no, were coded as yes = 1 and no =0)

For linear models, the value ßX was the final predicted value. For logistic models, the predicted value was calculated as:

$$p = \frac{e^{ßX}}{1 + e^{ßX}}$$

where e ≈ 2.7182818285

Linear Example – Calculations Used in COPD Length of Stay (LOS)

Total Cases: Number of hospitalizations after exclusions (equal to n).

Actual Length of Stay: Mean of the length of stay for each hospitalization.

Expected Length of Stay: Mean of the predicted length of stay for each hospitalization.

Step 1: Calculate each patient's predicted length of stay (PLOS):

$$PLOS = ßX$$
$$= ß_0 + ß_1x_1 + ß_2x_2$$
$$= -1.0780 + (0.0426)(x_1) + (0.\ 5677)(x_2)$$

where
x_1 = Patient Age in Years
x_2 = MediQual PredLOS value

(ß's can be found in Table 4.)

Step 2: Calculate the mean PLOS for an HMO plan:

$$\text{Mean PLOS} = \frac{\Sigma\ \text{PLOS}}{n}$$

Risk-Adjusted Length of Stay: $\frac{\text{Mean Actual LOS}}{\text{Mean PLOS}}\left(\text{Mean Actual LOS for the HMO, PPO and FFS combined database}\right)$

Logistic Example – Calculations used in COPD Percent Rehospitalized

Total Cases: Number of hospitalizations after exclusions (equal to n).

Actual Percent Rehospitalized: Total number of members rehospitalized at least once / total number of hospitalizations.

Predicted Percent Rehospitalized: Mean of the predicted probability of rehospitalization for each hospitalization.

Step 1: Calculate each patient's predicted rehospitalization percent (PRehosp):

$$ßX = ß_0 + ß_1x_1 + ß_2x_2$$
$$= -1.8495 + (0.2138)(x_1) + (-0.0119)(x_2)$$

where
x_1 = MediQual PredLOS value
x_2 = Median Household Income

(ß's can be found in Table 4.)

$$\text{PRehosp} = \frac{e^{\beta X}}{1+e^{\beta X}}$$

Step 2: Calculate the mean PRehosp for an HMO plan:

$$\text{Mean PRehosp} = \frac{\Sigma\ \text{PRehosp}}{n}$$

Statistical Ratings

Significance tests (using binomial distribution) were performed for the measures listed in the table below.

Table 5. *Binomial Distribution, by Measure*

Measure	Clinical Conditions
Hospitalization Rate (Members hospitalized for a given clinical condition per HMO population)	Ear, Nose and Throat Infections; High Blood Pressure; Gastrointestinal Infections; Kidney/Urinary Tract Infections; Chronic Obstructive Pulmonary Disease; Asthma; Diabetes
Procedure Rate (Members hospitalized for a hysterectomy)	Hysterectomy
In-Hospital Complications (Complication vs. No Complication)	Hysterectomy; Mastectomy; Neck and Back Procedures
Percent Rehospitalized (Rehospitalized vs. Not Rehospitalized)	COPD; Adult Asthma; Diabetes

Although the measures for any single HMO plan may be comparable to the statewide norm (or other reference database), random variation plays a role in such comparisons. Statistical evaluation was used to determine whether the difference between the observed and the expected (or average) value was *too large* to be attributed solely to chance.

Binomial Distribution

The use of binomial distribution required the following assumptions:

- each observation included in the study had one of two observable events (e.g., in-hospital complication vs. no in-hospital complication). In other words, the response was dichotomous.
- the probability of the event (e.g., having a complication) for each observation studied within a clinical condition group was equal to the probability provided by the risk models.
- the result for any one observation in the analyses had no impact on the result of another observation. In other words, the observations were independent.

The probability distributions were based on the HMO plans' predicted or expected rates. Using the probability distribution, a p-value was calculated for each observed value. This p-value is the probability, or likelihood, that the observed value could have occurred by chance. If it was very unlikely ($p < 0.05$; see "Inferential Error" section below) that the observed value could have occurred only by chance, then it was concluded that the observed value was "significantly different" from the expected value.

Calculation of p-values

Calculating the p-value for the binomial test is defined by a formula that sums discrete probabilities based upon the binomial distribution. The binomial formula (see below) was used, in part, to derive the p-value. The probability that a binomial random variable takes on a specific value is defined by the following equation (i.e., the binomial formula):

$$P(X=a) = [(N!)/(a!(N-a)!)]\ p^{a}(1-p)^{N-a}$$

where (for in-hospital complications analysis),

P(X=a) is the probability that the binomial random variable (X) takes on a specific value (a); that is, a = 1 hospitalization with complication, a = 2 hospitalizations with complications, etc.

X is the binomial random variable. X is a discrete random variable that can range from 0 through N ($0 \leq X \leq N$).

N is the number of observations for a particular HMO plan's clinical condition.

p is the overall expected probability of patient in-hospital complications for a particular HMO plan's clinical condition.

The p-value for a specific result is determined to be the sum of all probabilities associated with that result and all other results that are more extreme. The p-value associated with the observed number of in-hospital complications was calculated for each HMO plan and clinical condition.

Inferential Error

A type of inferential error that can be made in statistics is called a Type I error or "false positive." The probability of committing a Type I error is equal to the level of significance established by the researcher. For the current analysis, the level of significance was set to 0.05. In the context of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, a Type I error occurred when the difference between the observed in-hospital complications percent and the expected in-hospital complications percent was declared statistically significant, when in fact, the difference was due to chance. That is, for a particular clinical condition, the HMO plan was declared to be statistically higher or lower than expected, when in reality the HMO plan's level of performance was comparable to the statewide norm. Since the level of significance was set to 0.05, there was a 5% (or 1 in 20) chance of committing this type of error.

Assignment of Statistical Rating

A statistical rating was assigned to each HMO if the difference between what was observed and what was expected in a particular clinical condition was statistically significant. The p-value, calculated in terms of a "two-tailed" test was compared to the level of significance. For example, in the calculation of in-hospital complications percent for each HMO:

- if the calculated p-value was greater than or equal to 0.05, then the conclusion was made that the difference between what was expected and what was observed was *not* statistically significant. It *cannot be concluded* that the in-hospital complications percent for that particular clinical condition in that particular HMO was different from the comparative reference.

- if the calculated p-value was less than 0.05, then the conclusion was made that the difference between what was expected and what was observed *was* statistically significant.

- If the observed in-hospital complications percent was lower than expected, which was based on the statewide in-hospital complications percent, the HMO was assigned the symbol "○" (as shown in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report) to indicate the in-hospital complications percent was significantly lower than expected for a particular clinical condition.

- If the observed in-hospital complications percent was higher than expected, which was based on the statewide in-hospital complications percent, the HMO was assigned the symbol "●" (as shown in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report) to indicate the in-hospital complications percent was significantly higher than expected for a particular clinical condition.

In the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, statistical ratings are shown for HMO plans that have sufficient records. When the number of records for analysis was less than 10, "NR" (Not Reported) is displayed (except for analyses related to the rate of hospitalizations or procedures).

Treatment Measures Calculated by PHC4

PREVENTING HOSPITALIZATION THROUGH PRIMARY CARE

Pediatric Ear, Nose and Throat Infections

Inclusion Criteria

Cases were included in the data analysis for pediatric ear, nose, and throat infections if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population." Pediatric HMO members included in this analysis were 0 through 17 years of age.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate shown for each HMO used the total number of pediatric index hospitalizations per 10,000 pediatric members. Excluded hospitalizations are listed in Table 6A. The HMO database was used as the comparative reference.

Table 6A. *Exclusions from "Hospitalization Rate" Analysis for Pediatric Ear, Nose and Throat Infections*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*529*	*100.0*
Exclusions:		
❖ Non-PA Resident	31	5.9
❖ Neonate (age < 28 days)	12	2.3
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	6	1.1
❖ Extensive OR Procedures Unrelated to Principal Diagnosis*	0	0.0
❖ Mechanical Ventilation*	0	0.0
❖ Tracheitis*	4	0.8
❖ Metastatic Cancer; Ear, Nose, and Throat Cancer; Lung Cancer; HIV Infection; Tracheostomy; Cleft Lip and Palate Repair*	0	0.0
Total exclusions	*53*	*10.0*
Total members remaining in analysis	*476*	*90.0*

*See Appendix B for definitions of clinically complex exclusions.

Adult Ear, Nose and Throat Infections

Inclusion Criteria

Cases were included in the data analysis for adult ear, nose, and throat infections if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population." Adult HMO members included in this analysis were 18 through 64 years of age.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate shown for each HMO used the total number of adult index hospitalizations per 10,000 adult members. Excluded hospitalizations are listed in Table 6B. The HMO database was used as the comparative reference.

Table 6B. *Exclusions from "Hospitalization Rate" Analysis for Adult Ear, Nose and Throat Infections*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	570	100.0
Exclusions:		
❖ Non-PA Resident	28	4.9
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	5	0.9
❖ Metastatic Cancer*	7	1.2
❖ ENT Cancer*	2	0.4
❖ Lung Cancer*	0	0.0
❖ HIV Infection*	0	0.0
❖ Extensive OR Procedures Unrelated to Principal Diagnosis*	0	0.0
❖ Mechanical Ventilation*	5	0.9
❖ Tracheostomy*	2	0.4
❖ Tracheitis*	1	0.2
❖ Cleft Lip and Palate Repair*	1	0.2
Total exclusions	*51*	*8.9*
Total members remaining in analysis	*519*	*91.1*

*See Appendix B for definitions of clinically complex exclusions.

High Blood Pressure (Hypertension)

Inclusion Criteria

Only adult (18 through 64 years of age) HMO members were included in this analysis. Cases were included in the data analysis for high blood pressure if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population."

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate shown for each HMO used the total number of index hospitalizations per 10,000 adult members. Excluded hospitalizations are listed in Table 6C. The HMO database was used as the comparative reference.

Table 6C. *Exclusions from "Hospitalization Rate" Analysis for High Blood Pressure*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*576*	*100.0*
Exclusions:		
❖ Non-PA Resident	4	0.7
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	30	5.2
❖ Metastatic Cancer*	3	0.5
❖ Renal Dialysis*	2	0.3
❖ Open Heart Surgery*	1	0.2
❖ Extensive OR Procedures Unrelated to Principal Diagnosis*	3	0.5
❖ PTCA/Stent*	5	0.9
❖ HIV Infection*	0	0.0
❖ Mechanical Ventilation*	0	0.0
❖ Tracheostomy*	0	0.0
Total exclusions	*48*	*8.3*
Total members remaining in analysis	*528*	*91.7*

*See Appendix B for definitions of clinically complex exclusions.

Gastrointestinal Infections

Inclusion Criteria

Cases were included in the data analysis for gastrointestinal infections if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population." HMO members included in this analysis were 0 through 64 years of age.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate shown for each HMO used the total number of index hospitalizations per 10,000 members. Excluded hospitalizations are listed in Table 6D. The HMO database was used as the comparative reference.

Table 6D. *Exclusions from "Hospitalization Rate" Analysis for Gastrointestinal Infections*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*1,141*	*100.0*
Exclusions:		
❖ Non-PA Resident	20	1.8
❖ Neonate (age < 28 days)	0	0.0
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	11	1.0
❖ Gastrointestinal Cancer*	18	1.6
❖ Metastatic Cancer*	6	0.5
❖ HIV Infection*	1	0.1
❖ Extensive OR Procedures Unrelated to Principal Diagnosis*	1	0.1
❖ Major Large and Small Bowel Procedures*	7	0.6
❖ Other Digestive System OR Procedures with Complications*	3	0.3
Total exclusions	*67*	*5.9*
Total members remaining in analysis	*1,074*	*94.1*

*See Appendix B for definitions of clinically complex exclusions.

Kidney/Urinary Tract Infections

Inclusion Criteria

Cases were included in the data analysis for kidney/urinary tract infections if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population." HMO members included in this analysis were 0 through 64 years of age.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate shown for each HMO used the total number of index hospitalizations per 10,000 members. Excluded hospitalizations are listed in Table 6E. The HMO database was used as the comparative reference.

Table 6E. *Exclusions from "Hospitalization Rate" Analysis for Kidney/Urinary Tract Infections*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*1,424*	*100.0*
Exclusions:		
❖ Non-PA Residents	55	3.9
❖ Neonate (age < 28 days)	7	0.5
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	49	3.4
❖ Metastatic Cancer*	26	1.8
❖ Kidney/Urinary Tract Cancer*	2	0.1
❖ HIV Infection*	1	0.1
❖ Chronic Renal Failure*	9	0.6
❖ Renal Dialysis*	4	0.3
❖ Cases in DRGs Unrelated to Kidney/Urinary Tract Infections *	59	4.1
Total exclusions	*212*	*14.9*
Total members remaining in analysis	*1,212*	*85.1*

*See Appendix B for definitions of clinically complex exclusions and DRGs used to define Kidney/Urinary Tract Infections.

MANAGING ON-GOING ILLNESSES

Chronic Obstructive Pulmonary Disease (COPD)

Inclusion Criteria

Only adult (18 through 64 years of age) HMO members were included in this analysis. Cases were included in the data analysis for COPD if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population."

Utilization/Outcome Measures and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate is shown for each HMO using the total number of index hospitalizations per 10,000 adult HMO members. Excluded hospitalizations are listed in Table 7A. The HMO database was used as the comparative reference.

Table 7A. *Exclusions from "Hospitalization Rate" Analysis for COPD*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*1,198*	*100.0*
Exclusions:		
❖ Non-PA Resident	16	1.3
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	151	12.6
❖ Cases in DRGs Unrelated to COPD*	57	4.8
❖ Metastatic Cancer*	7	0.6
❖ Lung Cancer*	13	1.1
❖ HIV Infection*	1	0.1
❖ Mechanical Ventilation; Tracheostomy*	0	0.0
Total exclusions	*245*	*20.5*
Total members remaining in analysis	*953*	*79.5*

*See Appendix B for definitions of clinically complex exclusions and DRGs used to define COPD.

Length of Stay (risk-adjusted). The inpatient length of stay measure was calculated from the COPD index hospitalization only, beginning with the date of admission and ending with the date of discharge of the index hospitalization (length of stay was calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for

COPD are listed in Table 7B. The HMO, PPO and fee-for-service combined database was used as the comparative reference.

Table 7B. *Exclusions from "Length of Stay" (LOS) Analysis for COPD*

	Total HMO, PPO and Fee-for-Service Hospitalizations		
	N	***% of Total***	***Avg. LOS***
Total hospitalizations before exclusions	*2,078*	*100.0*	*4.7*
Exclusions:			
❖ Hospitalization Rate Exclusions	420	20.2	7.7
❖ Death in Hospital	5	0.2	5.6
❖ Missing *Atlas Outcomes*™ Score	17	0.8	3.0
❖ Outlier[1]/Missing or Invalid[2] LOS	9	0.4	16.9
Total exclusions	*451*	*21.7*	*7.6*
Total members remaining in analysis	*1,627*	*78.3*	*3.9*

[1]LOS values that were > 15 days.
[2]LOS value < 0.

Rehospitalizations (risk-adjusted). To calculate the percent rehospitalized, the first return hospitalization for respiratory-related acute care (MDC 4) within 180 days of discharge from an acute care facility in Pennsylvania was used. For multiple-hospitalization episodes, the discharge date of the last hospitalization (which may not be COPD-related) in the COPD episode was used as the start point for counting the 180 days. If a member was rehospitalized multiple times, he or she was still counted as one member who was rehospitalized. Exclusions are listed in Table 7C. The HMO, PPO and fee-for-service combined database was used as the comparative reference.

Table 7C. *Exclusions from "Rehospitalizations" Analysis for COPD*

	Total HMO, PPO and Fee-for-Service Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*2,078*	*100.0*
Exclusions:		
❖ Length of Stay Exclusions	451	21.7
❖ Patient was transferred and died in hospital	1	<0.1
❖ Invalid Social Security Number	5	0.2
❖ Invalid Admit Date/Discharge Date/Birth Date/Sex	0	0.0
Total exclusions	*457*	*22.0*
Total members remaining in analysis	*1,621*	*78.0*

Pediatric and Adult Asthma

Inclusion Criteria

Pediatric (0 through 17 of age) and adult (18 through 64 years of age) cases were analyzed separately. HMO cases were included in the data analysis if they included as a principal diagnosis one of the ICD-9-CM codes listed under this condition in Appendix A: "Description of Study Population."

Utilization/ Outcome Measures and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate is shown for each HMO using the total number of asthma index hospitalizations per 10,000 pediatric/adult members. Excluded hospitalizations are listed in Table 7D. The HMO database was used as the comparative reference.

Table 7D. *Exclusions from "Hospitalization Rate" Analyses for Asthma*

	Total HMO Hospitalizations			
	Pediatric		*Adult*	
	N	***% of Total***	***N***	***% of Total***
Total hospitalizations before exclusions	*1,103*	*100.0*	*2,135*	*100.0*
Exclusions:				
❖ Non-PA resident	26	2.4	19	0.9
❖ Neonate (age < 28 days)	1	0.1	NA	NA
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	56	5.1	278	13.0
❖ HIV Infection*	0	0.0	4	0.2
❖ Metastatic Cancer*	0	0.0	4	0.2
❖ Lung Cancer*	0	0.0	4	0.2
❖ Tracheostomy*	0	0.0	1	<0.1
❖ Mechanical Ventilation*	2	0.2	16	0.7
Total exclusions	*85*	*7.7*	*326*	*15.3*
Total members remaining in analysis	*1,018*	*92.3*	*1,809*	*84.7*

*See Appendix B for definitions of clinically complex exclusions.
NA: Not Applicable

Length of Stay (risk-adjusted). Length of stay was calculated from the asthma index hospitalization only, beginning with the date of admission and ending with the date of discharge of the index hospitalization (length of stay was calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for asthma are listed in Table 7E. The HMO, PPO and fee-for-service combined database was used as the comparative reference.

Table 7E. *Exclusions from "Length of Stay" (LOS) Analyses for Asthma*

	Total HMO, PPO and Fee-for-Service Hospitalizations					
	Pediatric			*Adult*		
	N	***% of Total***	***Avg. LOS***	***N***	***% of Total***	***Avg. LOS***
Total hospitalizations before exclusions	*1,488*	*100.0*	*1.9*	*3,426*	*100.0*	*3.7*
Exclusions:						
❖ Hospitalization Rate Exclusions	99	6.7	2.2	478	14.0	4.4
❖ Death in Hospital	0	0.0	NA	0	0.0	0.0
❖ Missing *Atlas Outcomes*^{TM} Score	9	0.6	2.2	36	1.1	4.4
❖ Outlier[1]/Missing or Invalid[2] LOS	2	0.1	11.0	9	0.3	18.1
Total exclusions	110	7.4	2.3	*523*	*15.3*	*4.6*
Total members remaining in analysis	*1,378*	*92.6*	*1.9*	*2,903*	*84.7*	*3.5*

[1]LOS values that were > 10 days for pediatric asthma and > 15 days for adult asthma.
[2]LOS value < 0.
NA: Not Applicable

Rehospitalizations (risk-adjusted). The percent rehospitalized was calculated for adult asthma only. Because pediatric cases frequently lack social security number identification, potential rehospitalizations cannot be linked to previous hospitalizations. Thus, the rehospitalization analysis was not performed for pediatric asthma cases.

To calculate the percent rehospitalized, the first return hospitalization for respiratory-related acute care (MDC 4) within 180 days of discharge from an acute care facility in Pennsylvania was used. For multiple-hospitalization episodes, the discharge date of the last hospitalization (which may not be asthma-related) in the asthma episode was used as the start point for counting the 180 days. If a member was rehospitalized multiple times, he or she was still counted as one member who was rehospitalized. Exclusion criteria for rehospitalizations are listed in Table 7F. The HMO, PPO and fee-for-service combined database was used as the comparative reference.

Table 7F. *Exclusions from "Rehospitalizations" Analysis for Adult Asthma*

	Total HMO, PPO and Fee-for-Service Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*3,426*	*100.0*
Exclusions:		
❖ Length of Stay Exclusions	523	15.3
❖ Patient was transferred and died in hospital	0	0.0
❖ Invalid Social Security Number	25	0.7
❖ Invalid Admit Date/Discharge Date/Birth Date/Sex	0	0.0
Total exclusions	*548*	*16.0*
Total members remaining in analysis	*2,878*	*84.0*

Diabetes

Inclusion Criteria

Hospitalizations for HMO members (18 through 75 years of age) were included in this analysis only if: 1) the member was identified as having diabetes according to HEDIS NCQA guidelines, 2) met continuous enrollment requirements set by NCQA, and 3) the hospitalization had a principal diagnosis of diabetes (ICD-9-CM codes are listed in Appendix A: *Description of Study Population).* Note that the age interval for this analysis is different from the other clinical treatments/conditions included in the report.

Utilization/Outcome Measures and Exclusion Criteria

Hospitalization Rate (age and sex-adjusted). The hospitalization rate is shown for each HMO using the total number of adult HMO members with diabetes hospitalized per 10,000 diabetic members. Excluded hospitalizations are listed in Table 7G. The HMO database was used as the comparative reference.

Table 7G. *Exclusions from "Hospitalization Rate" Analysis for Diabetes*

	Total HMO Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*1,481*	*100.0*
Exclusions:		
❖ Non-PA Resident	19	1.3
❖ Subsequent Hospitalization(s) (non-index) for the Same Person	248	16.7
❖ Metastatic Cancer*	8	0.5
❖ HIV Infection*	1	0.1
❖ Major Organ Transplant*	15	1.0
❖ Cases in DRGs Unrelated to Diabetes*	169	11.4
Total exclusions	460	31.1
Total members remaining in analysis	*1,021*	*68.9*

*See Appendix B for definitions of clinically complex exclusions and DRGs used to define diabetes.

Length of Stay (risk-adjusted). Length of stay was calculated from the diabetes index hospitalization, beginning with the date of admission and ending with the date of discharge of the hospitalization (length of stay was calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for diabetes are listed in the Table 7H. The HMO, PPO and fee-for-service combined database was used as the comparative reference.

Table 7H. *Exclusions from " Length of Stay" (LOS) Analysis for Diabetes*

	Total HMO, PPO and Fee-for-Service Hospitalizations		
	N	***% of Total***	***Avg. LOS***
Total hospitalizations before exclusions	*2,799*	*100.0*	*4.8*
Exclusions:			
❖ Hospitalization Rate Exclusions	884	31.6	6.5
❖ Death in Hospital	3	0.1	1.7
❖ Missing *Atlas Outcomes™* Scores	32	1.1	3.1
❖ Outlier[1]/ Missing or Invalid[2] LOS	5	0.2	44.0
Total exclusions	*924*	*33.0*	*6.5*
Total members remaining in analysis	*1,875*	*67.0*	*3.9*

[1]LOS values that were > 30 days.
[2]LOS value < 0.

Percent of Admissions for Short-Term Complications of Diabetes. For all diabetes hospitalizations included in the hospitalization rate analysis, PHC4 also calculated the percent that were hospitalized due to short-term complications of diabetes. These hospitalizations may be an immediate reflection of how well members are managing their diabetes. Short-term complications of diabetes are acute, life-threatening events related to blood sugar control. The following codes were used to identify short-term complications: 250.02, 250.03, 250.10-250.13, 250.20-250.23, 250.30-250.33.

Rehospitalizations (risk-adjusted). To calculate the percent rehospitalized, the first return hospitalization for diabetes-related acute care within 180 days of discharge from an acute care facility in Pennsylvania was used. For multiple-hospitalization episodes, the discharge date of the last hospitalization (which may not be diabetes-related) in the diabetes episode was used as the start point for counting the 180 days. If a member was rehospitalized multiple times, he or she was still counted as one member who was rehospitalized. Exclusion criteria for rehospitalizations are listed in Table 7I. The HMO, PPO and fee-for-service combined database was used as the comparative reference.

Table 7I. *Exclusions from "Rehospitalizations" Analysis for Diabetes*

	Total HMO, PPO and Fee-for-Service Hospitalizations	
	N	***% of Total***
Total hospitalizations before exclusions	*2,799*	*100.0*
Exclusions:		
❖ Length of Stay Exclusions	924	33.0
❖ Patient was transferred and died in hospital	1	<0.1
❖ Invalid Social Security Number	22	0.8
❖ Invalid Admit Date/Discharge Date/Birth Date/Sex	0	0.0
Total exclusions	*947*	*33.8*
Total members remaining in analysis	*1,852*	*66.2*

SURGICAL PROCEDURES

Hysterectomy

Inclusion Criteria

In the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, data are reported for abdominal and vaginal hysterectomies combined and separately. The study population included hospitalizations that were assigned a principal or secondary procedure code of hysterectomy (see Appendix A: "Description of Study Population"). Only adult (18 through 64 years of age) female HMO members were included in this analysis. Hysterectomies performed due to cancer or trauma of the female reproductive system or other emergent occurrences such as pregnancy related complications were excluded. Thus, only non-traumatic and non-female reproductive malignant hysterectomies were analyzed.

Utilization/Outcome Measures and Exclusion Criteria

Procedure Rate (age-adjusted). The procedure rate shown for each HMO used the total number of adult female index hospitalizations per 10,000 adult female members. Excluded hospitalizations are listed in Table 8A. The HMO database was used as the comparative reference.

Table 8A. *Exclusions from "Procedure Rate" Analyses for Hysterectomy*

	Total HMO Hospitalizations					
	Total		*Abdominal*		*Vaginal*	
	N	*% of Total*	*N*	*% of Total*	*N*	*% of Total*
Total hospitalizations before exclusions	*6,594*	*100.0*	*4,742*	*100.0*	*1,852*	*100.0*
Exclusions:						
❖ Non-PA Resident	86	1.3	60	1.3	26	1.4
❖ Multiple Hysterectomies for One Patient	0	0.0	0	0.0	0	0.0
❖ Metastatic Cancer[1, 2]	146	2.2	144	3.0	2	0.1
❖ Malignant/In situ Cancer[1,2]	567	8.6	498	10.5	69	3.7
❖ Hemorrhage on Admission[2]	0	0.0	0	0.0	0	0.0
❖ Cases in DRGs Unrelated to Hysterectomy[2]	88	1.3	74	1.6	14	0.8
❖ HIV Infection[2]	0	0.0	0	0.0	0	0.0
❖ Abdominal Trauma	1	<0.1	1	<0.1	0	0.0
Total exclusions	*888*	*13.5*	*777*	*16.4*	*111*	*6.0*
Total members remaining in analysis	*5,706*	*86.5*	*3,965*	*83.6*	*1,741*	*94.0*

[1]These hospitalizations were excluded due to cancer status of any body site, including reproductive organs.
[2]See Appendix B for definitions of clinically complex exclusions and DRGs used to define hysterectomy.

In-Hospital Complications (risk-adjusted). This measure is reported separately for abdominal and vaginal adult hysterectomies and was calculated for each HMO. In-hospital complications are any one of a particular set of ICD-9-CM codes in any procedure or secondary diagnosis position in the index hysterectomy hospitalization (refer to Appendix C for a detailed listing of the in-hospital complications). The exclusions to the in-hospital complications analysis for hysterectomy are outlined in Table 8B. The statewide database was used as the comparative reference.

Table 8B. *Exclusions from "In-Hospital Complications" Analyses for Hysterectomy*

	Total Statewide Hospitalizations			
	Abdominal		*Vaginal*	
	N	***% of Total***	***N***	***% of Total***
Total hospitalizations before exclusions	*15,684*	*100.0*	*6,054*	*100.0*
Exclusions:				
❖ Procedure Rate Exclusions	3,095	19.7	572	9.4
❖ Missing *Atlas Outcomes™* Score	78	0.5	45	0.7
Total exclusions	*3,173*	*20.2*	*617*	*10.2*
Total members remaining in analysis	*12,511*	*79.8*	*5,437*	*89.8*

Length of Stay (risk-adjusted). The inpatient length of stay for hysterectomy is the period of hospitalization beginning with the date of admission of the hospitalization in which the hysterectomy procedure was performed and ending with the date of discharge of the same hospitalization (length of stay was calculated as discharge date minus admit date). The exclusions to the risk-adjusted length of stay analysis for abdominal and vaginal hysterectomy are outlined in Table 8C. The statewide database was used as the comparative reference.

Table 8C. *Exclusions from "Length of Stay" (LOS) Analyses for Hysterectomy*

	Total Statewide Hospitalizations					
	Abdominal			*Vaginal*		
	N	***% of Total***	***Avg. LOS***	***N***	***% of Total***	***Avg. LOS***
Total hospitalizations before exclusions	*15,684*	*100.0*	*3.0*	*6,054*	*100.0*	*1.7*
Exclusions						
❖ In-Hospital Complications Exclusions	3,173	20.2	4.3	617	10.2	1.8
❖ Death in Hospital	0	0	0	0	0.0	0.0
❖ Outlier[1]/ Missing or Invalid[2] LOS	8	0.1	21.3	1	<0.1	14.0
Total exclusions	3,181	20.3	4.4	618	10.2	1.8
Total members remaining in analysis	*12,503*	*79.7*	*2.6*	*5,436*	*89.8*	*1.6*

[1]LOS > 16 days for abdominal and > 11 days for vaginal hysterectomy hospitalizations.
[2]LOS value < 0.

Mastectomy

Inclusion Criteria

Only adult (age 18 through 64 years of age) female HMO members were included in this analysis. Mastectomy cases were included in the data analysis if they included a principal diagnosis of breast cancer and a procedure code, in any position, for mastectomy (see Appendix A: "Description of Study Population" for a list of the ICD-9-CM codes included in the study).

Utilization/Outcome Measures and Exclusion Criteria

Procedure Rate (age-adjusted). The procedure rate is shown for each HMO using the total number of procedures (both inpatient and ambulatory) per 10,000 adult female members. Procedure rates were based upon the *total number of mastectomies.* If a single patient had more than one mastectomy over the course of the study period, all encounters were included. Excluded hospitalizations are listed in Table 8D. The HMO database served as the comparative reference.

Table 8D. *Exclusions from "Procedure Rate" Analyses for Mastectomy–Inpatient and Ambulatory*

	Total HMO Procedures	
	N	***% of Total***
Total procedures before exclusions	*634*	*100.0*
Exclusions:		
❖ Non-PA Resident	12	1.9
❖ HIV Infection*	0	0.0
❖ Metastatic cancer, except cancer of the breast*	9	1.4
Total exclusions	*21*	*3.3*
Total procedures remaining in analysis	*613*	*96.7*

*See Appendix B for definitions of clinically complex exclusions.

In-Hospital Complications (risk-adjusted). This measure was calculated only for inpatient procedures for each HMO. In-hospital complications are any one of a particular set of ICD-9-CM codes in any procedure or secondary diagnosis position in a discharge record associated with mastectomy (refer to Appendix C for a detailed listing of the in-hospital complications). The exclusions to the in-hospital complications analysis are found in Table 8E. The statewide database was used as the comparative reference.

Table 8E. *Exclusions from "In-Hospital Complications" Analyses for Mastectomy*

	Total Statewide Procedures	
	N	***% of Total***
Total procedures[1] before exclusions	*2,379*	*100.0*
Exclusions:		
❖ Procedure Rate Exclusions	297	12.5
❖ Ambulatory Case[2]	315	13.2
❖ Missing *Atlas Outcomes™* Score	19	0.8
Total exclusions	*631*	*26.5*
Total hospitalizations remaining in analysis	*1,748*	*73.5*

[1]Includes inpatient and ambulatory cases.
[2]Records related to ambulatory care were not analyzed in the in-hospital complications percent since this was derived from inpatient records only.

Length of Stay (risk-adjusted). Only inpatient hospitalizations were included in the length of stay outcome measure. Length of stay was calculated from a single hospitalization only, beginning with the date of admission and ending with the date of discharge (length of stay was calculated as discharge date minus admit date). Hospitalizations that were excluded from the analysis are listed in Table 8F. The statewide database was used as the comparative reference.

Table 8F. *Exclusions from "Length of Stay" (LOS) Analyses for Mastectomy*

	Total Statewide Procedures		
	N	***% of Total***	***Avg. LOS[1]***
Total procedures[2] before exclusions	*2,379*	*100.0*	*2.2*
Exclusions:			
❖ Procedure Rate Exclusions	631	26.5	2.7
❖ Death in Hospital	0	0.0	NA
❖ Outlier[3]/Missing or Invalid[4] LOS	1	<0.1	16.0
Total exclusions	*632*	*26.6*	*2.7*
Total hospitalizations remaining in analysis	*1,747*	*73.4*	*2.1*

[1] Based on inpatient cases only.
[2]Includes inpatient and ambulatory cases.
[3]LOS > 15 days.
[4]LOS value < 0.
NA: Not Applicable

Neck and Back Procedures

Inclusion Criteria

Adult (18 through 64 years of age) HMO members were included in the analyses of neck and back procedures. Cases were included in the data analysis if they included a principal diagnosis and a procedure code (in any position) of one of the ICD-9-CM codes listed in Appendix A: "Description of Study Population."

Utilization/Outcome Measures and Exclusion Criteria

Procedure Rate (age and sex-adjusted). The procedure rate is shown for each HMO using the total number of neck and back procedures (fusion and non-fusion combined; both inpatient and ambulatory) per 10,000 adult HMO members. Excluded encounters are listed in Table 8G. The HMO database was used as the comparative reference.

Table 8G. *Exclusions from "Procedure Rate" Analyses for Neck and Back Procedures – Inpatient and Ambulatory*

	Total HMO Procedures					
	Total		*With Fusion*		*Without Fusion*	
	N	*% of Total*	*N*	*% of Total*	*N*	*% of Total*
Total procedures before exclusions	*5,031*	*100.0*	*1,898*	*100.0*	*3,133*	*100.0*
Exclusions:						
❖ Non-PA Resident	106	2.1	40	2.1	66	2.1
❖ Refusion*	20	0.4	18	0.9	2	0.1
❖ Pathological Spinal Fracture*	4	0.1	3	0.2	1	<0.1
❖ Spinal Nerve Root Injury*	3	0.1	2	0.1	1	<0.1
❖ Paraplegia*	2	<0.1	2	0.1	0	0.0
❖ Quadriplegia*	3	0.1	3	0.2	0	0.0
❖ Hemiplegia*	0	0.0	0	0.0	0	0.0
❖ Unspecified Paralysis*	2	<0.1	2	0.1	0	0.0
❖ Spinal Fracture*	3	0.1	2	0.1	1	<0.1
❖ Metastatic Cancer*	0	0.0	0	0.0	0	0.0
❖ HIV Infection; Infantile Cerebral Palsy*	0	0.0	0	0.0	0	0.0
❖ Invalid dates	0	0.0	0	0.0	0	0.0
Total exclusions	*143*	*2.8*	*72*	*3.8*	*71*	*2.3*
Total procedures remaining in analysis	*4,888*	*97.2*	*1,826*	*96.2*	*3,062*	*97.7*

*See Appendix B for definitions of clinically complex exclusions.

Percent Performed Inpatient. The percent of procedures that were performed in an inpatient setting is reported for both fusion and non-fusion procedures. All procedures that were counted in the respective procedure rates were included in this analysis. The percent is unadjusted.

In-Hospital Complications (risk-adjusted). This measure was calculated only for inpatient procedures for each HMO and is reported separately for fusion and non-fusion procedures. In-hospital complications are any one of a particular set of ICD-9-CM codes in any procedure or secondary diagnosis position in a discharge record associated with the neck/back hospitalization (refer to Appendix C for a detailed listing of the in-hospital complications). The exclusions to the in-hospital complications analysis are found in Table 8H. The statewide database was used as the comparative reference.

Table 8H. *Exclusions from "In-Hospital Complications" Analyses for Neck and Back Procedures – Inpatient Only*

	Total Statewide Procedures			
	With Fusion		*Without Fusion*	
	N	***% of Total***	***N***	***% of Total***
Total procedures[1] before exclusions	*7,721*	*100.0*	*12,613*	*100.0*
Exclusions:				
❖ Procedure Rate Exclusions	801	10.4	1,125	8.9
❖ Missing *Atlas Outcomes™* Score	33	0.4	62	0.5
❖ Improper Coding of Fusion Technique[2]	26	0.3	NA	NA
❖ Ambulatory Cases[3]	524	6.8	2,881	22.8
Total exclusions	*1,384*	*17.9*	*4,068*	*32.3*
Total hospitalizations remaining in analysis	*6,337*	*82.1*	*8,545*	*67.7*

[1]Includes inpatient and ambulatory cases
[2]Fusion technique was tested as a risk factor for in-hospital complications. Therefore, if the ICD-9-CM procedure coding did not clearly indicate the fusion technique, the hospitalization was excluded from the complications analysis.
[3]Records related to ambulatory care were not analyzed in the in-hospital complications percent since this was derived from inpatient records only.
NA: Not Applicable

Length of Stay (risk-adjusted). Length of stay was calculated from a single hospitalization only, beginning with the date of admission and ending with the date of discharge (length of stay was calculated as discharge date minus admit date). It is reported separately for fusion and non-fusion procedures and was calculated for each HMO. Only inpatient hospitalizations were included in the length of stay measure. Hospitalizations that were excluded from the risk-adjusted length of stay analysis for neck and back procedures are listed in Table 8I. The statewide database was used as the comparative reference.

Table 8I. *Exclusions from "Length of Stay" (LOS) Analysis for Inpatient Neck and Back Procedures*

	Total Statewide Inpatient Procedures					
	With Fusion			*Without Fusion*		
	N	***% of Total***	***Avg. LOS[1]***	***N***	***% of Total***	***Avg. LOS***
Total procedures[2] before exclusions	*7,721*	*100.0*	*2.4*	*12,613*	*100.0*	*1.7*
Exclusions:						
❖ In-Hospital Complications Exclusions	1,384	17.9	2.8	4,068	32.3	1.6
❖ Death in Hospital	4	0.1	11.8	2	0.0	1.0
❖ Outlier[3]/Missing or Invalid[4] LOS	9	0.1	28.9	9	0.1	23.0
Total exclusions	*1,397*	*18.1*	*3.1*	4,079	*32.3*	*1.7*
Total hospitalizations remaining in analysis	*6,324*	*81.9*	*2.3*	*8,534*	*67.7*	*1.7*

[1]Based on inpatient cases only.
[2]Includes inpatient and ambulatory cases.
[3]LOS > 20 days for neck and back procedures with fusion and > 16 days for procedures without fusion.
[4]LOS value < 0.

MEMBER SATISFACTION

Satisfaction Measures

The following CAHPS Survey Questions are included in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report for calendar year 2005:

- Question 9 "In the last 12 months, how much of a problem, if any, was it to see a specialist that you needed to see?"
- Question 24 "In the last 12 months, how much of a problem, if any, was it to get the care, tests or treatment you or a doctor believed necessary?"
- Question 26 "In the last 12 months, how much of a problem, if any, were delays in health care while you waited for approval from your health plan?"
- Question 42 "In the last 12 months, how much of a problem, if any, was it to get the help you needed when you called your health plan's customer service?"
- Question 45 "Was your complaint or problem settled to your satisfaction?"
- Question 49 "How would you rate your health plan?"

All reported CAHPS measures include an average for the group of Pennsylvania HMO plans. These averages were calculated by PHC4 by weighting each plan's score by its CY2005 total commercial enrollment. National averages were also included when available from NCQA. The national averages (provided in the NCQA *Quality Compass*® database) include all lines of business across all reporting managed care organizations in the United States.

HMO PLAN PROFILE

The HMO "Plan Profile" is found on the PHC4 Web site only. The specific source of data and the determination of the information in the HMO profile is described below.

NCQA Accreditation Status. The "NCQA Accreditation Status" variable was obtained from the NCQA Web site and was current as of the publication date of the *CY2005 Measuring the Quality of Pennsylvania's Commercial HMOs*.

Additional Data. The following information was provided by the plans:

- Full plan name
- Abbreviated plan name
- Contact telephone number
- Web site address
- Counties served

APPENDICES

Preventing Hospitalization Through Primary Care

Ear, Nose and Throat Infections *(Pediatric and Adult)*	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 017.4x (x = 0-6), 034.0, 055.2, 112.82, 380.10, 380.11, 380.12, 380.14, 380.16, 381.00, 381.01, 381.02, 381.03, 381.04, 381.05, 381.06, 381.10, 381.19, 381.20, 381.29, 381.3, 381.4, 382.00, 382.01, 382.1, 382.2, 382.3, 382.4, 382.9, 461.0, 461.1, 461.2, 461.3, 461.8, 461.9, 462, 463, 464.00, 464.01, 464.20, 464.21, 464.30, 464.31, 464.4, 464.50, 464.51, 465.0, 465.8, 465.9, 472.0, 472.1, 472.2, 473.0, 473.1, 473.2, 473.3, 473.8, 473.9, 474.00, 474.01, 474.02, 476.0, 476.1, 487.1
High Blood Pressure	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 401.0, 401.1, 401.9, 402.00, 402.10, 402.90, 403.00, 403.10, 403.90, 404.00, 404.10, 404.90
Gastrointestinal Infections	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 003.0, 006.2, 009.0, 009.1, 558.2, 558.9
Kidney/Urinary Tract Infections	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 590.00, 590.01, 590.10, 590.11, 590.2, 590.3, 590.80, 590.9, 595.x (x=0-3), 595.81, 595.89, 595.9, 599.0

Managing On-Going Illness

Chronic Obstructive Pulmonary Disease	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 491.20, 491.21, 491.22, 492.0, 492.8, 496, 506.4
Asthma *(Pediatric and Adult)*	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 493.00, 493.01, 493.02, 493.10, 493.11, 493.12, 493.20, 493.21, 493.22, 493.81, 493.82, 493.90, 493.91, 493.92
Diabetes	*Any one of the following ICD-9-CM diagnosis codes in the principal position:* 250.xy (x = 0-9, y = 0-3)

Surgical Procedures

Hysterectomy *(Abdominal)* *(Vaginal)*	*Any one of the following ICD-9-CM procedure codes in the any position:* 68.31, 68.39, 68.4, 68.6, 68.7 68.51, 68.59, 68.9
Mastectomy	*Any one of the following ICD-9-CM or CPT procedure codes in any position:* 85.41, 85.42, 85.43, 85.44, 85.45, 85.46, 85.47, 85.48, 19180, 19200, 19220, 19240 *AND* *Any one of the following ICD-9-CM diagnosis codes in the principal position:* 174.0, 174.1, 174.2, 174.3, 174.4, 174.5, 174.6, 174.8, 174.9, 196.3, 198.2, 198.81, 233.0, 238.3, 239.3
Neck and Back Procedures *(With Fusion)*	*Any one of the following ICD-9-CM or CPT procedure codes in any position:* 03.09, 80.50, 80.51, 80.59, 63001, 63003, 63005, 63011, 63012, 63015, 63016, 63017, 63045, 63046, 63047, 63050*, 63051*, 63055, 63056, 63064, 22220, 22222, 22224, 63020, 63030, 63040, 63042, 63075, 63077 *AND* *Any one of the following ICD-9-CM or CPT fusion codes in any position:* 81.00, 81.01, 81.02, 81.03, 81.04, 81.05, 81.06, 81.07, 81.08, 81.61, 81.62, 81.63, 81.64, 22800, 22802, 22804, 22808, 22810, 22812, 22548, 22590, 22595, 22554, 22600, 22556, 22610, 22558, 22612, 22630 *AND* *Any one of the following ICD-9-CM diagnosis codes in the principal position:* 720.0, 721.0, 721.1, 721.2, 721.3, 721.41, 721.42, 721.90, 721.91, 722.0, 722.10, 722.11, 722.2, 722.4, 722.51, 722.52, 722.6, 722.70, 722.71, 722.72, 722.73, 722.90, 722.91, 722.92, 722.93, 723.0, 723.1, 724.00, 724.01, 724.02, 724.09, 724.1, 724.2, 724.3, 724.5, 738.4, 756.11, 756.12
(Without Fusion)	*Any one of the following ICD-9-CM or CPT procedure codes in any position:* 03.09, 80.50, 80.51, 80.59, 63001, 63003, 63005, 63011, 63012, 63015, 63016, 63017, 63045, 63046, 63047, 63050*, 63051*, 63055, 63056, 63064, 22220, 22222, 22224, 63020, 63030, 63040, 63042, 63075, 63077 *AND* *Any one of the following ICD-9-CM diagnosis codes in the principal position:* 720.0, 721.0, 721.1, 721.2, 721.3, 721.41, 721.42, 721.90, 721.91, 722.0, 722.10, 722.11, 722.2, 722.4, 722.51, 722.52, 722.6, 722.70, 722.71, 722.72, 722.73, 722.90, 722.91, 722.92, 722.93, 723.0, 723.1, 724.00, 724.01, 724.02, 724.09, 724.1, 724.2, 724.3, 724.5, 738.4, 756.11, 756.12

*New code effective CY 2005

Appendix B: Clinically Complex Exclusions and DRGs Used to Define Conditions

Clinically Complex Exclusions

Exclusion	Definition[1]
Abdominal trauma	Dx: 867.4, 867.5, 864.6, 867.7, 867.8, 867.9, 868.00, 868.03, 868.04, 868.09, 868.10, 868.13, 868.14, 868.19, 869.0, 869.1, 879.6, 879.7, 879.8, 879.9, 906.0, 908.1, 908.2, 939.1, 947.4
Chronic Renal Failure	Dx: 585**, 585.1-6* 585.9*
Cleft Lip and Palate Repair	DRG: 052
Ear, Nose, or Throat Cancer	Dx: 146.0-146.9, 147.0-147.3, 147.8, 147.9, 148.0-148.3, 148.8, 148.9, 149.0, 149.1, 149.8, 149.9, 160.0-160.5, 160.8, 160.9, 161.0-161.3, 161.8, 161.9, 162.0, 231.0, 231.1, 231.8, 231.9, 235.1, 235.6, 235.9
Extensive OR Procedures Unrelated to Principal Diagnosis	DRG: 468
Gastrointestinal Cancer	Dx: 150.0-150.5, 150.8, 150.9, 151.0-151.6, 151.8, 151.9, 152.0-152.3, 152.8, 152.9, 153.0-153.9, 154.0-154.3, 154.8, 155.0-155.2, 156.0-156.2, 156.8, 156.9, 157.0-157.4, 157.8, 157.9, 158.0, 158.8, 158.9, 159.0, 159.8, 159.9, 195.2, 197.4-197.8, 230.1-230.9, 235.2-235.5, 239.0
Heart or Heart and Lung Transplant	Px: 33.6, 37.51, 37.52
Hemiplegia	Dx: 342.00-342.02, 342.10-342.12, 342.80-342.82, 342.90-342.92
Hemorrhage	Dx: 998.11
HIV Infection	Dx: 042
Infantile Cerebral Palsy	Dx: 343.0-343.3
Kidney, Ureter and Major Bladder Procedures for Nonneoplasms with CC[2]	DRG: 304
Kidney, Ureter and Major Bladder Procedures for Nonneoplasms without CC[2]	DRG: 305
Kidney/Urinary Tract Cancer	Dx: 188.0-188.9, 189.0-189.4, 189.8, 189.9, 233.7, 233.9, 236.7, 236.90, 236.91, 236.99, 239.4
Lung Cancer	Dx: 162.2-162.5, 162.8, 162.9, 197.0, 231.2, 235.7, 239.1
Malignant/In Situ Cancer	Dx: 140.0-208.9, 230.0-239.9
Major Large and Small Bowel Procedures with CC[2]	DRG: 148
Major Large and Small Bowel Procedures without CC[2]	DRG: 149
Major Organ Transplant	Px: 33.50-33.52, 33.6, 37.51, 37.52, 41.00-41.09, 41.94, 46.97, 50.51, 50.59, 52.80-52.86, 55.61, 55.69
Mechanical Ventilation	Px: 96.70, 96.71, 96.72
Metastatic Cancer	Dx: 196.3, 196.5, 196.6, 196.8, 196.9, 197.0-197.8, 198.2, 198.82, 198.89, 199.0, 199.1
Metastatic Cancer, except Cancer of the Breast	Dx:196.1-196.2,196.5,196.6,196.8,196.9,197.0–197.8,198.3-198.7, 198.82, 198.89, 199.0,199.1
Open Heart Surgery	Dx: 35.00-35.04, 35.10-35.14, 35.20-35.28, 35.31-35.35, 35.39, 35.42, 35.50-35.54, 35.60-35.63, 35.70-35.73, 35.81-35.84, 35.91-35.95, 35.98, 35.99, 36.10-36.17, 36.19, 36.2, 36.31, 36.32, 36.39, 36.91, 36.99, 37.10-37.12, 37.31-37.33, 37.4**, 37.41*, 37.49*, 37.51, 37.52, 37.53
Other Digestive System OR Procedures with CC[2]	DRG: 170
Paraplegia	Dx: 344.1
Pathological Spinal Fracture	Dx: 733.13
PTCA/Stent	Px: 36.01**, 36.02**, 36.05**, 36.06, 36.07, 00.66*
Quadriplegia	Dx: 344.00-344.04, 344.09
Refusion	Px: 81.30-81.39 in any position
Renal Dialysis	Dx: V45.1, V56.0, V56.8 Px: 39.95, 54.98
Spinal Fracture	Dx: 805.0x, 805.1x, x=0-8; 805.2-805.9; 806.0x, x=0-9; 806.1x, x=0-9; 806.2x, x=0-9; 806.3x, x=0-9; 806.4; 806.5; 806.6x, x=0-2, 9; 806.7x, x=0-2, 9; 806.8; 806.9
Spinal Nerve Root Injury	Dx: 952.0x, x=0-9; 952.1x, x=0-9; 952.2; 952.3; 952.4; 952.8; 952.9; 953.0-953.5; 953.8; 953.9; 954.0; 954.1; 954.8; 954.9
Tracheitis	Dx: 464.10, 464.11, 464.20, 464.21
Tracheostomy	Px: 31.1, 31.21, 31.29
Unspecified Paralysis	Dx: 344.9

[1]Cases are defined by ICD-9-CM Diagnosis (Dx)/ Procedure (Px) Codes or Diagnostic Related Group (DRG). [2]Comorbidity(s) and/or Complication(s).
* Valid as of October 1, 2005. **Invalid as of October 1, 2005.

DRGs Used to Define Conditions

Listed below are the DRGs used to define cases related to kidney/urinary tract infections, COPD, diabetes, and hysterectomy. For each condition, cases in DRGs other than those below are considered clinically complex and are excluded.

Kidney/Urinary Tract Infection cases are restricted to the following DRGs:

320	Kidney and Urinary Tract Infections, Age Greater than 17 with CC‡
321	Kidney and Urinary Tract Infections, Age Greater than 17 without CC‡
322	Kidney and Urinary Tract Infections, Age 0 – 17

COPD cases are restricted to the following DRG:

88	Chronic Obstructive Pulmonary Disease

Diabetes cases are restricted to the following DRGs:

018	Cranial and Peripheral Nerve Disorders with CC‡
019	Cranial and Peripheral Nerve Disorders without CC‡
113	Amputation for Circulatory System Disorders Except Upper Limb and Toe
114	Upper Limb and Toe Amputation for Circulatory System Disorders
130	Peripheral Vascular Disorders with CC‡
131	Peripheral Vascular Disorders without CC‡
285	Amputation of Lower Limb for Endocrine, Nutritional and Metabolic Disorders
294	Diabetes, Age Greater than 35
295	Diabetes, Age 0 – 35
331	Other Kidney and Urinary Tract Diagnoses, Age Greater than 17 with CC‡
332	Other Kidney and Urinary Tract Diagnoses, Age Greater than 17 without CC‡

Hysterectomy (abdominal and vaginal) cases are restricted to the following DRGs:

353	Pelvic Evisceration, Radical Hysterectomy and Radical Vulvectomy
354	Uterine and Adnexa Procedures for Nonovarian/Adnexal Malignancy with CC‡
355	Uterine and Adnexa Procedures for Nonovarian/Adnexal Malignancy without CC‡
357	Uterine and Adnexa Procedures for Ovarian or Adnexal Malignancy
358	Uterine and Adnexa Procedures for Nonmalignancy with CC‡
359	Uterine and Adnexa Procedures for Nonmalignancy without CC‡

‡CC: Complication(s) and/or Comorbidity(s)

Appendix C: In-Hospital Complications for Surgical Procedures

Statewide In-Hospital Complications for Hysterectomy

Total Abdominal Cases[†]				*Total Vaginal Cases*[†]			
Complication Type	**#**	**%**	**Avg. LOS**	**Complication Type**	**#**	**%**	**Avg. LOS**
• Procedure/Medical Care Related Events	372	3.0	3.8	• Procedure/Medical Care Related Events	133	2.4	2.3
• Digestive System Complications	325	2.6	5.3	• Hemorrhage	108	2.0	2.8
• Hemorrhage	224	1.8	3.9	• Urinary Complications	38	0.7	2.3
• Pulmonary Compromise	150	1.2	4.5	• Digestive System Complications	32	0.6	3.6
• Urinary Complications	95	0.8	3.9	• Pulmonary Compromise	30	0.6	2.9
• Infection	71	0.6	7.0	• Hypo/Hypertension	10	0.2	3.4
• Pneumonia	43	0.3	5.8	• Cardiac Complications	9	0.2	2.7
• Cardiac Complications	38	0.3	3.7	• Gastric/Intestinal Hemorrhage or	9	0.2	5.2
• Hypo/Hypertension	33	0.3	2.7	• Pneumonia	8	0.1	4.3
• Venous Thrombosis/Pulmonary Embolism	22	0.2	5.9	• Infection	7	0.1	6.1
• Gastric/Intestinal Hemorrhage or Ulceration	9	0.1	4.6	• Venous Thrombosis/Pulmonary Embolism	7	0.1	3.9
• Stroke/Anoxic Brain Damage	6	<0.1	4.0	• Device, Implant or Graft Complications	4	0.1	2.3
• Device, Implant or Graft Complications	2	<0.1	3.0	• Stroke/Anoxic Brain Damage	0	0.0	NA
• Death	0	0.0	NA	• Death	0	0.0	NA
Any Complication Above	***1,211***	***9.7***	***4.1***	***Any Complication Above***	***356***	***6.5***	***2.6***
Without Any Complication Above	***11,300***	***90.3***	***2.5***	***Without Any Complication Above***	***5,081***	***93.5***	***1.6***

Statewide In-Hospital Complications for Mastectomy

Total Mastectomy Cases[†]			
Complication Type	**#**	**%**	**Avg. LOS**
• Hemorrhage	39	2.2	3.7
• Procedure/Medical Care Related Events	12	0.7	5.0
• Pulmonary Compromise	12	0.7	4.3
• Device, Implant or Graft Complications	12	0.7	3.7
• Urinary Complication	11	0.6	3.6
• Digestive System Complications	8	0.5	3.5
• Infection	4	0.2	7.0
• Cardiac Complications	4	0.2	3.0
• Hypo/Hypertension	3	0.2	3.0
• Venous Thrombosis/Pulmonary Embolism	2	0.1	4.5
• Pneumonia	1	0.1	4.0
• Stroke/Anoxic Brain Damage	1	0.1	2.0
• Gastric/Intestinal Hemorrhage or Ulceration	0	0.0	NA
• Death	0	0.0	NA
• Lymphedema	0	0.0	NA
Any Complication Above	***100***	***5.7***	***3.9***
Without Any Complication Above	***1,648***	***94.3***	***2.0***

[†]The term "cases" refers to hospitalizations after exclusions.
NA: Not Applicable

Statewide In-Hospital Complications for Neck and Back Procedures

Total Cases† With Fusion				***Total Cases† Without Fusion***			
Complication Type	**#**	**%**	**Avg. LOS**	**Complication Type**	**#**	**%**	**Avg. LOS**
▪ Procedure/Medical Care Related Events	150	2.4	5.1	▪ Procedure/Medical Care Related Events	241	2.8	3.2
▪ Digestive System Complications	79	1.2	5.5	▪ Urinary Complications	82	1.0	3.5
▪ Pulmonary Compromise	70	1.1	6.7	▪ Stroke/Anoxic Brain Damage	45	0.5	4.1
▪ Hemorrhage	47	0.7	5.8	▪ Pulmonary Compromise	40	0.5	4.9
▪ Urinary Complications	44	0.7	4.9	▪ Digestive System Complications	35	0.4	4.1
▪ Hypo/Hypertension	21	0.3	4.2	▪ Hemorrhage	33	0.4	5.0
▪ Stroke/Anoxic Brain Damage	20	0.3	10.3	▪ Hypo/Hypertension	24	0.3	2.3
▪ Cardiac Complications	19	0.3	7.4	▪ Venous Thrombosis/Pulmonary Embolism	12	0.1	8.2
▪ Venous Thrombosis/Pulmonary Embolism	16	0.3	11.3	▪ Device, Implant or Graft Complications	11	0.1	3.7
▪ Pneumonia	14	0.2	8.6	▪ Cardiac Complications	10	0.1	4.2
▪ Infection	9	0.1	17.1	▪ Infection	7	0.1	14.4
▪ Device, Implant or Graft Complications	9	0.1	3.9	▪ Pneumonia	4	<0.1	4.5
▪ Death	4	0.1	11.8	▪ Death	2	<0.1	1.0
▪ Gastric/Intestinal Hemorrhage or Ulceration	1	<0.1	3.0	▪ Gastric/Intestinal Hemorrhage or Ulceration	1	<0.1	16.0
Any Complication Above	***425***	***6.7***	***5.1***	***Any Complication Above***	***501***	***5.9***	***3.6***
Without Any Complication Above	***5,912***	***93.3***	***2.1***	***Without Any Complication Above***	***8,044***	***94.1***	***1.6***

†The term "cases" refers to hospitalizations after exclusions.
NA: Not Applicable

Definition of In-Hospital Complications for Surgical Procedures

The following ICD-9-CM codes were used to define in-hospital complications for all surgical procedures including Hysterectomy (Abdominal and Vaginal), Mastectomy, and Neck and Back Procedures (With Fusion and Without Fusion). Exceptions are noted.

Procedure/Medical Care Related Events					
995.4	998.0	998.32	998.7	998.9	999.8
995.86	998.2	998.4	998.83	999.6	999.9
995.89	998.31	998.6	998.89	999.7	
Digestive System Complications					
557.0[4]	560.1[4]	560.9[1,4]	997.4		
Pulmonary Compromise					
31.1 (Procedure)	31.29 (Procedure)	514	518.5	518.82	997.3
31.21 (Procedure)	512.1	518.4	518.81	518.84	998.81
Lymphedema					
457.0[2]					
Hemorrhage					
39.98 (Procedure)	57.93 (Procedure)[1]	998.11	998.12	998.13	
Infection					
038.0	038.41	567.21[1,4]	567.89[1,4]	995.94	996.66[3]
038.10	038.42	567.22[1,4]	567.9[1,4]	996.60[1,2]	996.67[3]
038.11	038.43	567.29[1,4]	995.90	996.62	996.69[2]
038.19	038.44	567.31[1,4]	995.91	996.63[3]	998.51
038.2	038.49	567.38[1,4]	995.92	996.64	998.59
038.3	038.8	567.39[1,4]	995.93	996.65[1]	999.3
038.40	038.9				
Pneumonia *Coded by causative organism.*					
481	482.30	482.40	482.82	482.9	485
482.0	482.31	482.41	482.83	483.0	486
482.1	482.32	482.49	482.84	483.1	
482.2	482.39	482.81	482.89	483.8	
Cardiac Complications					
410.01	410.21	410.41	410.61	410.81	997.1
410.11	410.31	410.51	410.71	410.91	
Venous and Arterial Thrombosis/Pulmonary Embolism					
415.11	451.19	451.83[4]	453.40[4]	453.9[4]	997.79
415.19	451.2[4]	451.84[4]	453.41[4]	997.2	999.1
451.0[4]	451.81	451.89[4]	453.42[4]	997.71	999.2
451.11	451.82[4]	451.9[4]	453.8	997.72	
Hypotension/Hypertension					
458.21	458.29	997.91			
Stroke/Anoxic Brain Damage					
348.1	432.1	433.21	434.01	997.00	
430	432.9	433.31	434.11	997.01	
431	433.01	433.81	434.91	997.02	
432.0	433.11	433.91	436	997.09	
Device, Implant, or Graft Complications					
996.2[3,4]	996.31	996.52 [2,3]	996.55[2]	996.75[3]	996.78[3]
996.30[1]	996.39[1]	996.54[2]	996.70[2]	996.76[1]	996.79[2]
Gastric/Intestinal Hemorrhage or Ulceration					
49.95 (Procedure)[1]	531.41	532.21	533.11	534.01	534.61
531.00	531.60	532.40	533.20	534.10	537.84
531.01	531.61	532.41	533.21	534.11	568.81[1,4]
531.10	532.00	532.60	533.40	534.20	578.9
531.11	532.01	532.61	533.41	534.21	
531.20	532.10	533.00	533.60	534.40	
531.21	532.11	533.01	533.61	534.41	
531.40	532.20	533.10	534.00	534.60	
Urinary Complications					
584.5[4]	584.6[4]	584.7[4]	584.8[4]	584.9[4]	997.5[4]
Death	Discharge Status Code 20 was included as a complication for all surgical procedures.				

[1]Hysterectomy group only
[2] Mastectomy group only
[3] Neck & back group only
[4]Code added to category beginning CY 2005

Appendix D: Risk Factor Descriptions

Pediatric Ear, Nose and Throat Infections

Cases age 0 through 17

Hospitalization Rate	**HMO Inpatient Cases* (N = 476)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
0 – 4 years	274	57.6
5 –17 years	202	42.4
• Sex		
Female	203	42.6
Male	273	57.4

**Cases after hospitalization rate exclusions; comparative reference = HMO database*

Adult Ear, Nose and Throat Infections

Cases age 18 through 64

Hospitalization Rate	**HMO Inpatient Cases* (N = 519)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	298	57.4
45 – 64 years	221	42.6
• Sex		
Female	289	55.7
Male	230	44.3

**Cases after hospitalization rate exclusions; comparative reference = HMO database*

High Blood Pressure (Hypertension)

Cases age 18 through 64

Hospitalization Rate	**HMO Inpatient Cases* (N = 528)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	142	26.9
45 – 64 years	386	73.1
• Sex		
Female	292	55.3
Male	236	44.7

**Cases after hospitalization rate exclusions; comparative reference = HMO database*

Gastrointestinal Infections

Cases age 0 through 64

Hospitalization Rate	**HMO Inpatient Cases* (N = 1,074)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
0 – 4 years	101	9.4
5 – 17 years	83	7.7
18 – 44 years	449	41.8
45 – 64 years	441	41.1
• Sex		
Female	660	61.5
Male	414	38.5

**Cases after hospitalization rate exclusions; comparative reference = HMO database*

Kidney/Urinary Tract Infections

Cases age 0 through 64

Hospitalization Rate	**HMO Inpatient Cases* (N = 1,212)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
0 – 4 years	145	12.0
5 – 17 years	115	9.5
18 – 44 years	437	36.1
45 – 64 years	515	42.5
• Sex		
Female	950	78.4
Male	262	21.6

**Cases after hospitalization rate exclusions; comparative reference = HMO database*

Chronic Obstructive Pulmonary Disease

Cases age 18 through 64

Hospitalization Rate	**HMO Inpatient Cases* (N = 953)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	45	4.7
45 – 64 years	908	95.3
• Sex		
Female	497	52.2
Male	456	47.8
**Cases after hospitalization rate exclusions; comparative reference = HMO database*		

Length of Stay (LOS)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 1,627)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• Age			
18 – 50 years	303	18.6	3.4
51 – 55 years	329	20.2	3.7
56 – 59 years	412	25.3	4.0
60 – 62 years	388	23.8	3.9
63 - 64 years	195	12.0	4.4
• *Atlas Outcomes™* MQPredLOS			
0 – 3.747 days	325	20.0	3.1
3.748 – 4.188 days	325	20.0	3.3
4.189 – 4.644 days	327	20.1	3.8
4.645 – 5.254 days	326	20.0	4.2
5.255 + days	324	19.9	4.9
• Psychological Disorders			
No	1,263	77.6	3.8
Yes	364	22.4	4.2
**Cases after LOS exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*			

Rehospitalizations (Rehosp)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 1,621)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Rehospitalized*
• *Atlas Outcomes™* MQPredLOS			
0 – 3.753days	324	20.0	13.0
3.754 – 4.188 days	323	19.9	16.7
4.189 – 4.644 days	326	20.1	19.3
4.645 – 5.254 days	325	20.0	24.6
5.255 + days	323	19.9	24.8
**Cases after rehospitalization exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*			

LOS	***Rehosp***	***Significant Risk Factors Used for Length of Stay and Rehospitalizations***
✓		• Age
		• Age-Squared
		• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes™* Predicted Length of Stay (MQPredLOS)
		• Diabetes (no, yes)
		• Female (no, yes)
		• Heart Failure (no, yes)
		• High Poverty (high, average, very high; based on zip code)
		• Malignant/In situ cancer (no, yes)
		• Median Household Income (based on zip code)
		• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes™* Predicted Probability of Death [MQPredDeath])
✓		• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)
		• Tobacco Use (no, yes)

NA - Not applicable

Pediatric Asthma

Cases age 0 through 17

Hospitalization Rate	**HMO Inpatient Cases* (N = 1,018)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
0 – 4 years	438	43.0
5 – 17 years	580	57.0
• Sex		
Female	359	35.3
Male	659	64.7
**Cases after hospitalization rate exclusions; comparative reference = HMO database*		

Length of Stay (LOS)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 1,378)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• *Atlas Outcomes™* PredLOS			
0 – 2.004 days	88	6.4	1.7
2.005 – 2.177 days	808	58.6	1.8
2.178 – 2.485 days	210	15.2	2.1
2.486 +	272	19.7	2.3
• *Age*			
0 – 1 year	274	19.9	1.9
2 – 2 years	155	11.2	1.8
3 – 6 years	427	31.0	1.7
7 – 11 years	311	22.6	2.0
12 – 17 years	211	15.3	2.3
• *Asthma Presentation*			
Acute Exacerbation	817	59.3	1.8
Status Asthmaticus	447	32.4	2.1
Unspecified	114	8.3	1.8
• *Asthma Type*			
Chronic Obstructive/Intrinsic/Unspecified	1,169	84.8	1.9
Extrinsic	209	15.2	2.1
**Cases after LOS exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*			

LOS	***Significant Risk Factors Used for Length of Stay***
✓	• Age
	• Age-Squared
	• Alcohol and Drug Abuse (no, yes)
✓	• Asthma Presentation (unspecified, with Status asthmaticus, with (acute) exacerbation)
✓	• Asthma Type (extrinsic, intrinsic, chronic obstructive, unspecified)
✓	• *Atlas Outcomes™* Predicted Length of Stay (MQPredLOS)
	• Diabetes (no, yes)
	• Female (no, yes)
	• Heart Failure (no, yes)
	• Malignant/In situ cancer (no, yes)
	• Median Household Income (based on zip code)
	• Poverty Rate (based on zip code)
	• Psychological Disorder (no, yes)
	• Race (Black, Other, White)
	• Renal Dialysis (no, yes)
	• Renal Failure (no, yes)
	• Tobacco Use (no, yes)

Adult Asthma

Cases age 18 through 64

Hospitalization Rate	**HMO Inpatient Cases* (N 1,809)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	703	38.9
45 – 64 years	1,106	61.1
• Sex		
Female	1,333	73.7
Male	476	26.3

**Cases after hospitalization rate exclusions; comparative reference = HMO database*

Length of Stay (LOS)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 2,903)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• *Atlas Outcomes™* PredLOS			
0 – 2.842 days	573	19.7	2.5
2.843 – 3.334 days	588	20.3	2.9
3.335 – 3.808 days	581	20.0	3.5
3.809 – 4.396 days	583	20.1	4.0
4.397+ days	578	19.9	4.6
• Asthma Type			
Chronic Obstructive	828	28.5	4.3
Extrinsic	123	4.2	3.0
Intrinsic/Unspecified	1,952	67.2	3.2
• Asthma Presentation			
Acute Exacerbation	2,235	77.0	3.5
Status Asthmaticus	276	9.5	3.6
Unspecified	392	13.5	3.3
• *Female*			
No	746	25.7	3.0
Yes	2,157	74.3	3.7
• Diabetes			
No	2,399	82.6	3.3
Yes	504	17.4	4.3

**Cases after LOS exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*

Rehospitalizations (Rehosp)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 2,878)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Rehospitalized*
• *Atlas Outcomes™* PredLOS			
0 - 2.845 days	575	20.0	11.7
2.846 - 3.343 days	574	19.9	12.4
3.344 - 3.815 days	579	20.1	10.7
3.816 - 4.396 days	575	20.0	15.7
4.397 + days	575	20.0	18.6
• Asthma Type			
Chronic Obstructive	823	28.6	18.3
Extrinsic	120	4.2	12.5
Intrinsic/Unspecified	1,935	67.2	11.9
• Median Household Income			
$0 – 29,620	582	20.2	15.1
$29,630 – 34,820	567	19.7	13.8
$34,830 – 39,540	576	20.0	15.3
$39,550 – 49,380	575	20.0	13.9
$49,390+	578	20.1	10.9
• Psychological Disorder			
No	2,317	80.5	12.6
Yes	561	19.5	18.5

**Cases after rehospitalization exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*

Adult Asthma continued

LOS	*Rehosp*	*Significant Risk Factors Used for Length of Stay and Rehospitalizations*
		• Age
		• Age-Squared
		• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes*™ Predicted Length of Stay (MQPredLOS)
✓	✓	• Asthma Type (unspecified, with Status asthmaticus, with (acute) exacerbation)
✓		• Asthma Presentation (extrinsic, intrinsic, chronic obstructive, unspecified)
✓		• Diabetes (no, yes)
✓		• Female (no, yes)
		• Heart Failure (no, yes)
		• Malignant/In situ cancer (no, yes)
	✓	• Median Household Income (based on zip code)
		• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes*™ Predicted Probability of Death [MQPredDeath])
	✓	• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)
		• Tobacco Use (no, yes)

NA - Not applicable

Diabetes

Cases age 18 through 75

Hospitalization Rate	**HMO Inpatient Cases* (N = 1,021)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 25 years	63	6.2
26 – 35 years	94	9.2
36 – 45 years	206	20.2
46 – 55 years	315	30.9
56 – 65 years	303	29.7
66 – 75 years	40	3.9
• Sex		
Female	427	41.8
Male	594	58.2
**Cases after hospitalization rate exclusions; comparative reference = HMO database*		

Diabetes *continued*

Length of Stay (LOS)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 1,875)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• *Atlas Outcomes™* PredLOS			
0 – 2.726 days	375	20.0	2.4
2.727 – 3.439 days	375	20.0	2.9
3.400 – 4.447 days	375	20.0	3.0
4.448 – 6.494 days	375	20.0	4.2
6.495 + days	375	20.0	7.1
• Amputation			
No	1,673	89.2	3.4
Yes	202	10.8	8.3
• Alcohol Drug Abuse			
No	1,808	96.4	3.9
Yes	67	3.6	4.8
• Heart Failure			
No	1,767	94.2	3.8
Yes	108	5.8	6.4
• Renal Failure			
No	1,656	88.3	3.7
Yes	219	11.7	5.8
• Renal Dialysis			
No	1,822	97.2	3.8
Yes	53	2.8	7.5
• Psychological Disorder			
No	1,664	88.7	3.9
Yes	211	11.3	3.9
• Median Household Income			
$0 – 29,450	371	19.8	4.1
$29,460 – 34,920	387	20.6	3.8
$34,930 – 39,940	369	19.7	3.9
$39,950 – 49,650	377	20.1	4.1
$49,660+	371	19.8	3.7

**Cases after LOS exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*

Rehospitalizations (Rehosp)	**HMO, PPO and Fee-for-Service Inpatient Cases* (N = 1,852)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Rehospitalized*
• *Atlas Outcomes™* PredLOS			
0 - 2.721 days	370	20.0	6.8
2.722 - 3.438 days	370	20.0	8.4
3.439 - 4.456 days	372	20.1	12.4
4.457 - 6.497 days	370	20.0	13.2
6.498 days +	370	20.0	19.5
• Alcohol Drug Abuse			
No	1,786	96.4	11.8
Yes	66	3.6	19.7
• Long Term Diabetes Complications			
No	997	53.8	8.4
Yes	855	46.2	16.3
• Female			
No	1,087	58.7	10.5
Yes	765	41.3	14.2
• Psychological Disorder			
No	1,646	88.9	11.4
Yes	206	11.1	17.0
• Renal Dialysis			
No	1,799	97.1	11.5
Yes	53	2.9	30.2

**Cases after rehospitalization exclusions; comparative reference = HMO, PPO and Fee-for-Service combined databases*

Diabetes continued

LOS	*Rehosp*	*Significant Risk Factors Used for Length of Stay and Rehospitalizations*
		• Age
		• Age-Squared
✓	✓	• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes™* Predicted Length of Stay (MQPredLOS)
		• Cardiomyopathy (no, yes)
		• COPD (no, yes)
	✓	• Diabetes Complications (long-term, short-term, none)
✓	✓	• Female (no, yes)
✓		• Heart Failure (no, yes)
		• Hypertensive Disease (no, yes)
		• Ischemic Heart Disease (no, yes)
✓		• Lower Extremity Amputation—non-traumatic (no, yes)
		• Malignant/In situ cancer (no, yes)
		• Median Household Income (based on zip code)
		• Medical DRG (no, yes)
		• Obesity (no, yes)
		• Peripheral Vascular Disease (no, yes)
		• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes™* Predicted Probability of Death [MQPredDeath])
✓	✓	• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
✓	✓	• Renal Dialysis (no, yes)
✓		• Renal Failure (no, yes)
		• Tobacco Use (no, yes)

NA - Not applicable

Hysterectomy (Abdominal and Vaginal)

Cases age 18 through 64

Procedure Rate	**HMO Inpatient Cases* (N = 5,706)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	2,612	45.8
45 – 64 years	3,094	54.2
**Cases after procedure rate exclusions; comparative reference = HMO database*		

Hysterectomy – Abdominal

Cases age 18 through 64

Procedure Rate	**HMO Inpatient Cases* (N = 3,965)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	1,813	45.7
45 – 64 years	2,152	54.3
**Cases after procedure rate exclusions; comparative reference = HMO database*		

Length of Stay (LOS)	**Statewide Inpatient Cases* (N = 12,503)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• *Atlas Outcomes™* PredLOS			
0 – 2.611 days	2,494	19.9	2.3
2.612 – 2.724 days	2,506	20.0	2.5
2.725 – 2.883 days	2,516	20.1	2.5
2.884 – 3.118 days	2,487	19.9	2.6
3.119 + days	2,500	20.0	3.2
• Poverty Rate			
0 – 4.6380%	2,517	20.1	2.6
4.6381 – 7.5189%	2,466	19.7	2.5
7.5190 – 10.3559%	2,500	20.0	2.6
10.3560 – 15.1123%	2,508	20.1	2.6
15.1124% +	2,512	20.1	2.9
• Radical			
No	12,478	99.8	2.6
Yes	25	0.2	3.7
• Principal Diagnosis Group			
Bleeding/Other	4,457	35.6	2.7
Fibroids/Hyperplasia/Endometriosis/ Uterine Prolapse	8,046	64.4	2.6
**Cases after LOS exclusions; comparative reference = Statewide database*			

In-Hospital Complications (Compl)	**Statewide Inpatient Cases* (N = 12,511)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Complications*
• *Atlas Outcomes™* PredLOS			
0 – 2.611 days	2,497	20.0	6.1
2.612 – 2.724 days	2,506	20.0	7.7
2.725 – 2.883 days	2,518	20.1	6.8
2.884 – 3.119 days	2,497	20.0	8.2
3.120 + days	2,493	19.9	19.6
• Poverty Rate			
0 – 4.6380%	2,517	20.1	9.4
4.6381 – 7.5189%	2,467	19.7	8.8
7.5190 – 10.3559%	2,501	20.0	9.6
10.3560 – 15.1123%	2,511	20.1	8.7
15.1124% +	2,515	20.1	11.8
**Cases after in-hospital complications exclusions; comparative reference = Statewide database*			

Hysterectomy – Abdominal continued

LOS	*Compl*	*Significant Risk Factors Used for Length of Stay and In-Hospital Complications*
		• Age
		• Age-Squared
		• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes*™ Predicted Length of Stay (MQPredLOS)
		• Diabetes (no, yes)
		• Heart Failure (no, yes)
		• History of Female Reproductive Cancer (no, yes)
		• Hypertensive Disease (no, yes)
		• Median Household Income (based on zip code)
		• Obesity (no, yes)
✓	✓	• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes*™ Predicted Probability of Death [MQPredDeath])
✓		• Principal Diagnosis Group (bleeding/other, fibroids/hyperplasia/endometriosis/uterine prolapse)
		• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
✓		• Radical Hysterectomy (no, yes)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)

NA - Not applicable

Hysterectomy – Vaginal

Cases age 18 through 64

Procedure Rate	**HMO Inpatient Cases* (N = 1,741)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	799	45.9
45 – 64 years	942	54.1
**Cases after procedure rate exclusions; comparative reference = HMO database*		

Length of Stay (LOS)	**Statewide Inpatient Cases* (N = 5,436)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• *Atlas Outcomes*™ PredLOS			
0 – 1.724 days	1,027	18.9	1.5
1.725 – 1.852 days	1,135	20.9	1.5
1.853 – 1.982 days	1,103	20.3	1.6
1.983 – 2.199 days	1,086	20.0	1.7
2.200 + days	1,085	20.0	1.9
• Laparoscopic Procedure			
No	3,475	63.9	1.7
Yes	1,961	36.1	1.5
• Age			
18 – 36 years	931	17.1	1.6
37 – 41 years	1,057	19.4	1.6
42 – 46 years	1,345	24.7	1.6
47 – 52 years	1,123	20.7	1.6
53 – 64 years	980	18.0	1.9
• Poverty Rate			
0 – 4.6380%	1,102	20.3	1.6
4.6381 – 7.4485%	1,075	19.8	1.6
7.4486 – 10.0085%	1,088	20.0	1.6
10.0086 – 13.6131%	1,071	19.7	1.6
13.6132% +	1,100	20.2	1.8
**Cases after LOS exclusions; comparative reference = Statewide database*			

Hysterectomy – Vaginal continued

In-Hospital Complications (Compl)	**Statewide Inpatient Cases* (N = 5,437)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Complications*
• *Atlas Outcomes™* PredLOS			
0 – 1.724 days	1,027	18.9	4.0
1.725 – 1.852 days	1,135	20.9	3.9
1.853 – 1.982 days	1,103	20.3	4.4
1.983 – 2.199 days	1,087	20.0	6.1
2.200 + days	1,085	20.0	14.5
• Laparoscopic Procedure			
No	3,475	63.9	6.8
Yes	1,962	36.1	6.1
**Cases after in-hospital complications exclusions; comparative reference = Statewide database*			

LOS	***Compl***	***Significant Risk Factors Used for Length of Stay and In-Hospital Complications***
✓		• Age
		• Age-Squared
		• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes™* Predicted Length of Stay (MQPredLOS)
		• Diabetes (no, yes)
		• Heart Failure (no, yes)
		• History of Female Reproductive Cancer (no, yes)
		• Hypertensive Disease (no, yes)
✓	✓	• Laparoscopic Procedure (no, yes)
		• Median Household Income (based on zip code)
		• Obesity (no, yes)
✓		• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes™* Predicted Probability of Death [MQPredDeath])
		• Principal Diagnosis Group (bleeding/other, fibroids/hyperplasia/endometriosis/uterine prolapse)
		• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)

NA - Not applicable

Mastectomy

Cases age 18 through 64

Procedure Rate	**HMO Procedures* (N = 613)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	165	26.9
45 – 64 years	448	73.1
**Cases after procedure rate exclusions; comparative reference = HMO database*		

Appendix D: Risk Factor Descriptions
Mastectomy continued

Cases age 18 through 64

Length of Stay (LOS)	**Statewide Inpatient Cases* (N = 1,747)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• Reconstruction–Concurrent			
Flap/Graft	319	18.3	3.7
Implant/Other	471	27.0	2.0
None	957	54.8	1.7
• Poverty Rate			
0 – 3.8784%	351	20.1	2.2
3.8785 – 6.3721%	348	19.9	2.1
6.3722– 9.8819%	350	20.0	1.9
9.8820 – 14.4444%	348	19.9	2.1
14.4445% +	350	20.0	2.3
• *Atlas Outcomes™* PredLOS			
1.576 – 1.712 days	675	38.6	2.1
1.713 – 1.816 days	416	23.8	2.0
1.817 – 2.051 days	307	17.6	2.1
2.052 + days	349	20.0	2.4
• Bilateral			
No	1,313	75.2	2.1
Yes	434	24.8	2.3
• Psychological Disorder			
No	1,539	88.1	2.1
Yes	208	11.9	2.4
• Diabetes			
No	1,616	92.5	2.1
Yes	131	7.5	2.1

**Cases after LOS exclusions; comparative reference = Statewide database*

In-Hospital Complications (Compl)	**Statewide Inpatient Cases* (N = 1,748)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Complication*
• Reconstruction–Concurrent			
Flap/Graft	319	18.2	11.0
Implant/Other	471	26.9	3.6
None	958	54.8	5.0
• *Atlas Outcomes™* PredLOS			
1.576 – 1.712 days	675	38.6	5.0
1.713 – 1.816 days	416	23.8	4.3
1.817 – 2.057 days	322	18.4	5.9
2.058 + days	335	19.2	8.7
• *Hypertension*			
No	1,342	76.8	5.1
Yes	406	23.2	7.9

** Cases after in-hospital complications exclusions; comparative reference = Statewide database*

LOS	***Compl***	***Significant Risk Factors Used for Length of Stay and In-hospital Complications***
		• Age
		• Age-Squared
		• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes™* Predicted Length of Stay (MQPredLOS)
✓		• Bilateral Procedure
		• Breast Cancer Type (malignant; in situ; metastatic)
✓		• Diabetes (no, yes)
		• Family History of Breast Cancer (no, yes)
		• Heart Failure (no, yes)
		• History of Breast Cancer (no, yes)
	✓	• Hypertensive Disease (no, yes)
		• Median Household Income (based on zip code)
		• Obesity (no, yes)
✓		• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes™* Predicted Probability of Death [MQPredDeath])
		• Procedure Group (simple mastectomy; radical mastectomy)
✓		• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
✓	✓	• Reconstruction–Concurrent (no, yes)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)

NA - Not applicable

Neck and Back Procedures (With Fusion and Without Fusion)

Cases age 18 through 64

Procedure Rate	**HMO Procedures* (N = 4,888)**	
Significant Variable	*Number of Cases*	*Percent of Total*
• Age		
18 – 44 years	1,892	38.7
45 – 64 years	2,996	61.3
• Sex		
Female	2,282	46.7
Male	2,606	53.3
**Cases after procedure rate exclusions; comparative reference = HMO database*		

Neck and Back Procedures With Fusion

Cases age 18 through 64

Length of Stay (LOS)	**Statewide Inpatient Cases* (N = 6,324)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• Fusion Location			
Cervical/Atlas-Axis	4,221	66.7	1.6
Dorsal and Dorsolumbar	31	0.5	7.1
Lumbar and Lumbosacral	2,072	32.8	3.6
• *Atlas Outcomes™* PredLOS			
0 – 1.591 days	970	15.3	1.5
1.592 – 1.900 days	1,559	24.7	1.6
1.901 – 2.378 days	1,267	20.0	2.0
2.379 – 2.994 days	1,266	20.0	2.5
2.995 + days	1,262	20.0	3.6
• Principal Diagnosis Group			
Disc Degeneration	690	10.9	3.0
Disc Displacement	2,990	47.3	1.8
Narrowing of the Spinal Canal	2,023	32.0	2.7
Other Disc Disorders/Back Pain	621	9.8	2.4
• Poverty Rate			
0 – 4.5291%	1,278	20.2	2.1
4.5292 – 7.4365%	1,234	19.5	2.3
7.4366 – 10.0849%	1,304	20.6	2.3
10.0850 – 14.0459%	1,237	19.6	2.1
14.0460% +	1,271	20.1	2.5
• Alcohol/Drug Abuse			
No	6,225	98.4	2.2
Yes	99	1.6	3.4
• Obesity			
No	5,924	93.7	2.2
Yes	400	6.3	2.9
• Procedure Group			
Both	154	2.4	3.6
Discectomy	5,661	89.5	2.1
Laminectomy	509	8.0	3.7
**Cases after LOS exclusions; comparative reference = Statewide database*			

Appendix D: Risk Factor Descriptions
Neck and Back Procedures With Fusion continued

In-Hospital Complications (Compl)	**Statewide Inpatient Cases* (N = 6,337)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Complication*
• Fusion Location			
Cervical/Atlas-Axis	4,225	66.7	2.9
Dorsal and Dorsolumbar	32	0.5	40.6
Lumbar and Lumbosacral	2,080	32.8	13.9
• *Atlas Outcomes™* PredLOS			
0 – 1.591 days	970	15.3	2.9
1.592 – 1.902 days	1,563	24.7	3.5
1.903 – 2.382 days	1,273	20.1	6.1
2.383 – 2.996 days	1,264	19.9	8.5
2.997+ days	1,267	20.0	12.4
• Principal Diagnosis Group			
Disc Degeneration	691	10.9	9.8
Disc Displacement	2,991	47.2	4.5
Narrowing of the Spinal Canal	2,031	32.0	8.4
Other Disc Disorders/Back Pain	624	9.8	8.3
• Female			
No	3,055	48.2	6.8
Yes	3,282	51.2	6.6
• Fusion Technique			
Anterior	429	6.8	4.7
Multiple	5,752	90.8	6.3
Posterior	156	2.5	26.3
• Age			
18 – 39 years	1,267	20.0	5.6
40 – 44 years	1,191	18.8	5.0
45 – 50 years	1,504	23.7	5.8
51 – 56 years	1,224	19.3	8.1
57 + years	1,151	18.2	9.4
• Poverty Rate			
0 – 4.5291%	1,279	20.2	5.6
4.5292 – 7.4365%	1,237	19.5	6.9
7.4366 – 10.0849%	1,307	20.6	6.2
10.0850 – 14.0459%	1,240	19.6	6.7
14.0460% +	1,274	20.1	8.2

** Cases after in-hospital complications exclusions; comparative reference = Statewide database*

LOS	***Compl***	***Significant Risk Factors Used for Length of Stay and In-Hospital Complications***
	✓	• Age
		• Age-Squared
✓		• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes™* Predicted Length of Stay (MQPredLOS)
		• COPD (no, yes)
		• Diabetes (no, yes)
	✓	• Female (no, yes)
✓	✓	• Fusion Location (cervical/atlas-axis; dorsal and dorsolumbar; lumbar and lumbosacral)
	✓	• Fusion Technique (anterior; posterior/lateral; multiple, 2 or more procedure codes)
		• Heart Failure (no, yes)
		• Hypertensive Disease (no, yes)
		• Malignant/ In situ Cancer (no, yes)
		• Median Household Income (based on zip code)
		• Musculoskeletal Disorders (no, yes)
✓		• Obesity (no, yes)
✓	✓	• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes™* Predicted Probability of Death [MQPredDeath])
✓	✓	• Principal Diagnoses Group (disc displacement; narrowing of spinal; disc degeneration; other disc disorders/back pain)
✓		• Procedure Group (discectomy; laminectomy; both discectomy and laminectomy)
		• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)
		• Tobacco Use (no, yes)

NA - Not applicable

Neck and Back Procedures Without Fusion

Cases age 18 through 64

Length of Stay (LOS)	**Statewide Inpatient Cases* (N = 8,534)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*Avg. LOS*
• *Atlas Outcomes™* PredLOS			
0 – 1.489 days	1,686	19.8	1.3
1.490 – 1.658 days	1,601	18.8	1.4
1.659 – 1.915 days	1,839	21.5	1.5
1.916 – 2.396 days	1,702	19.9	1.7
2.397 + days	1,706	20.0	2.8
• Principal Diagnosis Group			
Disc Degeneration	143	1.7	2.1
Disc Displacement	6,011	70.4	1.6
Narrowing of Spinal Canal	2,168	25.4	2.1
Other Disc Disorders/Back Pain	212	2.5	2.5
• Poverty Rate			
0 – 4.4195%	1,717	20.1	1.6
4.4196 – 7.1300%	1,688	19.8	1.8
7.1301 – 9.8612%	1,708	20.0	1.7
9.8613 – 13.4242%	1,715	20.1	1.7
13.4243% +	1,706	20.0	1.9
• Female			
No	4,977	58.3	1.7
Yes	3,557	41.7	1.8
• Procedure Group			
Both Discectomy and Laminectomy	562	6.6	2.2
Discectomy	5,795	67.9	1.5
Laminectomy	2,177	25.5	2.1
• Alcohol/Drug Abuse			
No	8,436	98.9	1.7
Yes	98	1.1	2.9

**Cases after LOS exclusions; comparative reference = Statewide database*

In-Hospital Complications (comp)	**Statewide Inpatient Cases* (N = 8,545)**		
Significant Variable	*Number of Cases*	*Percent of Total*	*% Complication*
• Principal Diagnosis Group			
Disc Degeneration	143	1.7	7.7
Disc Displacement	6,017	70.4	4.3
Narrowing of Spinal Canal	2,172	25.4	9.6
Other Disc Disorders/Back Pain	213	2.5	9.9
• *Atlas Outcomes™* PredLOS			
0 – 1.489 days	1,687	19.7	3.2
1.490 – 1.658 days	1,602	18.7	5.2
1.659 – 1.915 days	1,839	21.5	5.5
1.916 – 2.399 days	1,710	20.0	6.8
2.400 + days	1,707	20.0	8.5
• Age			
18 – 36 years	1,649	19.3	2.6
37 – 43 years	1,581	18.5	4.6
44 – 51 years	2,115	24.8	5.7
52 – 57 years	1,582	18.5	7.8
58 – 64 years	1,618	18.9	8.8
• Median Household Income			
$0 – 31,9800	1,729	20.2	7.0
$31,990 – 36,340	1,699	19.9	5.7
$36,350 – 43,320	1,703	19.9	7.0
$43,330 – 52,120	1,698	19.9	5.1
$52,130 +	1,716	20.1	4.5
• Hypertension			
No	6,067	71.0	4.8
Yes	2,478	29.0	8.5
• Alcohol/Drug Abuse			
No	8,445	98.8	5.8
Yes	100	1.2	15.0

** Cases after in-hospital complications exclusions; comparative reference = Statewide database*

Neck and Back Procedures Without Fusion continued

LOS	*Compl*	*Significant Risk Factors Used for Length of Stay and In-Hospital Complications*
	✓	• Age
		• Age-Squared
✓	✓	• Alcohol and Drug Abuse (no, yes)
✓	✓	• *Atlas Outcomes*^{TM} Predicted Length of Stay (MQPredLOS)
		• COPD (no, yes)
		• Diabetes (no, yes)
✓		• Female (no, yes)
		• Heart Failure (no, yes)
	✓	• Hypertensive Disease (no, yes)
		• Malignant/In situ Cancer (no, yes)
	✓	• Median Household Income (based on zip code)
		• Musculoskeletal Disorders (no, yes)
		• Obesity (no, yes)
✓		• Poverty Rate (based on zip code)
NA		• Predicted Death (logit of *Atlas Outcomes*^{TM} Predicted Probability of Death [MQPredDeath])
✓	✓	• Principal Diagnoses Group (disc displacement; narrowing of spinal canal; disc degeneration; other disc disorders/back pain:)
✓		• Procedure Group (discectomy; laminectomy; both discectomy and laminectomy)
		• Psychological Disorder (no, yes)
		• Race (Black, Other, White)
		• Renal Dialysis (no, yes)
		• Renal Failure (no, yes)
		• Tobacco Use (no, yes)

NA - Not applicable

Appendix E: Risk Factor Definitions

Risk Factor	Definition / ICD-9-CM Codes
Age	Age in years
Age-Squared	Age in years X Age in years
Alcohol and Drug Abuse	291.x, x=0-9; 292.0; 292.11[1]; 292.12[1]; 292.2[1]; 292.8[1]; 292.82; 292.83[1]; 292.84[1]; 292.85[2]; 292.89[1]; 292.9[4]; 303.0x, x=0-3; 303.9x, x=0-3; 304.xy, x=0-9 y= 0-3; 305xy, x=0-9 except 305.1 y = 0-3; 357.5; 425.5; 535.3x, x=0,1; 571.0-571.3; 980.0; 980.9; V11.3
Asthma Type	1) Extrinsic: 493.0x, x =0-2 2) Intrinsic: 493.1x , x =0-2 3) Chronic Obstructive 493.2x, x =0-2 4) Unspecified: 493.9x, x =0-2, 493.81, 493.82
Asthma Presentation	1) Unspecified: 493.00, 493.10, 493.20, 493.90, 493.81, 493.82 2) With Status asthmaticus: 493.01, 493.11, 493.21, 493.91 3) With (acute) exacerbation: 493.02, 493.12, 493.22, 493.92
Atlas Outcomes™ Predicted Length of Stay (MQPredLOS)	Expected length of stay as computed by Atlas Outcomes™ software
Breast Cancer Type (3 levels)	1) Malignant: 174.0-174.9, 238.3, 239.3 2) In Situ: 233.0 3) Metastatic: 196.3, 198.2, 198.81
Cardiomyopathy	425.3, 425.4, 425.8, 425.9
COPD	491.20, 491.21, 492.0, 492.8, 496, 506.4, 518.2[1]
Diabetes	250.0x-250.9x, x=0-3
Diabetes Complications (3 levels)	1) Long-term: 250.4x-250.9x, x=0-3 2) Short-term: 250.02, 250.03, 250.1x-250.3x, x=0-3 3) None: 250.00, 250.01
Family History of Breast Cancer	V16.3
Female	Self explanatory
Fusion Location (3 levels)	1) Cervical/Atlas-axis: 81.00, 81.01, 81.02, 81.03 2) Dorsal and Dorsolumbar: 81.04, 81.05 3) Lumbar and Lumbosacral: 81.06, 81.07, 81.08
Fusion Technique (3 levels)	1) Anterior: 81.00, 81.01, 81.02, 81.04, 81.06 2) Posterior/Lateral: 81.03, 81.05, 81.07, 81.08 3) Multiple: 81.61, 81.62, 81.63, 81.64, 2 or more procedure codes
Heart Failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20-428.23, 428.30-428.33, 428.40-428.43, 428.9
High Poverty (3 levels; based on zip code)	1) High 2) Average 3) Very high
History of Breast Cancer	V10.3
History of Female Reproductive Cancer	V10.40-V10.44
Hypertensive Disease	401.0, 401.1, 401.9; 402.00, 402.10, 402.90, 403.00, 403.10, 403.90, 404.00, 404.00, 404.10, 404.90, 405.01, 405.09, 405.11, 405.19, 405.91, 405.9
Ischemic Heart Disease	411.0, 411.1, 411.81, 411.89, 412, 413.0, 413.1, 413.9, 414.00, 414.01, 414.02, 414.03, 414.04, 414.05, 414.06, 414.07, 414.10, 414.11, 414.12, 414.19, 414.8, 414.9
Lower Extremity Amputation – Non-Traumatic	Procedure codes 84.10-84.17 (exclude diagnosis codes 895.x, x=0,1; 896.x, x=0-3; 897.x, x=0-7)

[1]Code added to category definition beginning CY 2005
[2]Code valid as of October 1, 2005
[3]Code invalid as of October 1, 2005

Appendix E: Risk Factor Definitions

continued

Risk Factor	Definition / ICD-9-CM Codes
Malignant/ In situ Cancer	140.0 - 208.9, 230.0 - 239.9
Median Household Income (based on zip code)	Self explanatory
Medical DRG	Diagnosis related group that is medical
Musculoskeletal Disorders	274.0, 274.10, 274.11, 274.19, 274.81, 274.82, 274.89, 274.9, 710.0; 7121.x, x=0-9; 712.2x, x=0-9; 712.3x, x=0-9; 712.8x, x=0-9; 712.9x, x=0-9; 713.x, x=0-8; 714.x, x=0-2; 714.3x, x=0-3; 714.4 ; 714.8x , x=1,9; 715.0x, x =0, 4, 9; 715.1x, x =0-8; 715.2x, x =0-8; 715.3x, x =0-8; 715.8x, x =0, 9; 715.9x, x =0-8; 733.0x, x=0-3,9; V43.6x, x=0-6, 9
Obesity	278.00, 278.01, V85.3x[2], x =0-9; V85.40[2]
Peripheral Vascular Disease	443.0, 443.1, 443.81, 443.89, 443.9
Poverty Rate (based on zip code)	Self explanatory
Predicted Death (logit of MQPredDeath)	Expected probability of death as computed by Atlas Outcomes™ software
Principal Diagnosis Group for Hysterectomy (2 levels)	1) Fibroids/hyperplasia/endometriosis/uterine prolapse: 218.x, x=0-2, 9; 621.2; 621.3x, x= 0-3; 617.x, x=0-9; 618.1-618.4 2) Bleeding abnormalities and other principal diagnoses: 626.2-626.9, 627.0, 627.1
Principal Diagnosis Group for Neck and Back Procedures (4 levels)	1) Disc displacement: 722.0, 722.10, 722.11, 722.2 2) Narrowing of spinal canal: 720.0, 721.0-721.42, 721.90, 721.91, 723.0, 724.00-724.09, 738.4, 756.11, 756.12 3) Disc degeneration: 722.4, 722.51, 722.52, 722.6 4) Other disc disorders/back pain: 722.70-722.73, 722.90-722.93, 723.1, 724.1-724.3, 724.5
Procedure Group for Mastectomy (2 levels)	1) Simple mastectomy: procedure codes 85.41-85.44, CPT19180 2) Radical mastectomy: procedure codes 85.45-85.48, CPT 19200, CPT 19220, CPT 19240
Procedure Group for Neck and Back Procedures (3 levels)	1) Discectomy: 80.50, 80.51, 80.59 2) Laminectomy: 03.09 3) Discectomy and laminectomy: 80.50, 80.51, or 80.59 and 03.09
Psychological Disorder	295.00-301.9, 309.0-312.9
Race (3 levels)	Black, Other, White
Radical Hysterectomy	68.6, 68.7
Reconstruction – Concurrent –Mastectomy Procedure	1) None 2) Implant/Other: 85.50, 85.51, 85.52, 85.53, 85.54, 85.86, 85.87, 85.89, 85.93, 85.96, 85.89 3) Flap/Graft: 85.7, 85.82, 85.83, 85.84, 85.85
Renal Dialysis	V45.1, V56.0, V56.8; procedure codes 39.95, 54.98
Renal Failure	403.01, 403.11, 403.91, 404.02, 404.12, 404.92, 585[3], 585.1-6[2], 585.9[2], 586
Tobacco Use	305.1, V15.82
Vaginal Hysterectomy- Laparoscopic Procedure	68.51 (procedure)

[1]Code added to category definition beginning CY 2005
[2]Code valid as of October 1, 2005
[3]Code invalid as of October 1, 2005