Diagnostic Cost Group Hierarchical Condition Category Models for Medicare Risk Adjustment

Final Report

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Executive Summary

The Health Care Financing Administration (HCFA) implemented inpatient-based risk adjustment for a portion of capitation payments to Medicare + Choice (M+C) plans beginning January 1, 2000. The risk adjustment method used is the Principal Inpatient Diagnostic Cost Group or PIP-DCG model (Pope *et al*., 1999). Medicare is scheduled to transition to all-encounter-based risk adjustment in 2004. The all-encounter model will add information from hospital outpatient and physician encounters to information from inpatient encounter records. The all-encounter risk adjustment model within the Diagnostic Cost Group, or DCG, family of risk adjustment models is known as the Diagnostic Cost Group, Hierarchical Condition Category (DCG/HCC) model. This report describes the latest refinements and updates to the DCG/HCC model resulting from research funded by the Health Care Financing Administration.

The current project includes updates, refinements, and new research for the DCG/HCC models. The major updates to the DCG/HCC models were:

- recalibration of the model using 1996/1997 data (as compared to the 1991/92 data used in our previous projects);
- updating ICD-9-CM diagnosis codes to be current through FY 2000.

The major refinements to the model were:

- more clinically detailed diagnostic classification system;
- adjustments for the joint effect on expenditures of certain combinations of diagnoses;

- more detailed adjustment for expenditure differences of beneficiaries entitled to Medicare by disability;
- calibration of Medicaid, originally disabled, and working aged demographic factors in conjunction with the updated DCG/HCC model.

The major research issues we investigated were:

- validity of the DCG/HCC model assumption that the predicted expenditures associated with multiple diagnoses are generally modeled accurately as the sum of the incremental expenditures predicted for each (individual) diagnosis.
- gain in predictive accuracy from incorporating additional sources of diagnoses, for example, diagnoses from home health agencies.
- use of durable medical equipment in risk adjustment.
- evaluation of the predictive accuracy of model variants for additional nonrandom groups of beneficiaries, such as beneficiaries with high home health expenditures.

Clinical Classification and Elements of Revised Model

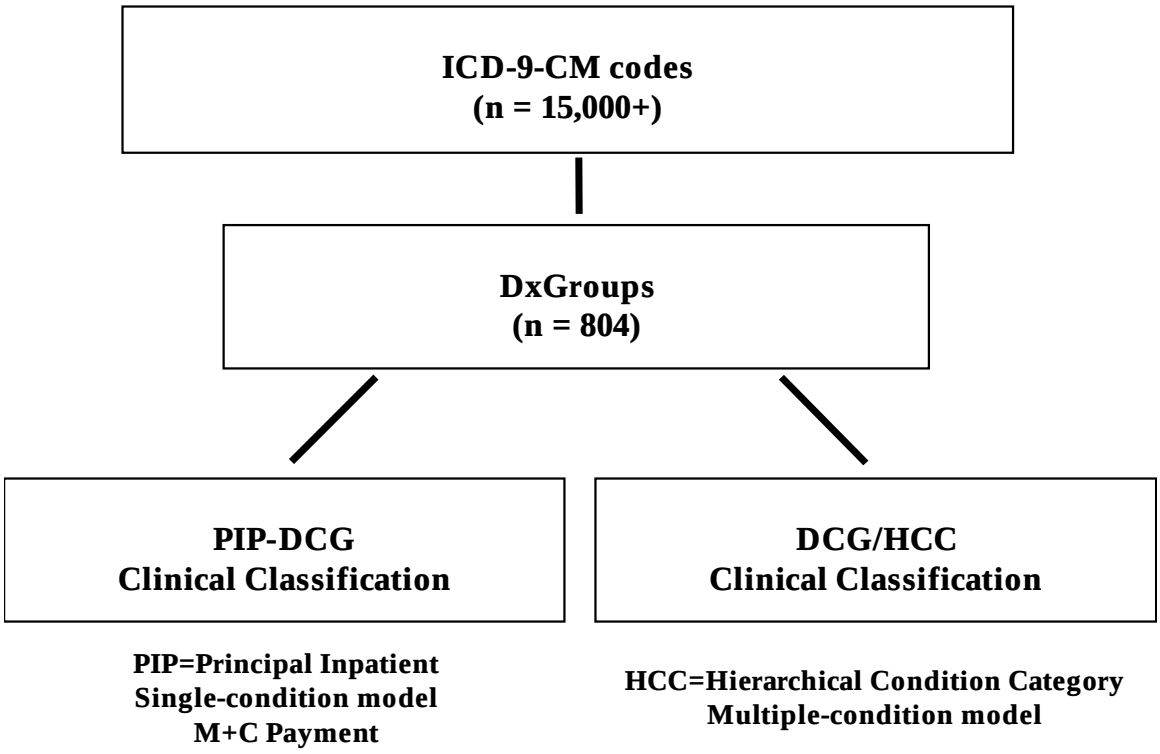
Table ES-1 outlines the Diagnostic Cost Group clinical classification system. The more than 15,000 International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes are grouped into 804 diagnosis groups, or "DxGroups". The DxGroups are further aggregated into either the Principal Inpatient Diagnostic Cost Groups (PIP-DCG) or the Diagnostic Cost Group/Hierarchical Condition Category (DCG/HCC) clinical classifications.[1] The PIP-DCG model utilizes only principal inpatient diagnoses, and classifies a beneficiary based on his or her single

[1] The PIP-DCG model has not been updated to reflect the latest revision of the DxGroups developed for this project. The PIP-DCG classification is based on the previous DxGroups (n=545).

diagnosis that predicts the highest future expenditures. The PIP-DCG model is currently used to risk adjust a portion of Medicare+Choice capitation payments.

Table ES-1

Diagnostic Cost Group Clinical Classifications



SOURCE: Health Economics Research, Inc.

The DCG/HCC model utilizes diagnoses from all physician and hospital encounters, and profiles beneficiary medical problems with diagnostic categories (HCCs) that are not mutually exclusive. A beneficiary's total predicted expenditure is the sum of the incremental predicted expenditures associated with each of his or her assigned HCCs.

As part of this project, the number of DxGroups was increased from 545 to 804, and the number of HCCs (in the comprehensive classification system) was increased from 118 to 189.

The revised prospective DCG/HCC payment model incorporates the following elements:

- 24 age/sex cells;
- a payment weight for base-year Medicaid enrollment;
- a payment weight for originally-disabled status (among people of age at least 65);
- a fractional multiplicative adjustment to predicted payments for beneficiaries in working aged status;
- 101 HCC diagnostic categories (88 of the full set of 189 are not used in making payment model predictions);
- increments to payments for 9 diagnostic categories (HCCs) when they occur in beneficiaries whose Medicare entitlement is due to disability (as opposed to age); and
- increments to payments for beneficiaries with 6 combinations of diagnoses, beyond the sum of the incremental payments predicted for each individual diagnosis included in these combinations.

Predictive Accuracy of All Encounter Versus Inpatient Models

Table ES-2 compares the percentage of individual variation in Medicare fee-for-service expenditures predicted by age/sex, PIP-DCG (inpatient), and DCG/HCC (all encounter) risk adjustment models. Adding inpatient diagnoses to demographic predictors (age/sex) increases predictive power six-fold. Adding ambulatory diagnoses and the multi-condition structure of the HCC model further doubles the predictive power.

Table ES-2

Predictive Power of All Encounter (DCG/HCC) Versus Inpatient (PIP-DCG) Models

Model	R-Squared[1]
Age/Sex	1.0%
PIP-DCG	6.2%
DCG All Encounter (DCG/HCC)	11.2%

[1] Percentage of individual expenditure variation predicted.

NOTE: From Tables 4-1 and 4-2, and Pope, et al. (1999), Table 8-6.

SOURCE: Health Economics Research, Inc.

Table ES-3 compares predictive accuracy of alternative models for beneficiaries with selected prior year inpatient or ambulatory diagnoses. (Predictive ratios close to one indicate accurate prediction, values less than one, underprediction.) The inpatient diagnosis model (PIP-DCG) improves substantially on age/sex, but only when ambulatory diagnoses are incorporated (DCG/HCC) are expenditures for beneficiaries with chronic conditions predicted accurately.

Table ES-4 compares predictive accuracy of alternative models for quantiles of prior year expenditures. Again, the inpatient model (PIP-DCG) improves substantially on age/sex, and the all encounter model (DCG/HCC) improves substantially on the

Table ES-3

Predictive Ratios[1] for All Encounter (DCG/HCC) vs. Inpatient (PIP-DCG) Models: Selected Prior Year Diagnoses

	Model		
Diagnosis[2]	Age/Sex	PIP-DCG	DCG All Encounter
Heart failure	0.47	0.74	0.97
Heart attack	0.45	0.78	0.98
COPD	0.59	0.79	0.99
Hip fracture	0.56	0.83	0.99
Depression	0.54	0.77	0.92
Colorectal cancer	0.60	0.78	0.98
Cerebral hemorrhage	0.44	0.73	1.04

[1] Mean predicted cost divided by mean actual cost.
[2] Diagnosis from either inpatient or ambulatory setting.

NOTE: From Table 4-8 and Pope et al. (1999), Table 9-1.

SOURCE: Health Economics Research, Inc.

Table ES-4

Predictive Ratios[1] for DCG All Encounter (DCG/HCC) vs. Inpatient (PIP-DCG) Models: Prior Year Expenditures

Quintiles of Expenditures	Model		
	Age/Sex	PIP-DCG	DCG All Encounter
First	2.66	2.09	1.23
Second	1.93	1.54	1.23
Third	1.37	1.10	1.14
Fourth	0.95	0.84	1.02
Fifth	0.44	0.75	0.86
Top 5%	0.28	0.61	0.77
Top 1%	0.17	0.47	0.69

[1] Percentage of individual expenditure variation predicted.

NOTE: From Table 4-8 and Pope et al. (1999), Table 9-1.

SOURCE: Health Economics Research, Inc.

inpatient model. Table ES-5 compares predictive accuracy by number of prior year hospitalizations. It is striking that the DCG/HCC model is clearly more accurate than the PIP-DCG model, which is an inpatient-based model.

Comparison of Revised to Previous DCG/HCC Models

Table ES-6 compares the predictive accuracy of the revised DCG/HCC (all encounter) model versus the previous version of the model (Pope *et al*., 1998). The revised model has more predictive accuracy, but the gains are small. The greatest gain in predictive accuracy is among the most severely ill (those in the top 1% of prior year expenditures). The R-square of the previous model on 1991/1992 data was only 8.83 percent, compared to 10.81 percent on 1996/1997 data (Table ES-6). Thus, the predictive power of diagnosis-based risk adjustment models in newer data is greater, perhaps due to more accurate diagnostic coding over time. Although the gains in predictive accuracy from the revised DCG/HCC classification are small, we believe that the revised system has substantially better clinical face validity and detail.

Conclusions on Research Issues

We investigated 4 major research issues in this project and arrived at the following broad conclusions.

1. Validity of the DCG/HCC model assumption that the predicted expenditures associated with multiple diagnoses are generally modeled accurately as the sum of the incremental expenditures predicted for each individual diagnosis.

Table ES-5

Predictive Ratios[1] for All Encounter (DCG/HCC) vs. Inpatient (PIP-DCG) Models: Prior Year Hospitalizations

	Model		
Hospitalizations	Age/Sex	PIP-DCG	DCG All Encounter
No admissions	1.33	1.07	1.03
One admission	0.63	1.02	1.02
Two admissions	0.44	0.91	0.98
Three or more admissions	0.26	0.69	0.82

[1] Percentage of individual expenditure variation predicted.

NOTE: From Table 4-8 and Pope et al. (1999), Table 9-1.

SOURCE: Health Economics Research, Inc.

Table ES-6

Predictive Accuracy of Revised All Encounter Model (DCG/HCC) Versus Previous All Encounter Model[1]

	Revised[2]	Previous[3]
R-Squared	11.15%	10.81%
Prior Year Expenditure Quintiles		
First	1.23	1.18
Second	1.23	1.25
Third	1.14	1.16
Fourth	1.02	1.03
Fifth	0.86	0.85
Top 5%	0.77	0.76
Top 1%	0.69	0.66

[1] Both models are estimated on 1996/97 Medicare data.
[2] From Tables 4-2 and 4-8.
[3] Computer outputs for R-squared (D9PR11C.OUT); for predictive ratios (D9PR11CC.OUT).

SOURCE: Health Economics Research, Inc.

We examined 35 2- and 3-way non-additive "interactions" among 6 common, high-cost, chronic diseases: diabetes, congestive heart failure, coronary artery disease, cerebrovascular disease, vascular disease, and chronic obstructive pulmonary disease. We also included 3 interactions of several of these conditions with renal failure. When all 38 interactions were included in the model, the percentage of individual expenditure variation predicted rose only from 11.10 percent to 11.13 percent, that is, hardly at all. We conclude that the additivity assumption of the DCG/HCC model is, in general, justified. However, we also found that 6 of the 38 interactions we examined satisfied the criteria of substantial magnitude, statistical significance, and clinical plausibility to be included in the base model. Hence, to improve clinical face validity and predictive accuracy for important subgroups of beneficiaries, we incorporated these 6 diagnosis interactions into our base model.

2. Gain in predictive accuracy from incorporating additional sources of diagnoses, for example, diagnoses from home health agencies.

We investigated using alternative sources of diagnoses to calibrate the DCG/HCC model. Adding diagnoses may improve predictive accuracy, but this gain must be balanced against added data collection costs and questionable clinical validity of diagnoses from some sources. Table ES-7 shows results for percentage of individual expenditure variation explained (R-square). Our base set of diagnoses was all hospital, physician, and clinically-trained nonphysician (e.g., psychologist, podiatrist) diagnoses. Some may question whether radiologist, anesthesiologist, pathologist (RAP) and

Table ES-7

Predictive Power of DCG/HCC Model Estimated with Alternative Diagnosis Sources

Diagnoses Used to Fit Model	R-Squared
1. Hospital, physician, excluding RAPs and clinically-trained non-physicians	11.03%
2. Hospital, physician (Base)	**11.15%**
3. Model 2 + Home Health Agency	11.65%
4. Model 3 + SNF, ASC, hospice	11.65%
5. Model 4 + DME	11.85%
6. Model 5 + lab, radiology/imaging clinics, misc. (ALL)	11.82%

NOTE:
RAPs=Radiologists, Anesthesiologists, Pathologists; SNF=Skilled Nursing Facility; ASC=Ambulatory Surgery Center; DME=Durable Medical Equipment.
From Table 5-4.
Hospital/physician includes clinically trained non-physicians.

SOURCE: Health Economics Research, Inc.

clinically-trained nonphysician diagnoses are as accurate (clinically valid) as other physician diagnoses. Excluding these diagnoses from our base set lowered predictive power slightly. Adding home health agency and durable medical equipment (DME) supplier diagnoses each adds incrementally to predictive power. All other sources of diagnoses either add no predictive power (skilled nursing facility, ambulatory surgery center, hospice) or detract from predictive power (clinical laboratory, radiology/imaging clinics). Adding home health and DME diagnoses also improve the underprediction of expenditures for beneficiaries utilizing home health or DME services in the prior year, although not dramatically (see Table ES-8 and Chapter 5). In addition to predictive accuracy, a complete evaluation of adding or excluding sources of diagnoses must consider the costs of collecting these data from Medicare+Choice plans, as well as the clinical validity of the diagnoses. Detailed consideration of these two issues was beyond the scope of this report.

We also simulated how sensitive payments from our base risk adjustment model are to variations in the diagnoses used to calculate payments. For these simulations, we did not recalibrate the risk adjustment model using alternative sets of diagnoses. Rather we used model parameters estimated with our base set of diagnoses (hospital, physician, and clinically-trained nonphysician), and simulated how health plan payments would change if alternative sets of diagnoses were erroneously included or excluded. Overall, our assessment is that payments are moderately, not severely, affected by changes in the information used. Increases on the order of 1 or 2 percent occur from including home health, nursing facility and ambulatory surgery center diagnoses, while payments would

increase by 7 percent if all diagnoses – including those from laboratory, DME and nonclinicians – are accepted A 7 percent overpayment is of concern if plans were to be allowed to include diagnoses appearing on all types of claims, but presumably this type of massive reclassifying would be subject to audit. Ignoring all physician claims has a dramatic effect and disproportionately affects certain chronic diseases, but it would be surprising if this were not true. We take the moderate sensitivity of model predictions to rather broad simulations using different sets of diagnoses as a sign that we have successfully excluded some of the less serious, discretionary, and prevalent diagnoses from our DCG/HCC payment model.

3. Use of durable medical equipment as an additional risk adjustment factor.

Durable medical equipment (DME, e.g., wheelchairs) is potentially attractive as a risk adjuster. It is a Medicare-covered benefit, plausibly identifies beneficiaries who are functionally impaired, may be available in the automated records of Medicare+Choice plans for their entire enrollee populations, does not require expensive and burdensome surveys, and can be accurately calibrated using Medicare fee-for-service data. The major concern about using DME as a risk adjuster is the incentive established for M+C plans to inappropriately supply DME to enrollees to increase Medicare reimbursements.[2] Additional disadvantages are added costs of data collection, not all DME utilization may be captured in Medicare or health plan records (e.g., Medicaid may pay for some DME

[2] Of course, under diagnosis-based risk adjustment plans have incentives to record more diagnoses, which may be even easier than supplying DME.

for dual eligibles), a single base year may be insufficient to capture DME use, variations in use of DME across health plans or FFS/managed care, and difficulty of distinguishing short-term from long-term use of DME.

We investigated how much incorporating DME improved the predictive accuracy of our diagnosis-based DCG/HCC risk adjustment model. We developed 5 DME-based clinical categories (HCCs) and incorporated 6 additional types of DME into existing HCCs. Adding DME to our clinical classification raises predictive power by about 1 percentage point, from 11.15 percent to 12.23 percent. Predictive accuracy for prior year utilizers of DME is substantially improved, and accuracy for prior year home health utilizers is somewhat improved (see Table ES-8 and Chapter 6).

If DME is incorporated into the payment model, utilization of DME would be associated with large incremental payments. For example, we estimate an incremental payment of $7,649 associated with our DME category "Patient Lifts, Power-Operated Wheelchairs, and Hospital Beds". This is virtually the same as the incremental payment associated with a diagnosis of metastatic cancer. The incremental payments triggered by DME utilization would, for some items, be much higher than the cost of supplying the item. Hence, we are concerned about incentives to inappropriately supply DME to enrollees should DME be used as a payment risk adjuster.

4. Evaluation of the predictive accuracy of model variants for additional nonrandom groups of beneficiaries, such as beneficiaries with high home health expenditures.

An innovation of this project was identifying additional subgroups of Medicare beneficiaries used in evaluating the predictive accuracy of alternative risk adjustment models. Of particular interest are "validation" groups for beneficiaries utilizing home health and DME services, which may proxy for functionally impaired beneficiaries. Table ES-8 presents predictive ratios (mean predicted expenditures divided by mean actual expenditures) for some of the important validation groups we have used in previous projects, and some of the new ones defined for this project. Predictive ratios are presented for 4 risk adjustment models: our base model, a model adding home health diagnoses, a model adding home health and DME diagnoses[3], and a model adding DME utilization as a risk adjuster.

All 4 models predict accurately for beneficiaries classified by most single and multiple diagnoses. The base model underpredicts expenditures for beneficiaries with the highest prior year expenditures. Adding home health and DME diagnoses or DME utilization slightly improves prediction across prior year total expenditure quintiles. But substantial underpredictions remain for beneficiaries with the highest prior year expenditures. The base model underpredicts the total expenditures of beneficiaries with prior year home health or DME expenditures. Adding home health and DME diagnoses, or DME utilization, improves predictive accuracy for beneficiaries with prior year home health utilization moderately. But underprediction for home health utilizers is still present. Adding DME utilization as a risk adjuster substantially improves total

[3] Skilled nursing facility, ambulatory surgery center, and hospice diagnoses are also included in this model, but they have almost no effect on predictive accuracy.

Table ES-8

Predictive Accuracy of Alternative Risk Adjustment Models for Medicare Subgroups

	1	2	3	4
	Model			
Validation Group	Base HCC[1]	Base + HHA DXs[2]	Base + HHA & DME DXs[3]	Base + DME[4]
Diagnoses[5]				
ANY 1996 CHRONIC CONDITION	0.98	0.99	0.99	0.98
DEPRESSION	0.92	0.95	0.95	0.93
ALCOHOL / DRUG DEPENDENCE	0.97	0.98	0.98	0.96
HYPERTENSIVE HEART/RENAL DISEASE	0.95	0.96	0.97	0.96
BENIGN/UNSPECIFIED HYPERTENSION	0.96	0.97	0.97	0.97
DIABETES WITH COMPLICATIONS	0.96	0.97	0.97	0.96
DIABETES WITHOUT COMPLICATIONS	0.99	1.00	1.00	0.99
HEART FAILURE / CARDIOMYOPATHY	0.97	0.99	0.99	0.98
ACUTE MYOCARDIAL INFARCTION	0.98	1.00	1.00	0.98
OTHER HEART DISEASE	0.98	0.99	0.99	0.98
CHRONIC OBSTRUCTIVE PULMONARY DISEASE	0.99	0.99	1.00	0.99
COLORECTAL CANCER	0.98	0.99	0.99	0.98
BREAST CANCER	1.08	1.08	1.08	1.08
LUNG/PANCREAS CANCER	0.90	0.91	0.91	0.91
OTHER STROKE	0.96	0.99	1.00	0.97
INTRACEREBRAL HEMORRHAGE	1.04	1.06	1.06	1.04
HIP FRACTURE	0.99	1.02	1.04	1.00
ARTHRITIS	0.91	0.91	0.91	0.92
Multiple Diagnoses[5]				
DIABETES, CORONARY ARTERY DISEASE	0.98	0.99	0.99	0.98
DIABETES, CEREBROVASCULAR DISEASE	0.98	1.00	1.00	0.98
HEART FAILURE, COPD	0.98	1.00	1.00	0.99
CORONARY ARTERY DISEASE, VASCULAR DISEASE	0.97	0.99	0.99	0.98
COPD, CORONARY ARTERY DISEASE	0.99	1.00	1.00	0.99
HEART FAILURE, RENAL FAILURE	0.98	1.00	0.99	0.99
DIABETES HEART FAILURE, RENAL FAILURE	0.98	1.00	1.00	0.98
COPD, CEREBROVASCULAR DISEASE, CORONARY ARTERY DISEASE	0.99	1.00	1.00	0.99
DIABETES, CEREBROVASCULAR DISEASE, VASCULAR DISEASE	0.99	1.01	1.01	0.99
Expenditures				
FIRST (LOWEST) QUINTILE, 1996 EXPEND	1.23	1.19	1.17	1.19
SECOND QUINTILE, 1996 EXPEND	1.23	1.21	1.19	1.19
MIDDLE QUINTILE, 1996 EXPEND	1.14	1.13	1.12	1.10
FOURTH QUINTILE, 1996 EXPEND	1.02	1.02	1.02	1.02
FIFTH (HIGHEST) QUINTILE,1996 EXPEND	0.86	0.88	0.88	0.89
Top 5 percent 1996 EXPENDITURES	0.77	0.79	0.80	0.81
Top 1 percent 1996 EXPENDITURES	0.69	0.70	0.71	0.72
No home health spending 1996	1.10	1.08	1.08	1.07
Home health spending > 0 1996	0.75	0.79	0.80	0.82
HHA spending>0:FIRST (LOWEST) QUINTILE, 1996	0.99	1.03	1.03	1.02
HHA spending>0:SECOND QUINTILE, 1996	0.98	1.02	1.03	1.04
HHA spending>0:MIDDLE QUINTILE, 1996	0.88	0.93	0.93	0.96
HHA spending>0:FOURTH QUINTILE, 1996	0.75	0.80	0.81	0.84
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.46	0.51	0.53	0.55
HHA spending>0: top 10% of HHA spending 1996	0.39	0.43	0.45	0.47
HHA spending>0: top 5% of HHA spending 1996	0.33	0.37	0.39	0.40
No DME spending 1996	1.09	1.08	1.06	1.02
DME spending > 0 1996	0.82	0.84	0.87	0.96
DME spending>0:FIRST (LOWEST) QUINTILE, 1996	0.94	0.95	0.97	0.96
DME spending>0:SECOND QUINTILE, 1996	0.89	0.91	0.93	1.00
DME spending>0:MIDDLE QUINTILE, 1996	0.89	0.91	0.94	1.00
DME spending>0:FOURTH QUINTILE, 1996	0.82	0.84	0.88	0.97
DME spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.65	0.68	0.72	0.91
DME spending>0: top 10% of DME spending 1996	0.59	0.61	0.66	0.87
DME spending>0: top 5% of DME spending 1996	0.57	0.59	0.64	0.81

Table ES-8 (continued)

Predictive Accuracy of Alternative Risk Adjustment Models for Medicare Subgroups

	1	2	3	4
	Model			
Validation Group	Base HCC[1]	Base + HHA DXs[2]	Base + HHA & DME DXs[3]	Base + DME[4]
DME				
oxygen supplies/equipment (DME)	0.65	0.67	0.70	0.99
wheelchairs (DME)	0.68	0.71	0.77	0.95
walkers (DME)	0.84	0.86	0.88	1.03
HOSPITAL ADMISSIONS				
0 1996 HOSP ADMISSIONS	1.03	1.02	1.02	1.02
1 1996 HOSP ADMISSIONS	1.02	1.03	1.03	1.03
2 1996 HOSP ADMISSIONS	0.98	0.99	1.00	1.00
3+ 1996 HOSP ADMISSIONS	0.82	0.83	0.83	0.84

NOTES:

[1]Calibrated using hospital, physician, and clinically-trained nonphysician diagnoses (Source=1-5).

[2]Home health agency (HHA) diagnoses added to base model (Source=1-5, 6b).

[3]HHA and durable medical equipment (DME) diagnoses added to base model (Source=1-6, 8a).

[4]Utilization of DME added to the base model.

[5] Validation group diagnoses assigned using Source=1-6.

OUTPUT: From Table 5-5 and Table 6-9.

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

expenditure prediction for DME utilizers so that prediction is quite accurate, except for the highest prior year DME utilizers. But adding only home health or DME diagnoses improves total expenditure prediction for DME utilizers only slightly (home health diagnoses) to moderately (DME diagnoses). The base model underpredicts for beneficiaries with 3 or more prior year hospitalizations; adding home health and DME diagnoses, or DME utilization improves accuracy only slightly for this group.

Concluding Remark

Updates and refinements to the DxGroups, the Condition Categories, and the hierarchical rules for HCCs have improved clinical face validity. Also, inclusion of diagnosis interactions, home health and durable medical equipment diagnoses, and durable medical equipment utilization will add to predictive accuracy. However, the largest increase in predictive accuracy (resulting in our base prospective payment model having an R-square of over 11 percent) found in this project is associated with our use of newer (1996-1997) Medicare data.

1

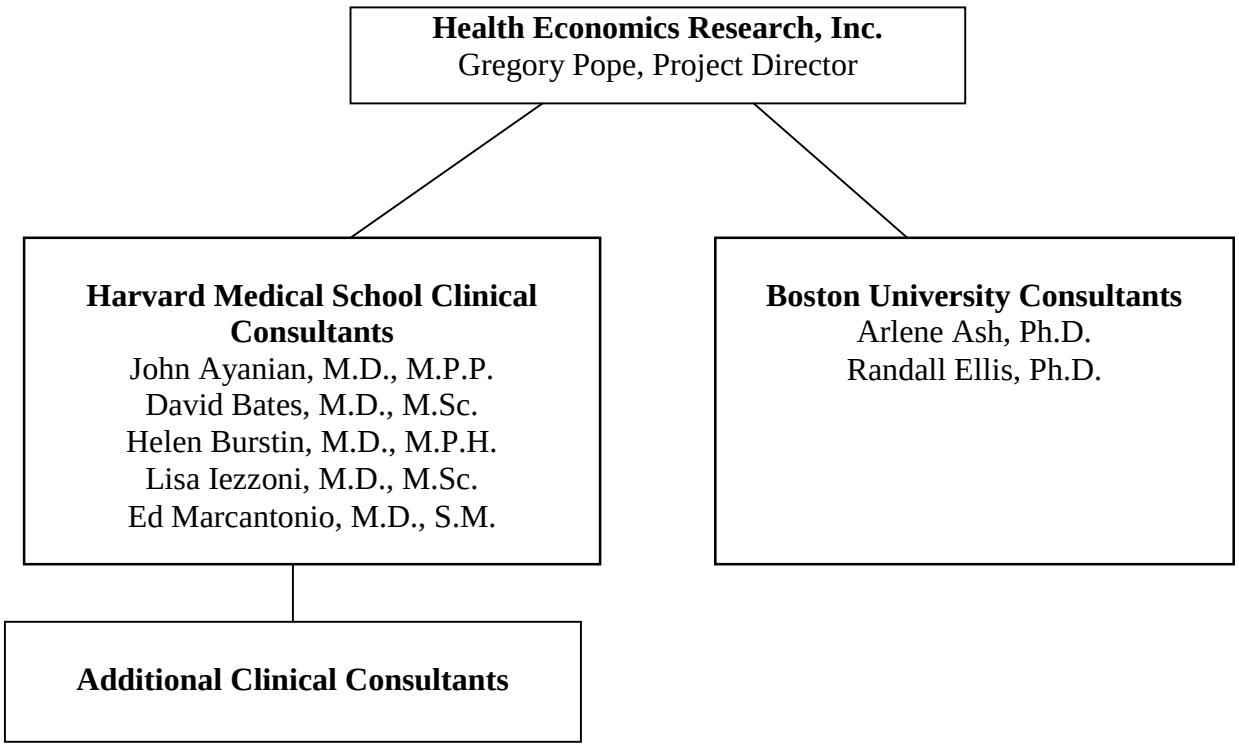
Introduction and Overview

The Health Care Financing Administration (HCFA) implemented inpatient encounter-based risk adjustment for a portion of capitation payments to Medicare + Choice (M+C) plans beginning January 1, 2000. The risk adjustment method used is the Principal Inpatient Diagnostic Cost Group or PIP-DCG model (Pope *et al.*, 1999). Medicare is scheduled to transition to all-encounter-based risk adjustment in 2004. The all-encounter model will add information from hospital outpatient and physician encounters to information from inpatient encounter records. The all-encounter risk adjustment model within the Diagnostic Cost Group, or DCG, family of risk adjustment models is known as the Diagnostic Cost Group, Hierarchical Condition Category model, or DCG/HCC model. This report describes the latest refinements and updates to the DCG/HCC model resulting from research funded by the Health Care Financing Administration.

Table 1-1 shows the multidisciplinary team that developed the latest version of the Medicare DCG/HCC model. This is the same team that developed Medicare's PIP-DCG model. Health Economics Research, Inc. (HER), based in Waltham, Massachusetts, was the prime contractor with HCFA for Medicare model development. Gregory Pope was the Project Director for HER. Arlene Ash, Ph.D. and Randall Ellis, Ph.D. of Boston University, the originators of the DCG family of risk adjustment models, served as consultants and active participants in the model refinement. Primary clinical

Table 1-1

DCG All Encounter Medicare Model Development Team



input was provided by a panel of physicians affiliated with Harvard Medical School in Boston. Additional clinical input was obtained from several physician specialists.

The current DCG/HCC model as presented in this report builds on earlier research sponsored by HCFA. All-encounter DCG models were first developed in the early-mid 1990s for Medicare. This first iteration of the models is reported in Ellis *et al*. (1996). Many of the principles for later model development were developed as part of this initial effort. HCFA then funded parallel projects to extend the DCG/HCC framework to

commercial and Medicaid populations (Ash *et al*., 1998), and to refine and update the Medicare DCG/HCC model (Pope *et al*., 1998). The current project thus represents a second update and refinement of the Medicare DCG/HCC models.

The current project reflects a combination of updates, refinements, and new research involving the DCG/HCC models. The major updates to the DCG/HCC models were:

- recalibration of the model using 1996/1997 data (as compared to the 1991/92 data used in our previous projects);
- updating ICD-9-CM diagnosis codes to be current through FY 2000.

The major refinements to the model were:

- more clinically detailed diagnostic classification system;
- adjustments for the joint effect on expenditures of certain combinations of diagnoses;
- more detailed adjustment for expenditure differences of beneficiaries entitled to Medicare by disability;
- calibration of Medicaid, originally disabled, and working aged demographic factors in conjunction with the updated DCG/HCC model.

The major research issues we investigated were:

- validity of the DCG/HCC model assumption that the predicted expenditures associated with multiple diagnoses are generally modeled accurately as the sum of the incremental expenditures predicted for each (individual) diagnosis.
- gain in predictive accuracy from incorporating additional sources of diagnoses, for example, diagnoses from home health agencies.
- use of durable medical equipment as an additional risk adjustment factor.

- evaluation of the predictive accuracy of model variants for additional nonrandom groups of beneficiaries, such as beneficiaries with high home health expenditures.

The remainder of the report is organized as follows. Chapter 2 discusses file construction with the 1996/97 Medicare fee-for-service 5 percent sample data used for this report. Chapter 3 describes the updated DCG/HCC diagnostic classification system. Chapter 4 details the development and evaluation of alternative diagnosis-based prospective risk adjustment models. The effects of adjustments for the joint effects of combinations of diagnoses ("diagnosis interactions") and differences for the under-age-65 disabled are examined. Also, the base version of the model is calibrated with age-specific adjustments for Medicaid enrollment and original entitlement by disability, and with a multiplicative adjustment for working-aged status. Chapter 5 presents our analysis of model sensitivity to use of different sources of diagnosis, including gains in predictive accuracy from use of additional sources. Chapter 6 contains our analysis of durable medical equipment as an additional risk adjuster, including a DCG/HCC model variant that incorporates DME. We also briefly consider the use of selected medical procedures, such as organ transplants, for risk adjustment. Chapters 4-6 consider only prospective risk adjustment models. In Chapter 7 we present our revised concurrent DCG/HCC risk adjustment model.

2 File Construction

We constructed a file of calendar year 1996 and 1997 Medicare enrollment, expenditure, diagnosis, and utilization information to develop and analyze risk adjustment models. Our analytic file was created from the 1996/1997 Medicare 5 percent sample Standard Analytic Files. The sample selection and file construction processes were similar to previous 1991/1992 and 1995/1996 5 percent sample files created in prior HCFA projects (see Ellis *et al*., 1996 for details on the 1991/1992 file, and Pope *et al*., 1999 for details on the 1995/1996 files). Two analytic samples were created from the 1996/1997 data: a prospective sample and a concurrent sample. The prospective sample includes beneficiaries eligible for Medicare throughout 1996 who are alive on January 1, 1997. Prospective risk adjustment models use demographic, diagnostic, and other information from 1996 to predict 1997 Medicare expenditures. They are discussed in Chapters 4-6. The concurrent sample includes beneficiaries eligible for Medicare in 1997. Concurrent risk adjustment models use demographic, diagnostic, and other risk adjustment information from 1997 to predict 1997 expenditures. They are discussed in Chapter 7.

In this chapter, we first describe sample selection. Then we discuss creation of our Medicare payment variables. Finally, we discuss data used for risk adjustment.

2.1 Sample Selection

Our "master" sample is the union of Medicare beneficiaries appearing on either the 1996 or 1997 Medicare "denominator" (enrollment) files. Prospective and concurrent analytic samples were extracted from this master sample. We first describe our prospective sample, then our concurrent sample.

2.1.1 Prospective Sample

Our prospective sample includes beneficiaries who satisfy the following conditions:

1. Continuously enrolled in both Parts A and B of Medicare from 1/1/96;
2. at least one month in 1997 entitled by age or disability, not residing in a hospice, and not enrolled in an HMO;
3. no months of HMO enrollment in 1996;
4. US residence throughout 1996 and 1997; and
5. no months of working aged status in either 1996 or 1997.

The primary goal of these conditions is to ensure that we analyze beneficiaries with a complete set of claims in 1996 to create a comprehensive diagnostic profile, and a complete set of claims in 1997 to measure total expenditures accurately. The first condition is necessary to have a complete set of inpatient and outpatient claims for all sample beneficiaries in 1996 and 1997.

The second condition excludes beneficiaries who are only ESRD-eligible, only hospice-residing, or only HMO-enrolled in 1997. HMO months are excluded because

Medicare does not collect a full set of encounter claims for months beneficiaries are enrolled in HMOs. Hospice months are excluded because HMOs are not responsible for hospice care. ESRD months are excluded because ESRD eligibles have not been allowed to enroll in Medicare HMOs. In a change from our earlier file constructions with 1991/1992 and 1995/1996 data (Ellis *et al*., 1996; Pope *et al*., 1999), we now include beneficiaries who have a mixture of FFS/HMO, or ESRD/aged-disabled months in the prediction year (1997). Previously we excluded entirely beneficiaries with any HMO or ESRD months in either the base or prediction years.

The third condition excludes beneficiaries with any base year (1996) months enrolled in a Medicare HMO. No claims are available for these months, hence the base year diagnostic profile may be incomplete. The fourth condition eliminates beneficiaries residing (and possibly receiving their medical care) outside the United States. The fifth condition eliminates beneficiaries for whom a private group health insurance plan was the primary payer to Medicare (known as "working aged" status) at any time in 1996 or 1997. Medicare may not have a complete set of claims for working aged beneficiaries.

Table 2-1 shows the number of beneficiaries excluded by the various sample restrictions. Beneficiaries may be excluded for more than one reason. The Medicare 5 percent standard analytic sample contains a total of 2,017,964 beneficiaries with any eligibility in 1997. Of these, 1,394,701 beneficiaries, or 69 percent, constitute our prospective sample. The largest sample exclusions are due to not being continuously enrolled in Medicare Parts A and B from the beginning of 1996 (presumably mostly newly-eligible beneficiaries) and being HMO-enrolled in either 1996 or 1997.

2.1.2 Concurrent Sample

Our concurrent sample was defined to include beneficiaries who satisfy the following conditions:

1. Eligible for both Medicare Part A and Part B for any months of Medicare eligibility in 1997;
2. at least one month in 1997 entitled by age or disability, not residing in a hospice, and not enrolled in an HMO;
3. US residence in 1997; and
4. no months of working aged status in 1997.

The first condition is necessary for a complete set of inpatient and outpatient claims during 1997. Note that beneficiaries need not be Part A and B eligible from the beginning of 1997 to be included in the concurrent sample. They may become Medicare-eligible during 1997 and qualify for the concurrent sample. The second condition excludes beneficiaries with only ESRD-eligible, only hospice-residing, or only HMO-enrolled months in 1997. The third condition excludes non-US residents, and the fourth condition excludes beneficiaries with any working aged months in 1997.

Of the 2,017,964 beneficiaries in the 5 percent sample with any 1997 eligibility, 1,581,370, or 78 percent, qualified for our concurrent sample.

2.2 1997 Medicare Expenditures

Medicare payments were summed from the Medpar inpatient file (including SNF) and four 1997 Standard Analytic Files: hospital outpatient, Part B physician/supplier, home health, and Durable Medical Equipment (DME). The paid amount recorded on

each SAF claim was included in total Medicare payments. For the Medpar file, we used the following definition of payments:

> Payments = Medpar Medicare Payment Amount (#52) + Medpar Total Pass Through Amount (#47) - Medpar Indirect Medical Education (IME) Amount (#45).

Thus, our payment variable includes all Medicare payments exclusive of:

- deductibles and copayments paid by beneficiaries;
- hospice payments; and
- indirect medical education (IME) payments.

We exclude hospice and IME payments because these are not paid to HMOs (see Pope *et al*., 1999 for further discussion).

Payments were summed only for 1997 months that beneficiaries were enrolled in fee-for-service, not enrolled in hospice, and entitled by age or disability. Months enrolled in an HMO, hospice, or ESRD are excluded. After payments were summed, they were annualized by dividing them by the fraction of months in 1997 each beneficiary was Medicare-eligible by age or disability, enrolled in FFS, and not enrolled in hospice. All analyses are then weighted by this same fraction. Annualization and weighting ensures that monthly payments are correctly estimated for all beneficiaries, including people who died (Ellis *et al*., 1996).

Table 2-2 shows the distribution of annualized 1997 payments for the prospective sample. Mean payments are $5,314, with a standard error of $12. The maximum payment is $1,997,706, and about 10 percent of the sample are nonusers (zero payments).

Table 2-3 compares frequencies and mean payments between the 1995/1996 (Pope *et al*., 1999) and 1996/1997 prospective samples. Beneficiaries entitled by disability comprise a slightly higher percentage of the 1996/1997 sample (11.7% versus 11.2%), with most of the gain occurring in the older disabled. The older elderly (age 85+) and Medicaid dual eligibles also comprise slightly higher proportions of the 1996/1997 sample. Ratios of mean subgroup payments to overall mean payments are fairly stable across samples.

Table 2-4 shows descriptive statistics of components of 1997 total annualized payments. Inpatient payments comprise 48 percent of the total, and Part B excluding laboratory 22 percent. Less than 5 percent of the sample have any SNF expenditures, less than 12 percent any home health expenditures, less than 18 percent any DME expenditures, and less than 22 percent any inpatient expenditures.

2.3 Information Used for Risk Adjustment

Our risk adjustment models primarily use demographics and diagnoses to predict expenditures. The demographic factors we employ are age, sex, originally disabled status, and Medicaid status. We defined age and sex factors identically to Pope *et al*. (1999) as 24 age/sex cells using prorated months when a beneficiary spent 1997 in more than one age range. Ever disabled is also defined identically to the previous project. Following HCFA practice, we have now relabelled "ever disabled" to "originally disabled". By either name, beneficiaries in this status were originally entitled to Medicare by disability, but are currently (1997) entitled by age. For prospective

analyses, a person is defined to be in Medicaid status if he or she had any months of Medicaid eligibility in 1996. For concurrent analyses, Medicaid status is defined as any Medicaid eligibility in 1997.

In prospective modelling, diagnoses from 1996 claims are used to predict 1997 expenditures. In concurrent modelling, 1997 diagnoses are used to explain 1997 expenditures. Diagnoses from Medicare claims were assigned to one of the following Sources:

1. hospital inpatient—principal diagnoses
2. hospital inpatient—secondary diagnoses
3. hospital outpatient department
4. physician
   - 4a. physicians, excluding RAPs
   - 4b. radiologist, anesthesiologist, pathologist (RAPs)
5. clinically-trained nonphysician (e.g., psychologist, therapist, podiatrist)
6. facility types
   - 6a. ambulatory surgery center
   - 6b. home health agency
   - 6c. skilled nursing facility
   - 6d. hospice
7. diagnostic testing
   - 7a. non-laboratory, e.g., radiology imaging clinics
   - 7b. clinical laboratory
8. durable medical equipment/medical supplies
   - 8a. DME diagnosis from DME Standard Analytic File
   - 8b. DME diagnosis from Part B file
9. other/miscellaneous

We conduct an analysis of sensitivity of the prospective risk adjustment model to source of diagnoses in Chapter 5. But for most of our analyses, we use Sources 1-5 to provide diagnoses for risk adjustment.

Diagnoses from both header and line items were included from Medicare Part B records (claims). For Part B line item diagnoses, we assigned the Source based on the HCFA provider specialty code. The Source of header diagnoses was assigned based on the lowest-numbered Source of any of the line items on that claim.

For some prospective risk adjustment model variants we used DME and procedure utilization as additional risk adjusters. These predictors are discussed in Chapter 6.

Table 2-1

Exclusions to Create 1996/97 Prospective Modeling Sample

	Beneficiaries	Percentage	Months	Percentage
Eligible in 1997, Total[1]	2,017,964	100.0%	23,074,601	100.0%
Prospective Modeling Sample Exclusions[2]				
Not continuously Medicare A/B enrolled from 1/1/96[3]	349,443	17.3	3,537,349	15.3
HMO-enrolled in 1996[4]	244,473	12.1	2,877,620	12.5
No months non-HMO, non-hospice aged/disabled eligibility, 1997	260,026	12.9	2,981,702	12.9
only HMO months	245,019	12.1	2,842,019	12.3
only ESRD months	11,264	0.6	116,832	0.5
only hospice months	2,107	0.1	8,797	0.0
mix of HMO/ESRD/hospice months	1,636	0.1	14,054	0.1
Any working aged months, 1996 or 1997	65,474	3.2	744,646	3.2
Any months of non-US residence, 1996 or 1997	16,772	0.8	193,319	0.8
Prospective Sample	1,394,701	69.1	16,335,299	70.8

NOTES:

[1]Eligible Part A or Part B Medicare at least one month in 1997. Five percent sample of Medicare beneficiaries.

[2]A person may be excluded for more than one reason. Hence, sum of number of people excluded for each reason is greater than the difference between 1997 eligibles and the prospective modeling sample.

[3]Until 12/31/97 or date of death.

[4]Enrolled in an HMO at least one month in 1996.

Computer output: DENOM02D.OUT

SOURCE: Health Economics Research, Inc. analysis of 1996/97 Medicare 5% sample data.

Table 2-2

Distribution of Annualized 1997 Payments[1]

N	1,394,701
Mean[2]	$5,314
Standard Deviation[2]	$13,822
Coefficient of Variation[2]	260%
Standard Error[2]	$12
Percentile	
Max[3]	$1,997,706
99	78,748
95	31,437
90	17,142
75	4,114
50 (Median)	844
25	189
10	4
5	0
1	0
Min	0
% non-users (zero payments)	9.7%

[1] For prospective modelling sample.

[2] Weighted by fraction of year alive.

[3] The maximums shown is of annualized expenditures. The maximum of actual expenditures was $566,302.

Output: D9P001A.OU2

SOURCE: Health Economics Research, Inc. analysis of 1996/97 Medicare Standard Analytic Files.

Table 2-3

Frequencies and Mean Annualized Payments for Medicare Subgroups: 1995/1996 and 1996/1997 Prospective Modeling Samples

Subgroup	1995/1996 Sample[1]				1996/1997 Sample[1]			
	N	Percent of Total Sample	Mean 1996 Payments[2]	Ratio to the Mean	N	Percent of Total Sample	Mean 1997 Payments[2,3]	Ratio to the Mean
Overall Sample	1,387,105	100.0%	$5,186	1.00	1,394,701	100.0%	$5,314	1.00
Disabled (age <= 64)	154,784	11.2	4,636	0.89	163,230	11.7	4,592	0.86
Younger disabled (age <= 44)	55,579	4.0	3,846	0.74	56,844	4.1	3,806	0.72
Older disabled (age 45 - 64)	99,205	7.2	5,082	0.98	106,386	7.6	5,018	0.94
Aged (age >= 65)	1,232,321	88.8	5,256	1.01	1,231,471	88.3	5,411	1.02
Ever disabled	87,154	6.3	7,966	1.54	89,468	6.4	8,224	1.55
Younger elderly (age 65 - 84)	1,073,853	77.4	4,917	0.95	1,070,124	76.7	5,042	0.95
Older Elderly (age 85+)	158,468	11.4	7,685	1.48	161,347	11.6	7,986	1.50
Medicaid[4]	204,267	14.7	7,290	1.41	209,897	15.0	7,277	1.37
Disabled (age <= 64)	66,370	4.8	5,556	1.07	70,972	5.1	5,497	1.03
Elderly (age >= 65)	137,897	9.9	8,161	1.57	138,925	10.0	8,228	1.55
Non-Medicaid	1,182,838	85.3	4,828	0.93	1,184,804	85.0	4,968	0.93
Disabled (age <= 64)	88,414	6.4	3,944	0.76	92,258	6.6	3,887	0.73
Elderly (age >= 65)	1,094,424	78.9	4,901	0.95	1,092,546	78.3	5,061	0.95
Female	812,354	58.6	5,098	0.98	815,510	58.5	5,247	0.99
Male	574,760	41.4	5,310	1.02	579,191	41.5	5,408	1.02

NOTES:

[1] Excludes part-year HMO and ESRD enrollees (see text).

[2] Excluding IME and Hospice payments. Payments are annualized and weighted by fraction of year eligible.

[3] Includes part-year HMO and ESRD enrollees (see text).

[4] Medicaid status is defined using the Medicaid buy-in indicator from the denominator files.

OUTPUTS: D9P002A.srt

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare claims data.

Table 2-4

Statistics on Components of 1997 Medicare Payments for Prospective Sample

	N	Mean	Std. Error of Mean	% of Total $	% Zero	Maximum[2]
Total	1,394,701	$5,314	$11.95	100.0%	9.7%	$1,997,706
Inpatient[1]	1,394,701	2,535	8.52	47.7	78.5	1,963,008
Hospital Outpatient	1,394,701	439	1.12	8.3	37.3	128,764
Part B, Excluding Laboratory	1,394,701	1,178	1.95	22.2	13.0	447,874
Laboratory	1,394,701	75	0.12	1.4	35.8	10,359
Skilled Nursing Facility	1,394,701	372	2.08	7.0	95.4	195,192
Home Health	1,394,701	564	2.64	10.6	88.6	138,022
Durable Medical Equipment	1,394,701	150	0.64	2.8	82.1	164,192

[1]Excludes Indirect Medical Education payments.

[2]The maximums shown are of annualized expenditures. The maximum of actual total expenditures was $566,302.

NOTES:
All payments are annualized.
No hospice payments are included because hospice payments were excluded from our expenditure variable.

OUTPUT: D9P001B.OUT

SOURCE: Health Economics Research, Inc. analysis of 1996/97 Medicare 5% sample data.

3 Diagnostic Classification

The diagnostic classification developed for this project builds on the classification originally developed by Ellis *et al*. (1996) and refined by Pope *et al*. (1998). Further extensive revisions in the diagnostic classification were completed for this project. We begin by reviewing the principles we have established for our classification system. We then give an overview of the system and the current round of revisions, and examples from the revised classification.

3.1 Principles

Ten principles guide the design of the Diagnostic Cost Groups/Hierarchical Condition Categories (DCG/HCC) diagnostic classification system and models.

1. Diagnostic categories should be clinically meaningful.

Each diagnostic category is a grouping of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes. These codes should all relate to a reasonably well-specified medical condition, symptom, or finding which defines the category.

Clinical meaningfulness improves the face validity of the classification system to clinicians, improves its interpretability, facilitates development of the clinical logic of

models based on it, and increases its usefulness for disease management and quality monitoring.

2. Diagnostic categories should predict medical expenditures.

A primary purpose is to develop a system for risk-adjusting capitation payments to Medicare + Choice plans. Therefore, the clinical classification should be useful in predicting expenditures. ICD-9-CM codes should be grouped into categories that are reasonably homogeneous with respect to their effect on both future (prospective risk adjustment) and current (concurrent risk adjustment) costs. Diagnoses with high cost implications should be distinguished from low-cost ones.

3. Diagnostic categories that will affect payments should have adequate sample sizes to permit accurate and stable estimates of expenditures.

Medical problems that are observed in only a few hundred people out of more than a million are too rare to be able to obtain stable and replicable estimates of their effects on costs. Diagnostic categories used in establishing payments should have adequate sample sizes in available data sets. Given the extreme skewness and large outliers that characterize medical expenditure distributions, diagnostic categories with small sample sizes are likely to be mis-priced.

4. In creating an individual's clinical profile, hierarchies should be used to characterize the person's illness level within each disease process, while the effects of unrelated disease processes should be cumulative.

Because each new medical problem adds to an individual's total disease burden, unrelated disease processes should contribute cumulatively to predicted costs of care. However, the most severe manifestation of a given disease process principally defines its impact on costs. Therefore, related conditions should be treated hierarchically, with more severe manifestations of a condition dominating less serious ones. In particular, a new code that adds a low-level, related medical problem to a sick person's profile will not increase that person's predicted cost.

5. The diagnostic classification should encourage specific coding.

Vague diagnostic codes should be grouped with less severe and lower-paying diagnostic categories to provide incentives for more specific diagnostic coding.

6. The diagnostic classification should not reward coding proliferation.

The classification should not measure greater disease burden simply because more ICD-9-CM codes are present. Hence, neither the number of times that a particular code appears, nor the presence of additional, closely-related codes that all indicate the same condition should increase predicted costs (see Principle 4).

7. Providers should not be penalized for recording additional diagnoses.

This principle has two consequences for modeling: 1) no condition category should carry a negative payment weight, and 2) a condition that is higher-ranked in a disease hierarchy should have at least as large a payment weight as a lower-ranked condition in the same hierarchy.

8. The classification system should be internally consistent (transitive).

If diagnostic category A is higher-ranked than category B in a disease hierarchy, and category B is higher-ranked than category C, then category A should be higher-ranked than category C. Transitivity improves the internal consistency of the classification system, and ensures that the assignment of diagnostic categories will be independent of the order in which hierarchical exclusion rules are applied.

9. The diagnostic classification should assign all ICD-9-CM codes.

Since each diagnostic code potentially contains relevant clinical information, the classification should categorize all ICD-9-CM codes.

10. Discretionary diagnostic categories should be excluded from prospective payment models.

Diagnoses that are particularly subject to intentional or unintentional discretionary coding variation or inappropriate coding by health plans/providers, or that are not clinically or empirically credible predictors of future expenditures, should not increase cost predictions. We excluded diagnoses from prospective payment models because they

were vague/nonspecific (e.g., symptoms), discretionary in medical treatment or coding (e.g., osteoarthritis), not medically significant (e.g., sprains/strains), transitory or admitting of definitive treatment this year (e.g., appendicitis). Also, we excluded diagnoses that did not, empirically, add to future costs. Excluding these diagnoses reduces the sensitivity of the payment models to coding variation, coding proliferation (Cf. Principle 6, above), "gaming", and "upcoding". See Pope *et al*. (1998), Chapter 2, for further discussion of diagnostic exclusions.

Several of these principles were followed absolutely, but most involved tradeoffs requiring judgment. Principles 7 (monotonicity), 8 (transitivity), and 9 (exhaustive classification of ICD-9-CM codes that are valid in the year 2000, including "V" and "E" codes) were always satisfied. As will be discussed further in Chapter 4, if the expenditure weights for our models did not originally satisfy monotonicity, we imposed constraints to create models that did[1]. Similarly, we ensured that all of the diagnostic hierarchies in our classification satisfy the principle of transitivity.

Judgment was used to make tradeoffs among the other principles. For example, clinical meaningfulness (Principle 1) is often best served by creating a very large number of very detailed clinical groupings. But a large number of groupings conflict with adequate sample sizes for each category (Principle 3). Another tradeoff is encouraging specific coding (Principle 5) versus predictive power (Principle 2). In current coding practice, nonspecific codes are used very frequently. But if these codes are excluded

from or downweighted in the classification system, substantial predictive power would be sacrificed. Excluding discretionary codes (Principle 10) can also conflict with Principle 2 (predictive power). Excluding diagnoses from the model generally reduces predictive power.

We approached the inherent tradeoffs involved in designing a classification system using empirical evidence, clinical judgment, and experience in designing payment systems. The 1996/1997 Medicare fee-for-service 5 percent sample analytic datafile as described in Chapter 2 was used to provide empirical evidence on frequencies of diagnoses, mean and incremental expenditures, and predictive power/fit of the risk adjustment models. Our panel of clinical consultants (see Table 1-1) determined clinical meaningfulness (Principle 1), relationships among disease processes (Principle 4), and discretionary diagnoses (Principle 10), as well as providing general input on the clinical groupings. The Project Director and Boston University consultants (see Table 1-1) have considerable experience in designing medical provider payment systems, and provided input on incentives established by the classification system and likely provider responses to it. The DCG/HCC clinical classification system has been designed to achieve a good balance among competing goals for a real-world health-based payment system.

[1] In several cases, we allowed monotonicity to be violated for specific clinical reasons. These included completed versus uncompleted pregnancies, and kidney transplants versus dialysis status.

3.2 Elements and Organization

The DCG/HCC diagnostic classification system begins by classifying each of the more than 15,000 ICD-9-CM diagnosis codes, as shown in Table 3-1. These are first grouped into 804 diagnostic groupings, or "DxGroups". Each ICD-9-CM code maps into exactly one DxGroup, which represents a specific medical condition. Examples are DxGroup "3.02 non-viral encephalitis, meningoencephalitis, other CNS infection" "28.01 acute liver disease, including acute liver necrosis/failure, abscess, infarction," and "30.01 gallstones with gallbladder inflammation and other gallbladder disease." The DxGroups are each given an integer part, and a two decimal extension, with closely-related DxGroups sharing the same integer part. The integer part relates to the next highest level of aggregation, to be explained below. Each DxGroup also has a descriptive label naming the most common or clinically-important specific diagnoses included in the group.

DxGroups are further aggregated into 189 "Condition Categories", or CCs. These CCs describe major diseases and are broadly organized into body systems, somewhat analogous to the ICD-9-CM major diagnostic categories. The ICD-9-CM diagnoses that define a single CC are not as similar as the ICD-9-CM codes in a single DxGroup. However, the CCs are designed to be both clinically- and cost-similar, reflecting the principles just described. The integer assigned to each CC corresponds to the integer part of the DxGroups that constitute it.

Hierarchies are imposed among related CCs according to Principle 4 discussed in the preceding section. After the hierarchies are imposed, the CCs become "Hierarchical

Condition Categories", or HCCs. HCCs are clinically meaningful categories, although at a more aggregate level than the DxGroups. Examples of HCCs are HCC 3 “Central Nervous System Infection", HCC 28 “Acute Liver Failure/Disease” and HCC 30 “Gallbladder and Biliary Tract Disorders.” Note that these three HCCs correspond to the three DxGroups (3.02, 28.01 and 30.01) discussed two paragraphs previous. The HCCs, together with demographic information, are used to predict next year's (prospective risk adjustment) or this year's (concurrent risk adjustment) expenditures.

At the level of the person, neither DxGroups nor HCCs are mutually exclusive. A beneficiary may be assigned to none, one, or more than one DxGroup or HCC. An individual’s HCCs, taken as a group, yield a comprehensive clinical profile. For example, a man with heart disease, cerebrovascular disease, and cancer will be assigned to three separate HCCs, and his predicted cost will reflect increments for each of these problems.

The kind of cumulative model structure that we use is parsimonious, flexible, and comprehensive. As opposed to a clinical algorithm that assigns persons to mutually exclusive clinical categories, an additive model can “price” the effects of tens of thousands of distinct clinical profiles using fewer than 200 parameters. The DCG/HCC models impose fewer a priori constraints on the allowed combinations of diagnoses than a mutually exclusive grouping, giving it greater flexibility to represent patterns of coexisting conditions. Similarly, because the DCG/HCC model recognizes all combinations of diagnoses, it provides a comprehensive clinical profile of each

individual, something not possible with mutually exclusive groupings that are necessarily limited in number.

We describe our models as cumulative rather than additive, to reflect the possibility that for some diseases costs may go up more quickly, or less quickly than the separate cost of each disease. For example, the cost of a person with both diabetes and congestive heart failure (CHF) could be greater or less than the sum of the separate costs for people who have only diabetes or only CHF. Whether a relationship is additive, more-than-additive, or less-than-additive is empirically testable. In Chapter 4, we conduct empirical tests of the additivity hypothesis in our Medicare fee-for-service data. We postpone a detailed discussion of our methods and results until Chapter 4. However, the bottom line is that simple additivity generally provides a very good fit to these data. In a few important cases, additivity is not supported, and we modify our model accordingly.

Severity of illness is captured in the DCG/HCC models in two ways. Within a particular type of illness or body system, disease hierarchies assign a person to the most severe manifestation, for example, metastatic cancer rather than prostate cancer. In addition, the burden of comorbid or coexisting conditions is captured through the accumulation of disease burden across multiple body systems or disease types. So if a person with metastatic cancer also suffers from congestive heart failure, the two disease impacts are both used in predicting the total disease burden.

In previous projects, each DxGroup was assigned to one and only one HCC. This one-to-one mapping was relaxed for this project in a few important cases. Every

DxGroup has a single primary HCC assignment. But certain DxGroups also have secondary or "duplicate" HCC assignments. Duplicate assignments of DxGroups to HCCs occur when certain ICD-9-CM codes denote the presence of more than one clinical condition or disease. An example is DxGroup 131.03 "hypertensive heart/renal disease, with heart/renal failure". This DxGroup is assigned to both HCC 80 "Congestive Heart Failure" and HCC 131 "Renal Failure". A beneficiary assigned to DxGroup 131.03 based on the underlying ICD-9-CM code is appropriately assigned to both heart and renal failure categories.

Considerable clinical detail was added to the DCG/HCC classification system in this project. As Table 3-2 shows, compared to the previous DCG/HCC model (Pope *et al*., 1998) the number of DxGroups was increased from 545 to 804, and the number of HCCs from 118 to 189. Refinements were made throughout the clinical classification. Examples of new HCCs are HCC 5 "Opportunistic Infections", HCC 20 "Type I Diabetes Mellitus", HCC 27 "Chronic Hepatitis", HCC 54 "Schizophrenia", HCC 95 "Cerebral Hemorrhage", and HCC 150 "Extensive Third Degree Burns". The new classification embodies a more explicit and detailed identification of different types of diseases, and captures a greater range of severity within types of disorders. Further examples are given in the next section.

Descriptive statistics for the 189 HCCs are provided in Tables 3-3 and 3-4. Table 3-3 presents statistics for the HCCs on the prospective sample, when beneficiaries are assigned to HCCs using base year (1996) information. Table 3-4 shows analogous information for the concurrent model in which HCCs are assigned using 1997

information. The "frequency" in Table 3-3 and throughout the report is the number of unique beneficiaries assigned to a HCC based on 1996 information. "1997 person years" refers to the number of months beneficiaries assigned to a HCC are eligible for our sample (see Chapter 2 for sample eligibility rules) divided by 12. If all beneficiaries assigned to a HCC were eligible for the full 12 months in 1997, person years would equal frequency. But primarily because of deaths during 1997, frequency is somewhat greater than person years.

Most HCCs are assigned entirely based on ICD-9-CM diagnosis codes. But as discussed in Chapter 6, for this project we also explore defining several HCCs wholly or partly in terms of durable medical equipment (DME) or procedure utilization. HCCs 185-189 are defined by beneficiary utilization of selected types of DME, such as wheelchairs. HCC 173, Major Organ Transplant, is defined by procedure codes only. Several other HCCs—for example, HCC 181 Chemotherapy—are alternately defined by diagnosis codes only, or by diagnosis codes and analogous procedure and DME codes. In Table 3-3, descriptive statistics are presented for both variants of these HCCs – those using only diagnoses, and those using DME and carefully selected procedure codes.

HCC 129, End Stage Renal Disease (ESRD), is unique in that it is defined by Medicare entitlement status, not by diagnosis, DME, or procedure codes. No data are presented for this HCC because ESRD eligibles were excluded from our analysis sample for this project. However, the ESRD HCC may prove useful in future work involving risk adjustment for the ESRD population.

3.3 Examples

This section presents examples of the new DCG/HCC clinical classification system. We begin, in Table 3-5, with a clinical vignette that illustrates the grouping of ICD-9-CM codes into DxGroups, then DxGroups into Condition Categories (CCs). A 79-year-old woman has diagnoses of acute myocardial infarction (AMI), obstructive chronic bronchitis, interstitial emphysema, and renal failure. Her ICD-9-CM AMI diagnosis is grouped into a DxGroup and a CC for AMI. Her two lung diagnoses are both grouped into the DxGroup for emphysema/chronic bronchitis, which assigns her to HCC 108 Chronic Obstructive Pulmonary Disease (COPD). Her two renal failure diagnoses are grouped into two DxGroups for types of renal failure, which both assign her to the single HCC 131 "Renal Failure". In the end, this woman's 5 ICD-9-CM codes assign her to three HCCs, for AMI, COPD, and Renal Failure. Although not shown in Table 3-5, estimated incremental cost weights are assigned to each of these illnesses (HCCs), which are summed to predict the woman's total expected medical expenditures.

Cancer, heart disease, and cerebrovascular disease are the three greatest killers of Americans. We now present examples of how these three severe, prevalent, and expensive diseases are represented in the DCG/HCC classification system. Table 3-6 shows the DCG/HCC Neoplasm Hierarchy. There are 8 HCCs in the hierarchy, arranged in a strictly hierarchical fashion. A diagnosis assigning a person to a higher-ranked HCC excludes the person from all lower-ranked HCCs. For example, if a person has metastatic cancer or acute leukemia, he or she is assigned to the highest ranked neoplasm HCC and excluded from all others. Only the top 4 HCCs are included in the prospective payment

model. The bottom 4 HCCs, consisting of benign or noninvasive neoplasms, are considered to have definitive treatment (e.g., surgical removal), and therefore are not expected to have significant future cost implications.

The DCG/HCC heart hierarchy is extensive, as might be expected of the disorder that kills far more male and female Americans than any other condition. It includes 15 HCCs altogether, 11 of which are included in the prospective payment model. In Table 3-7, we show selected heart disease HCCs. This table makes the point that 4 different major types of heart disease are cumulative in the heart disease HCCs. Congestive heart failure, coronary artery disease, valvular heart disease, and heart arrhythmias are all considered to contribute independently to a beneficiary's total burden of heart disease. Rather than assigning a beneficiary to just a single heart diagnosis considered to be most severe, the DCG/HCC classification provides a detailed description and cumulation of a beneficiary's types of heart disease.

However, severity of illness of several specific types of heart disease is captured through subhierarchies of HCCs within the overall heart disease hierarchy. As Table 3-7 shows, there are 4 HCCs for coronary artery disease, and 2 for heart arrhythmias. (There is only one HCC for congestive heart failure and one for valvular heart disease.) Table 3-8 shows the 4 coronary artery disease HCCs. They are arranged in a strict hierarchy. For example, a diagnosis of heart attack (AMI) excludes all other ischemic heart disease diagnoses. In short, the DCG/HCC heart disease hierarchy is a mixture of subhierarchies identifying severity of some specific types of heart disease, and an additive cumulation of multiple types of heart disease. A person's total burden, or severity, of heart disease is a

combination both of his or her severity of particular types of heart disease, and the numbers of different types of heart disease present.

Table 3-9 shows the DCG/HCC Cerebrovascular Disease hierarchy, which includes 9 HCCs. All are included in the prospective payment model. The 5 for cerebrovascular disease itself are arranged in a strict hierarchy. A diagnosis of hemorrhagic or ischemic stroke is considered more severe than the other HCCs, for example, cerebral atherosclerosis. In addition, there are 4 HCCs for the late effects of cerebrovascular disease. These are (not shown in Table 3-9): HCC 100 Hemiplegia/Hemiparesis, HCC 101 Diplegia, Monoplegia, and Other Paralytic Syndromes, HCC 102 Speech, Language, Cognitive, Perceptual Deficits, and HCC 103 Cerebrovascular Disease Late Effects, Unspecified[2]. The HCCs for late effects are additive to the HCCs for cerebrovascular disease itself. Thus, a stroke with late effects is considered more severe than a stroke without late effects.

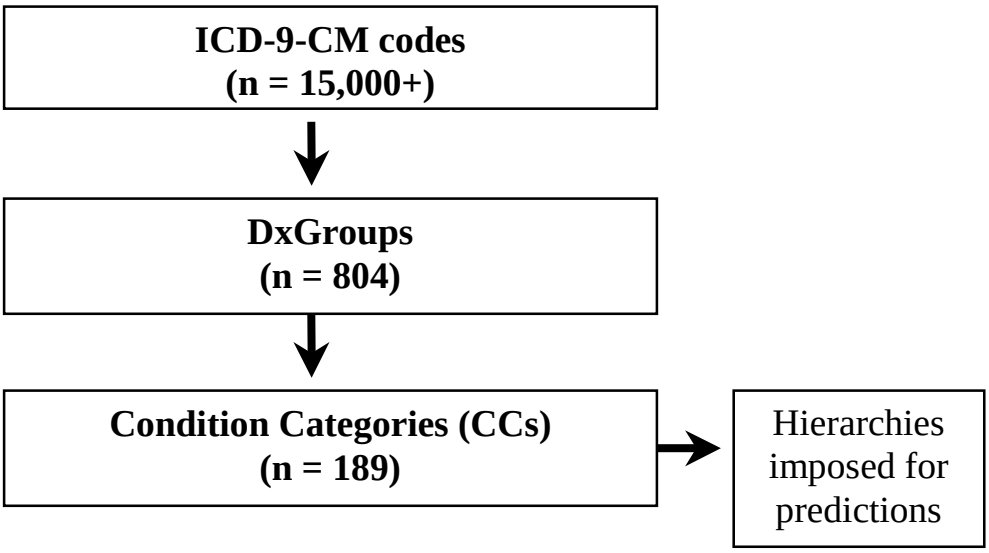
The last example we give is of the mental illness HCCs. This area of the DCG/HCC classification underwent extensive revisions in this project. Table 3-10 shows the 4 domains of mental dysfunction that are identified in the DCG/HCC classification. These 4 domains contribute independently and additively to the total burden of mental illness. Each of the 4 domains encompasses a multi-HCC hierarchy. Table 3-11 shows one subhierarchy of mental illness, the Psychiatric Hierarchy. Seven HCCs are included, ranked in a strict hierarchy. A person can be classified into at most one of these HCCs.

[2] The hierarchical relationships among the late effects HCCs are that HCCs 100, 101, and 102 exclude HCC 103, and HCC 100 excludes HCC 101.

The six top-ranked psychiatric HCCs are included in the prospective payment model, but the seventh ("Other Psychiatric Disorders") is not.

Table 3-1

DCG Aggregations of ICD-9-CM Codes



SOURCE: Health Economics Research, Inc.

Table 3-2

Revised DCG/HCC Classification System

Previous All Encounter Model	Revised All Encounter Model
545 DxGroups	804 DxGroups
118 HCCs	189 HCCs

SOURCE: Health Economics Research, Inc.

Table 3-3

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
--	Overall Sample	1,394,701	1,338,647	$5,314	$12	$13,822	260%
1	HIV/AIDS	1,766	1,675	11,823	587	24,039	203
2	Septicemia/Shock	16,321	13,911	19,910	305	35,941	181
3	Central Nervous System Infection	4,830	4,523	11,396	351	23,594	207
4	Tuberculosis	3,319	3,111	10,399	440	24,530	236
5	Opportunistic Infections	2,275	2,001	19,284	891	39,837	207
6	Other Infectious Diseases	221,070	208,575	8,231	37	16,826	204
7	Metastatic Cancer and Acute Leukemia	17,379	14,182	16,235	214	25,521	157
8	Lung, Upper Digestive Tract, and Other Severe Cancers	12,511	10,949	12,714	236	24,723	194
9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	18,304	17,107	9,577	148	19,340	202
10	Breast, Prostate, Colorectal and Other Cancers and Tumors	96,002	91,913	6,870	50	15,300	223
11	Other Respiratory and Heart Neoplasms	3,310	3,103	9,782	411	22,869	234
12	Other Digestive and Urinary Neoplasms	38,502	37,136	6,780	81	15,527	229
13	Other Neoplasms	79,905	77,260	5,588	48	13,295	238
14	Benign Neoplasms of Skin, Breast, Eye	122,239	119,529	4,252	32	10,916	257
15	Diabetes with Renal Manifestation	5,605	4,897	18,667	426	29,804	160
16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	29,221	27,208	13,580	142	23,431	173
17	Diabetes with Acute Complications	10,038	9,289	12,424	236	22,758	183
18	Diabetes with Ophthalmologic Manifestation	20,030	19,138	8,467	131	18,068	213
19	Diabetes with No or Unspecified Complications	148,986	141,721	7,529	45	16,925	225
20	Type I Diabetes Mellitus	67,424	62,785	12,429	91	22,721	183
21	Protein-Calorie Malnutrition	13,419	11,107	19,301	318	33,555	174
22	Other Significant Endocrine and Metabolic Disorders	14,254	13,270	10,587	188	21,669	205
23	Disorders of Fluid/Electrolyte/Acid-Base Balance	97,625	87,875	13,303	82	24,315	183
24	Other Endocrine/Metabolic/Nutritional Disorders	340,288	329,904	5,109	22	12,540	245
25	End-Stage Liver Disease	2,232	1,939	16,858	637	28,043	166
26	Cirrhosis of Liver	4,231	3,890	11,743	326	20,324	173
27	Chronic Hepatitis	1,512	1,444	10,273	594	22,572	220
28	Acute Liver Failure/Disease	1,244	1,149	11,803	681	23,073	195
29	Other Hepatitis and Liver Disease	13,268	12,382	9,969	186	20,674	207
30	Gallbladder and Biliary Tract Disorders	21,728	20,416	9,592	163	23,316	243

Table 3-3 (continued)

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
31	Intestinal Obstruction/Perforation	27,527	24,969	13,654	166	26,217	192
32	Pancreatic Disease	10,243	9,489	12,180	249	24,279	199
33	Inflammatory Bowel Disease	7,091	6,773	8,559	235	19,349	226
34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	82,555	77,715	9,122	69	19,205	211
35	Appendicitis	1,558	1,473	8,998	571	21,917	244
36	Other Gastrointestinal Disorders	272,018	260,551	6,593	29	14,839	225
37	Bone/Joint/Muscle Infections/Necrosis	11,884	11,051	13,989	239	25,125	180
38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	52,784	50,488	8,327	78	17,438	209
39	Disorders of the Vertebrae and Spinal Discs	107,069	103,162	7,005	47	15,151	216
40	Osteoarthritis of Hip or Knee	70,885	68,444	7,645	60	15,588	204
41	Osteoporosis and Other Bone/Cartilage Disorders	94,590	89,753	8,317	58	17,294	208
42	Congenital/Developmental Skeletal and Connective Tissue Disorders	1,167	1,122	8,127	532	17,823	219
43	Other Musculoskeletal and Connective Tissue Disorders	376,220	359,861	6,005	24	14,483	241
44	Severe Hematological Disorders	7,740	6,690	17,161	381	31,165	182
45	Disorders of Immunity	7,762	6,906	15,030	341	28,320	188
46	Coagulation Defects and Other Specified Hematological Disorders	33,189	30,959	10,831	126	22,224	205
47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	130,121	120,833	9,841	56	19,473	198
48	Delirium and Encephalopathy	17,920	16,167	14,091	199	25,308	180
49	Dementia	74,668	66,313	10,951	77	19,815	181
50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	10,676	9,817	9,778	186	18,399	188
51	Drug/Alcohol Psychosis	5,290	4,902	13,759	328	22,993	167
52	Drug/Alcohol Dependence	8,805	8,310	11,033	226	20,622	187
53	Drug/Alcohol Abuse, Without Dependence	19,954	18,885	9,349	149	20,446	219
54	Schizophrenia	21,615	21,038	7,942	113	16,360	206
55	Major Depressive, Bipolar, and Paranoid Disorders	39,121	37,096	9,843	100	19,273	196
56	Reactive and Unspecified Psychosis	18,020	16,043	10,662	160	20,273	190
57	Personality Disorders	1,798	1,710	7,492	346	14,325	191

Table 3-3 (continued)

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
58	Depression	44,620	42,183	8,124	80	16,510	203
59	Anxiety Disorders	8,148	7,828	6,405	162	14,349	224
60	Other Psychiatric Disorders	42,513	40,494	7,235	81	16,395	227
61	Profound Mental Retardation/Developmental Disability	1,169	1,151	4,401	428	14,504	330
62	Severe Mental Retardation/Developmental Disability	934	913	4,124	361	10,918	265
63	Moderate Mental Retardation/Developmental Disability	1,123	1,106	4,355	386	12,835	295
64	Mild/Unspecified Mental Retardation/Developmental Disability	7,166	7,012	4,541	149	12,510	275
65	Other Developmental Disability	861	821	6,935	519	14,861	214
66	Attention Deficit Disorder	415	404	8,178	884	17,780	217
67	Quadriplegia, Other Extensive Paralysis	2,624	2,410	16,439	578	28,391	173
68	Paraplegia	1,869	1,771	16,467	647	27,239	165
69	Spinal Cord Disorders/Injuries	11,809	10,959	11,889	212	22,198	187
70	Muscular Dystrophy	566	530	10,455	891	20,508	196
71	Polyneuropathy	31,034	29,185	12,060	136	23,185	192
72	Multiple Sclerosis	4,198	4,004	10,163	305	19,280	190
73	Parkinson's and Huntington's Diseases	19,936	18,285	10,719	141	19,036	178
74	Seizure Disorders and Convulsions	36,159	33,961	9,917	113	20,864	210
75	Coma, Brain Compression/Anoxic Damage	1,960	1,665	19,480	884	36,058	185
76	Mononeuropathy, Other Neurological Conditions/Injuries	59,424	57,299	6,594	61	14,539	220
77	Respirator Dependence/Tracheostomy Status[1]	1,553	1,339	24,223	1,432	52,406	216
77a	Respirator Dependence/Tracheostomy Status (Plus DME and Procedures)[2]	2,601	2,204	29,276	1,405	65,974	225
78	Respiratory Arrest	2,307	1,950	24,795	1,154	50,953	205
79	Cardio-Respiratory Failure and Shock	31,421	27,633	16,877	192	31,913	189
80	Congestive Heart Failure	165,202	150,000	12,371	59	22,791	184
81	Acute Myocardial Infarction	15,543	14,138	12,800	211	25,107	196
82	Unstable Angina and Other Acute Ischemic Heart Disease	50,455	47,497	10,923	98	21,314	195
83	Angina Pectoris/Old Myocardial Infarction	72,125	68,199	8,984	67	17,524	195
84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	169,807	160,329	8,112	43	17,390	214
85	Heart Infection/Inflammation, Except Rheumatic	5,575	5,094	13,919	423	30,207	217
86	Valvular and Rheumatic Heart Disease	100,532	93,898	10,407	69	21,107	203

Table 3-3 (continued)

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
87	Major Congenital Cardiac/Circulatory Defect	386	366	11,863	1,088	20,825	176
88	Other Congenital Heart/Circulatory Disease	4,886	4,600	9,103	275	18,673	205
89	Hypertensive Heart and Renal Disease or Encephalopathy	6,891	6,314	11,061	292	23,239	210
90	Hypertensive Heart Disease	46,970	45,319	6,209	66	14,087	227
91	Hypertension	457,915	442,514	5,232	19	12,775	244
92	Specified Heart Arrhythmias	123,018	113,892	10,373	62	20,852	201
93	Other Heart Rhythm and Conduction Disorders	79,216	75,130	8,563	65	17,943	210
94	Other and Unspecified Heart Disease	17,451	16,659	6,669	115	14,829	222
95	Cerebral Hemorrhage	7,344	6,687	12,504	288	23,523	188
96	Ischemic or Unspecified Stroke	60,284	55,008	11,909	92	21,616	182
97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	59,772	56,795	8,866	77	18,300	206
98	Cerebral Atherosclerosis and Aneurysm	6,320	5,844	9,131	227	17,320	190
99	Cerebrovascular Disease, Unspecified	4,952	4,615	9,198	292	19,806	215
100	Hemiplegia/Hemiparesis	15,517	13,951	14,956	203	24,030	161
101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	3,526	3,355	8,630	304	17,606	204
102	Speech, Language, Cognitive, Perceptual Deficits	7,336	6,594	13,277	282	22,926	173
103	Cerebrovascular Disease Late Effects, Unspecified	18,263	16,619	11,216	149	19,270	172
104	Vascular Disease with Complications	26,636	24,376	15,090	176	27,506	182
105	Vascular Disease	133,587	123,876	9,998	56	19,566	196
106	Other Circulatory Disease	101,120	95,714	8,126	55	17,022	209
107	Cystic Fibrosis	492	475	8,941	1,866	40,650	455
108	Chronic Obstructive Pulmonary Disease	175,182	162,877	10,314	51	20,772	201
109	Fibrosis of Lung and Other Chronic Lung Disorders	22,111	20,443	10,203	158	22,524	221
110	Asthma	26,925	26,143	5,563	78	12,595	226
111	Aspiration and Specified Bacterial Pneumonias	12,131	10,029	20,267	355	35,558	175
112	Pneumococcal Pneumonia, Empyema, Lung Abscess	6,603	5,931	13,186	350	26,992	205
113	Viral and Unspecified Pneumonia, Pleurisy	82,861	75,647	11,377	82	22,530	198
114	Pleural Effusion/Pneumothorax	27,792	24,000	16,041	200	31,023	193
115	Other Lung Disorders	115,724	111,839	5,444	39	12,905	237
116	Legally Blind	3,780	3,433	10,686	341	19,985	187
117	Major Eye Infections/Inflammations	3,362	3,167	7,940	303	17,072	215
118	Retinal Detachment	6,463	6,208	6,260	171	13,500	216

Table 3-3 (continued)

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	8,306	7,794	11,758	240	21,226	181
120	Diabetic and Other Vascular Retinopathies	46,182	44,002	8,653	89	18,696	216
121	Retinal Disorders, Except Detachment and Vascular Retinopathies	92,626	88,729	6,299	48	14,291	227
122	Glaucoma	135,424	130,260	6,038	40	14,279	236
123	Cataract	376,703	363,153	5,725	23	13,762	240
124	Other Eye Disorders	100,776	97,110	5,602	44	13,859	247
125	Significant Ear, Nose, and Throat Disorders	12,106	11,567	7,766	165	17,744	228
126	Hearing Loss	45,857	43,915	6,719	71	14,835	221
127	Other Ear, Nose, Throat, and Mouth Disorders	336,576	324,412	5,951	25	14,493	244
128	Kidney Transplant Status[1]	1,495	1,280	10,966	653	23,377	213
128a	Kidney Transplant Status (Plus DME and Procedures)[2]	1,495	1,280	10,966	653	23,377	213
129	End Stage Renal Disease	.	.	.	.	.	.
130	Dialysis Status[1]	465	397	29,802	2,429	48,394	162
130a	Dialysis Status (Plus DME and Procedures)[2]	1,829	1,565	24,877	1,423	56,297	226
131	Renal Failure	22,164	18,924	16,717	233	32,004	191
132	Nephritis	3,716	3,422	13,463	398	23,267	173
133	Urinary Obstruction and Retention	60,102	56,321	9,694	83	19,625	202
134	Incontinence	28,172	26,477	10,095	115	18,666	185
135	Urinary Tract Infection	168,251	157,806	9,198	47	18,504	201
136	Other Urinary Tract Disorders	77,453	73,000	8,816	66	17,768	202
137	Female Infertility	133	132	4,627	708	8,129	176
138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	29,693	28,787	5,995	82	13,995	233
139	Other Female Genital Disorders	111,119	108,117	4,936	38	12,350	250
140	Male Genital Disorders	147,125	141,322	6,119	39	14,580	238
141	Ectopic Pregnancy	35	34	5,114	1,622	9,505	186
142	Miscarriage/Abortion	105	104	3,633	654	6,663	183
143	Completed Pregnancy With Major Complications	84	82	4,029	894	8,070	200
144	Completed Pregnancy With Complications	298	293	5,996	932	15,938	266
145	Completed Pregnancy Without Complications (Normal Delivery)	83	83	4,533	1,085	9,858	217

Table 3-3 (continued)

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
146	Uncompleted Pregnancy With Complications	75	71	10,405	3,428	28,900	278
147	Uncompleted Pregnancy With No or Minor Complications	308	305	5,968	720	12,576	211
148	Decubitus Ulcer of Skin	15,928	13,640	17,655	235	27,491	156
149	Chronic Ulcer of Skin, Except Decubitus	25,102	23,395	10,982	130	19,915	181
150	Extensive Third-Degree Burns	45	43	16,380	3,819	24,897	152
151	Other Third-Degree and Extensive Burns	483	460	11,998	1,027	22,021	184
152	Cellulitis, Local Skin Infection	99,305	93,393	9,890	66	20,162	204
153	Other Dermatological Disorders	290,539	280,121	5,612	25	13,207	235
154	Severe Head Injury	197	178	16,831	2,667	35,601	212
155	Major Head Injury	14,117	13,065	10,911	185	21,158	194
156	Concussion or Unspecified Head Injury	1,422	1,349	9,325	486	17,866	192
157	Vertebral Fractures	14,517	13,386	11,347	167	19,283	170
158	Hip Fracture/Dislocation	25,652	23,378	11,172	128	19,587	175
159	Major Fracture, Except of Skull, Vertebrae, or Hip	22,042	20,773	8,823	123	17,707	201
160	Internal Injuries	4,056	3,764	11,872	415	25,462	214
161	Traumatic Amputation	2,273	2,020	19,371	653	29,346	151
162	Other Injuries	212,963	203,906	6,810	34	15,358	226
163	Poisonings and Allegic Reactions	52,295	49,368	9,339	87	19,228	206
164	Major Complications of Medical Care and Trauma	37,154	34,291	13,091	136	25,260	193
165	Other Complications of Medical Care	17,837	16,841	10,039	165	21,473	214
166	Major Symptoms, Abnormalities	517,269	488,716	8,284	26	17,835	215
167	Minor Symptoms, Signs, Findings	243,897	236,027	4,658	24	11,513	247
168	Extremely Low Birthweight Neonates	6	5	12,019	17,091	39,470	328
169	Very Low Birthweight Neonates	3	3	6,552	4,592	7,953	121
170	Serious Perinatal Problem Affecting Newborn	2,261	2,089	12,776	554	25,329	198
171	Other Perinatal Problems Affecting Newborn	1,918	1,793	9,174	468	19,810	216
172	Normal, Single Birth	23	22	10,967	2,983	14,099	129
173	Major Organ Transplant[3]	53	49	24,218	5,194	36,326	150
174	Major Organ Transplant Status	838	780	14,831	1,535	42,884	289
175	Other Organ Transplant/Replacement	3,253	3,101	8,913	409	22,787	256
176	Artificial Openings for Feeding or Elimination[1]	8,008	6,958	17,404	334	27,894	160

Table 3-3 (continued)

Descriptive Statistics on Prospective HCCs

HCC	HCC Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std Err of Mean	Std. Dev.	Coefficient of Variation
176a	Artificial Openings for Feeding or Elimination (Plus DME and Procedures)[2]	11,398	9,695	18,991	313	30,858	162
177	Amputation Status, Lower Limb/Amputation Complications[1]	2,150	1,917	19,147	610	26,703	139
177a	Amputation Status, Lower Limb/Amputation Complications (Plus DME and Procedures)[2]	3,978	3,590	16,992	453	27,154	160
178	Amputation Status, Upper Limb[1]	164	152	12,086	1,572	19,348	160
178a	Amputation Status, Upper Limb (Plus DME and Procedures)[2]	270	253	10,112	1,092	17,352	172
179	Post-Surgical States/Aftercare/Elective	197,108	187,430	8,332	41	17,563	211
180	Radiation Therapy[1]	5,756	5,057	11,141	285	20,247	182
180a	Radiation Therapy (Plus DME and Procedures)[2]	13,081	11,296	11,748	203	21,600	184
181	Chemotherapy[1]	6,513	5,415	17,644	346	25,434	144
181a	Chemotherapy (Plus DME and Procedures)[2]	15,900	13,765	15,976	199	23,327	146
182	Rehabilitation	30,658	29,051	10,631	120	20,444	192
183	Screening/Observation/Special Exams	816,790	783,518	6,063	17	14,608	241
184	History of Disease	137,541	130,297	7,979	47	17,059	214
185	Oxygen	25,796	22,579	18,532	171	25,646	138
186	CPAP/IPPB/Nebulizers	16,220	15,205	11,552	165	20,389	176
187	Patient Lifts, Power Operated Vehicles, Beds	22,694	19,878	19,793	186	26,230	133
188	Wheelchairs, Commodes	37,177	33,995	14,591	128	23,538	161
189	Walkers	17,101	15,927	11,431	161	20,382	178

NOTE:

[1] Based on diagnosis codes only

[2] Based on diagnosis, DME, and procedure codes.

[3] Based on procedures codes only

OUTPUT: D9pr03ab.out, D9pr03ab.ou2, and D9pr05c.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare Data.

Table 3-4

Descriptive Statistics by HCC, Medicare Concurrent Sample, 1997

HCC	HCC Label	Frequency	1997 Person-Years	1997 Medicare Payments: 1997 Mean Expenditures	Std Err of Mean	Standard Deviation	CV
	Overall sample	1,581,370	1,479,288	$5,157	$11	$13,535	262%
	No 1997 HCC in base concurrent model[1]	149,778	122,276	88	4	1,245	1,421
1	HIV/AIDS	2,742	2,419	13,471	531	26,140	194
2	Septicemia/Shock	28,706	22,864	42,164	301	45,549	108
3	Central Nervous System Infection	5,607	5,257	19,777	441	31,959	162
4	Tuberculosis	3,122	2,939	16,187	553	30,007	185
5	Opportunistic Infections	3,639	3,094	36,397	888	49,408	136
6	Other Infectious Diseases	250,000	240,084	9,114	34	16,531	181
7	Metastatic Cancer and Acute Leukemia	29,893	24,334	25,430	174	27,117	107
8	Lung, Upper Digestive Tract, and Other Severe Cancers	17,401	15,254	16,063	204	25,239	157
9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	21,171	19,821	11,257	145	20,448	182
10	Breast, Prostate, Colorectal and Other Cancers and Tumors	107,384	103,618	7,343	45	14,415	196
11	Other Respiratory and Heart Neoplasms	3,767	3,545	16,016	519	30,875	193
12	Other Digestive and Urinary Neoplasms	43,681	42,447	7,916	78	16,161	204
13	Other Neoplasms	89,544	87,488	5,279	40	11,746	223
14	Benign Neoplasms of Skin, Breast, Eye	123,276	120,614	3,428	25	8,592	251
15	Diabetes with Renal Manifestation	8,734	7,666	23,708	370	32,367	137
16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	36,049	34,289	15,030	127	23,584	157
17	Diabetes with Acute Complications	11,186	10,377	15,629	251	25,553	163
18	Diabetes with Ophthalmologic Manifestation	23,023	22,287	6,438	89	13,244	206
19	Diabetes with No or Unspecified Complications	174,014	164,379	7,688	43	17,280	225
20	Type I Diabetes Mellitus	81,361	76,083	14,596	90	24,931	171
21	Protein-Calorie Malnutrition	24,086	19,571	40,109	307	42,897	107
22	Other Significant Endocrine and Metabolic Disorders	18,586	17,219	16,447	210	27,612	168
23	Disorders of Fluid/Electrolyte/Acid-Base Balance	135,310	119,712	22,879	84	29,219	128
24	Other Endocrine/Metabolic/Nutritional Disorders	411,870	400,519	4,479	16	9,824	219
25	End-Stage Liver Disease	3,960	3,321	27,610	627	36,129	131
26	Cirrhosis of Liver	5,217	4,765	15,290	359	24,789	162
27	Chronic Hepatitis	2,068	1,962	12,105	539	23,858	197
28	Acute Liver Failure/Disease	1,732	1,539	22,291	850	33,340	150
29	Other Hepatitis and Liver Disease	16,860	15,833	14,021	197	24,745	176
30	Gallbladder and Biliary Tract Disorders	25,334	23,689	18,168	185	28,539	157
31	Intestinal Obstruction/Perforation	36,279	32,569	26,895	193	34,859	130

Table 3-4 (continued)

Descriptive Statistics by HCC, Medicare Concurrent Sample, 1997

HCC	HCC Label	Frequency	1997 Person-Years	1997 Medicare Payments: 1997 Mean Expenditures	Std Err of Mean	Standard Deviation	CV
32	Pancreatic Disease	12,918	12,003	20,062	271	29,715	148
33	Inflammatory Bowel Disease	8,489	8,136	12,079	264	23,857	198
34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	97,288	91,796	13,215	76	23,088	175
35	Appendicitis	1,779	1,668	21,501	684	27,919	130
36	Other Gastrointestinal Disorders	305,060	294,112	7,026	26	13,946	198
37	Bone/Joint/Muscle Infections/Necrosis	13,806	13,057	23,487	280	32,017	136
38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	59,368	57,194	8,876	71	16,968	191
39	Disorders of the Vertebrae and Spinal Discs	124,133	120,453	7,386	41	14,181	192
40	Osteoarthritis of Hip or Knee	83,405	81,387	8,967	54	15,291	171
41	Osteoporosis and Other Bone/Cartilage Disorders	125,990	121,628	9,503	49	17,255	182
42	Congenital/Developmental Skeletal and Connective Tissue Disorders	1,273	1,228	13,189	666	23,349	177
43	Other Musculoskeletal and Connective Tissue Disorders	406,642	390,108	6,061	23	14,282	236
44	Severe Hematological Disorders	12,410	10,921	25,156	322	33,614	134
45	Disorders of Immunity	10,856	9,800	23,843	320	31,708	133
46	Coagulation Defects and Other Specified Hematological Disorders	45,457	42,410	16,810	136	28,016	167
47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	160,404	150,098	14,939	60	23,212	155
48	Delirium and Encephalopathy	23,736	21,563	25,906	229	33,629	130
49	Dementia	101,138	92,347	15,573	78	23,571	151
50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	11,964	11,015	13,054	207	21,682	166
51	Drug/Alcohol Psychosis	6,438	6,020	23,107	356	27,623	120
52	Drug/Alcohol Dependence	10,090	9,464	15,844	246	23,923	151
53	Drug/Alcohol Abuse, Without Dependence	27,148	25,763	13,868	125	20,110	145
54	Schizophrenia	23,714	23,024	9,488	116	17,637	186
55	Major Depressive, Bipolar, and Paranoid Disorders	47,492	45,002	13,139	107	22,662	172
56	Reactive and Unspecified Psychosis	21,311	19,629	16,242	163	22,799	140
57	Personality Disorders	1,797	1,711	9,392	412	17,023	181
58	Depression	54,190	51,608	10,483	85	19,305	184
59	Anxiety Disorders	9,654	9,262	7,066	164	15,800	224
60	Other Psychiatric Disorders	45,802	43,929	8,756	89	18,741	214
61	Profound Mental Retardation/Developmental Disability	1,264	1,239	5,726	448	15,769	275
62	Severe Mental Retardation/Developmental Disability	1,063	1,036	6,147	519	16,693	272
63	Moderate Mental Retardation/Developmental Disability	1,147	1,135	5,699	361	12,169	214
64	Mild/Unspecified Mental Retardation/Developmental Disability	7,690	7,518	6,079	169	14,682	242
65	Other Developmental Disability	954	923	11,795	760	23,094	196

Table 3-4 (continued)

Descriptive Statistics by HCC, Medicare Concurrent Sample, 1997

HCC	HCC Label	Frequency	1997 Person-Years	1997 Medicare Payments: 1997 Mean Expenditures	Std Err of Mean	Standard Deviation	CV
66	Attention Deficit Disorder	585	557	11,005	1,123	26,503	241
67	Quadriplegia, Other Extensive Paralysis	3,419	3,162	25,109	665	37,394	149
68	Paraplegia	2,248	2,102	23,781	717	32,884	138
69	Spinal Cord Disorders/Injuries	12,692	12,006	17,327	239	26,145	151
70	Muscular Dystrophy	645	608	13,321	987	24,347	183
71	Polyneuropathy	37,889	36,195	14,816	131	24,913	168
72	Multiple Sclerosis	5,047	4,774	12,315	324	22,354	182
73	Parkinson's and Huntington's Diseases	23,915	22,407	12,621	138	20,639	164
74	Seizure Disorders and Convulsions	43,809	40,736	14,849	132	26,707	180
75	Coma, Brain Compression/Anoxic Damage	5,412	4,004	43,158	805	50,958	118
76	Mononeuropathy, Other Neurological Conditions/Injuries	66,844	64,947	6,992	55	13,892	199
77	Respirator Dependence/Tracheostomy Status	2,967	2,434	78,254	1,722	84,977	109
78	Respiratory Arrest	4,798	3,517	47,327	828	49,121	104
79	Cardio-Respiratory Failure and Shock	58,211	46,880	29,668	153	33,216	112
80	Congestive Heart Failure	211,354	193,089	16,634	59	25,892	156
81	Acute Myocardial Infarction	22,989	19,736	29,955	222	31,194	104
82	Unstable Angina and Other Acute Ischemic Heart Disease	57,131	54,428	17,291	101	23,533	136
83	Angina Pectoris/Old Myocardial Infarction	80,528	77,100	10,094	62	17,266	171
84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	193,521	183,788	8,314	40	17,225	207
85	Heart Infection/Inflammation, Except Rheumatic	7,394	6,681	29,569	498	40,741	138
86	Valvular and Rheumatic Heart Disease	126,723	119,787	14,671	67	23,200	158
87	Major Congenital Cardiac/Circulatory Defect	347	326	23,105	2,038	36,800	159
88	Other Congenital Heart/Circulatory Disease	5,343	5,061	13,785	332	23,638	171
89	Hypertensive Heart and Renal Disease or Encephalopathy	8,391	7,814	16,732	305	26,985	161
90	Hypertensive Heart Disease	52,516	51,034	6,064	54	12,286	203
91	Hypertension	502,208	485,207	4,564	15	10,508	230
92	Specified Heart Arrhythmias	157,703	146,126	15,513	67	25,496	164
93	Other Heart Rhythm and Conduction Disorders	86,174	82,179	10,969	66	18,860	172
94	Other and Unspecified Heart Disease	20,010	19,096	7,897	115	15,852	201
95	Cerebral Hemorrhage	10,321	8,980	26,716	360	34,107	128
96	Ischemic or Unspecified Stroke	76,424	70,399	17,412	96	25,438	146
97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	67,341	65,112	10,161	69	17,603	173
98	Cerebral Atherosclerosis and Aneurysm	8,334	7,788	12,361	240	21,172	171
99	Cerebrovascular Disease, Unspecified	5,494	5,198	9,939	267	19,217	193

Table 3-4 (continued)

Descriptive Statistics by HCC, Medicare Concurrent Sample, 1997

HCC	HCC Label	Frequency	1997 Person-Years	1997 Medicare Payments: 1997 Mean Expenditures	Std Err of Mean	Standard Deviation	CV
100	Hemiplegia/Hemiparesis	21,060	18,995	26,760	210	28,977	108
101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	4,106	3,914	12,297	355	22,193	180
102	Speech, Language, Cognitive, Perceptual Deficits	11,526	10,614	23,796	260	26,830	113
103	Cerebrovascular Disease Late Effects, Unspecified	21,642	19,970	15,252	160	22,636	148
104	Vascular Disease with Complications	34,454	31,094	27,118	199	35,094	129
105	Vascular Disease	156,198	148,272	11,987	53	20,385	170
106	Other Circulatory Disease	111,469	105,770	10,421	59	19,236	185
107	Cystic Fibrosis	474	457	8,159	1,899	40,606	498
108	Chronic Obstructive Pulmonary Disease	210,284	196,374	13,238	53	23,353	176
109	Fibrosis of Lung and Other Chronic Lung Disorders	28,870	26,407	17,875	176	28,637	160
110	Asthma	30,664	29,579	5,008	64	10,936	218
111	Aspiration and Specified Bacterial Pneumonias	22,228	17,690	41,338	345	45,849	111
112	Pneumococcal Pneumonia, Empyema, Lung Abscess	8,897	7,984	21,558	330	29,479	137
113	Viral and Unspecified Pneumonia, Pleurisy	105,040	95,436	16,797	80	24,654	147
114	Pleural Effusion/Pneumothorax	44,349	38,004	34,289	197	38,340	112
115	Other Lung Disorders	122,843	119,102	5,062	31	10,747	212
116	Legally Blind	4,568	4,268	16,031	335	21,857	136
117	Major Eye Infections/Inflammations	3,755	3,627	9,237	312	18,762	203
118	Retinal Detachment	6,793	6,630	7,030	161	13,104	186
119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	9,703	9,273	11,129	188	18,093	163
120	Diabetic and Other Vascular Retinopathies	52,254	50,729	8,305	71	15,951	192
121	Retinal Disorders, Except Detachment and Vascular Retinopathies	102,475	100,513	5,730	38	12,061	210
122	Glaucoma	148,872	145,034	5,568	32	12,273	220
123	Cataract	404,294	396,817	5,266	18	11,582	220
124	Other Eye Disorders	108,642	105,430	5,645	42	13,619	241
125	Significant Ear, Nose, and Throat Disorders	13,939	13,486	10,097	185	21,470	213
126	Hearing Loss	47,926	46,842	7,116	67	14,576	205
127	Other Ear, Nose, Throat, and Mouth Disorders	369,466	358,968	5,922	23	13,962	236
128	Kidney Transplant Status	1,648	1,421	14,258	769	28,991	203
129	End Stage Renal Disease	.	.	.	.	.	.
130	Dialysis Status	1,838	1,184	38,496	1,120	38,539	100
131	Renal Failure	37,471	31,497	27,845	218	38,727	139
132	Nephritis	4,250	3,996	15,540	372	23,508	151
133	Urinary Obstruction and Retention	71,928	68,233	14,272	88	22,862	160

Table 3-4 (continued)

Descriptive Statistics by HCC, Medicare Concurrent Sample, 1997

HCC	HCC Label	Frequency	1997 Person-Years	1997 Medicare Payments: 1997 Mean Expenditures	Std Err of Mean	Standard Deviation	CV
134	Incontinence	35,115	33,871	12,501	108	19,794	158
135	Urinary Tract Infection	195,875	185,024	13,182	53	22,978	174
136	Other Urinary Tract Disorders	91,074	87,088	11,336	64	18,816	166
137	Female Infertility	116	113	9,305	2,204	23,473	252
138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	32,968	32,100	7,464	84	15,095	202
139	Other Female Genital Disorders	122,498	119,438	4,808	33	11,469	239
140	Male Genital Disorders	161,082	156,472	6,350	36	14,142	223
141	Ectopic Pregnancy	38	37	4,909	1,006	6,115	125
142	Miscarriage/Abortion	138	134	5,697	892	10,325	181
143	Completed Pregnancy With Major Complications	112	108	12,960	1,697	17,600	136
144	Completed Pregnancy With Complications	304	292	7,554	829	14,159	187
145	Completed Pregnancy Without Complications (Normal Delivery)	101	98	4,073	618	6,129	150
146	Uncompleted Pregnancy With Complications	110	104	9,561	2,341	23,913	250
147	Uncompleted Pregnancy With No or Minor Complications	318	302	4,863	556	9,652	198
148	Decubitus Ulcer of Skin	23,859	20,733	30,313	259	37,309	123
149	Chronic Ulcer of Skin, Except Decubitus	28,554	27,324	10,444	106	17,568	168
150	Extensive Third-Degree Burns	70	59	59,748	9,451	72,694	122
151	Other Third-Degree and Extensive Burns	523	502	19,597	1,357	30,401	155
152	Cellulitis, Local Skin Infection	113,669	109,235	12,238	67	22,114	181
153	Other Dermatological Disorders	316,615	308,454	5,012	20	11,010	220
154	Severe Head Injury	442	335	39,591	2,674	48,936	124
155	Major Head Injury	16,905	15,897	17,584	205	25,906	147
156	Concussion or Unspecified Head Injury	2,216	2,127	12,970	456	21,037	162
157	Vertebral Fractures	17,329	16,330	15,805	168	21,454	136
158	Hip Fracture/Dislocation	30,592	28,358	21,986	140	23,554	107
159	Major Fracture, Except of Skull, Vertebrae, or Hip	24,142	23,101	13,325	138	20,936	157
160	Internal Injuries	4,756	4,374	26,169	539	35,639	136
161	Traumatic Amputation	2,856	2,619	37,344	756	38,673	104
162	Other Injuries	236,173	228,752	6,905	30	14,547	211
163	Poisonings and Allegic Reactions	61,648	58,973	13,005	90	21,770	167
164	Major Complications of Medical Care and Trauma	47,004	42,941	30,352	174	35,959	118
165	Other Complications of Medical Care	20,661	19,583	20,833	200	28,009	134
166	Major Symptoms, Abnormalities	605,426	572,501	10,668	26	19,545	183
167	Minor Symptoms, Signs, Findings	273,490	264,395	2,827	14	7,048	249

Table 3-4 (continued)

Descriptive Statistics by HCC, Medicare Concurrent Sample, 1997

HCC	HCC Label	Frequency	1997 Person-Years	1997 Medicare Payments: 1997 Mean Expenditures	Std Err of Mean	Standard Deviation	CV
168	Extremely Low Birthweight Neonates	8	8	9,264	5,074	14,352	155
169	Very Low Birthweight Neonates	2	2	577	467	661	115
170	Serious Perinatal Problem Affecting Newborn	2,688	2,508	22,787	707	35,400	155
171	Other Perinatal Problems Affecting Newborn	1,939	1,850	13,976	605	26,044	186
172	Normal, Single Birth	11	11	5,956	3,057	10,139	170
173	Major Organ Transplant	.	.	.	.	.	.
174	Major Organ Transplant Status	1,195	1,095	25,910	1,588	52,539	203
175	Other Organ Transplant/Replacement	3,706	3,556	13,749	484	28,850	210
176	Artificial Openings for Feeding or Elimination	11,485	10,155	36,393	408	41,150	113
177	Amputation Status, Lower Limb/Amputation Complications	3,053	2,731	32,469	672	35,090	108
178	Amputation Status, Upper Limb	197	183	22,601	2,002	27,108	120
179	Post-Surgical States/Aftercare/Elective	250,261	241,138	12,199	42	20,408	167
180	Radiation Therapy	7,198	6,520	18,037	286	23,070	128
181	Chemotherapy	9,930	8,851	25,538	288	27,131	106
182	Rehabilitation	36,718	35,251	22,152	149	27,987	126
183	Screening/Observation/Special Exams	840,883	816,736	6,262	16	14,170	226
184	History of Disease	173,447	165,637	11,562	47	19,179	166
185	Oxygen	.	.	.	.	.	.
186	CPAP/IPPB/Nebulizers	.	.	.	.	.	.
187	Patient Lifts, Power Operated Vehicles, Beds	.	.	.	.	.	.
188	Wheelchairs, Commodes	.	.	.	.	.	.
189	Walkers	.	.	.	.	.	.

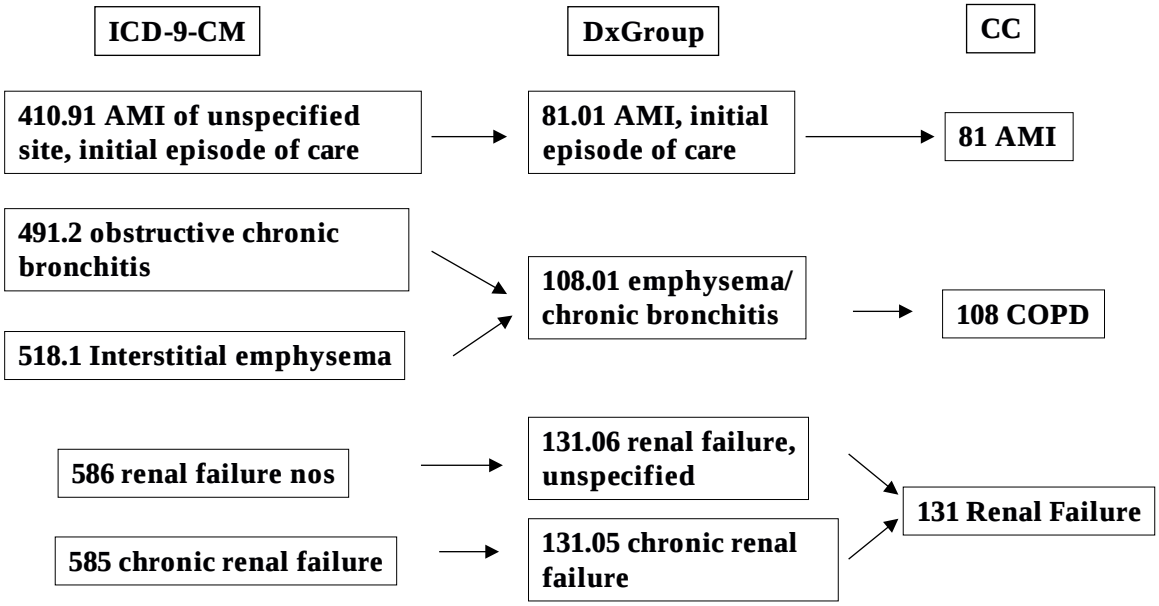
[1] Model 4 of Table 7-1.

OUTPUT: D9cn03b.out and D9cn03m.out.

SOURCE: Health Economics Research, Inc. analysis of 1996/1997 Medicare data.

Table 3-5

Clinical Vignette for DCG/HCC Classification
79 Year Old Woman with AMI, COPD, and Renal Insufficiency



SOURCE: Health Economics Research, Inc.

Table 3-6

Neoplasm Hierarchy

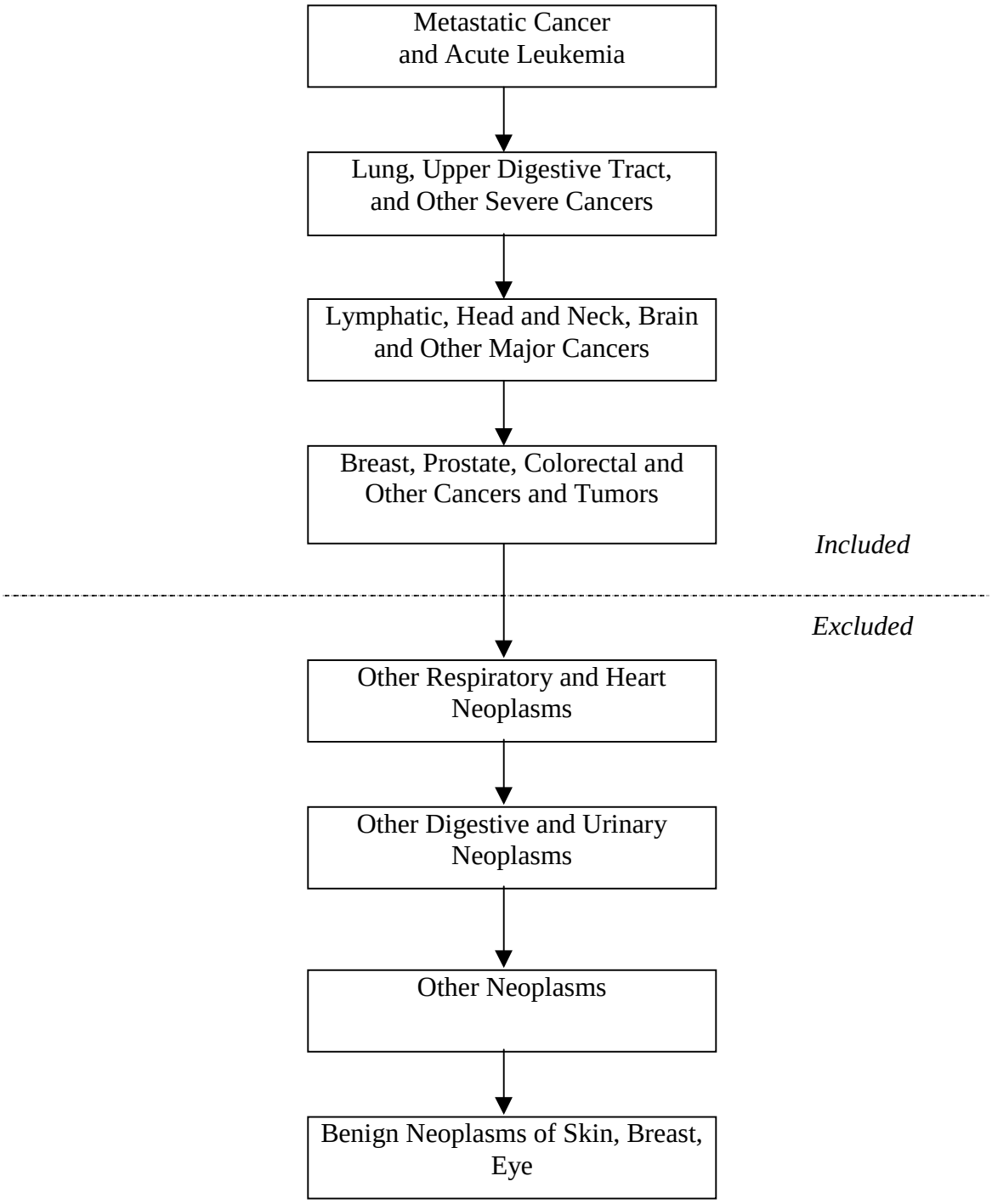
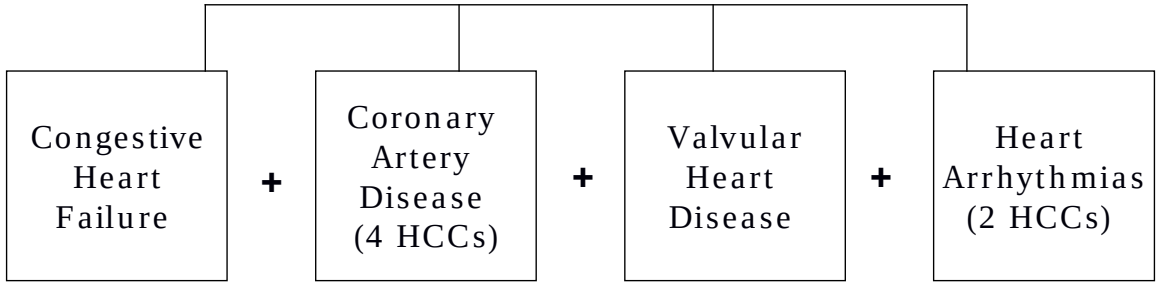


Table 3-7

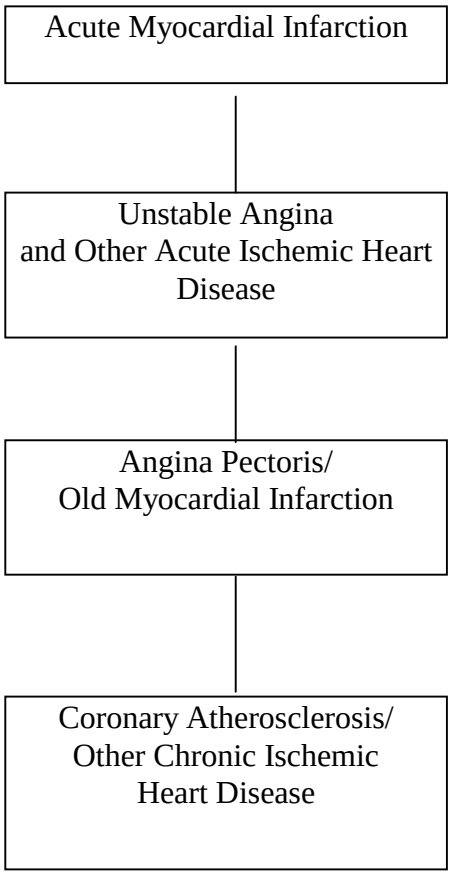
Selected Heart Disease HCCs



SOURCE: Health Economics Research, Inc.

Table 3-8

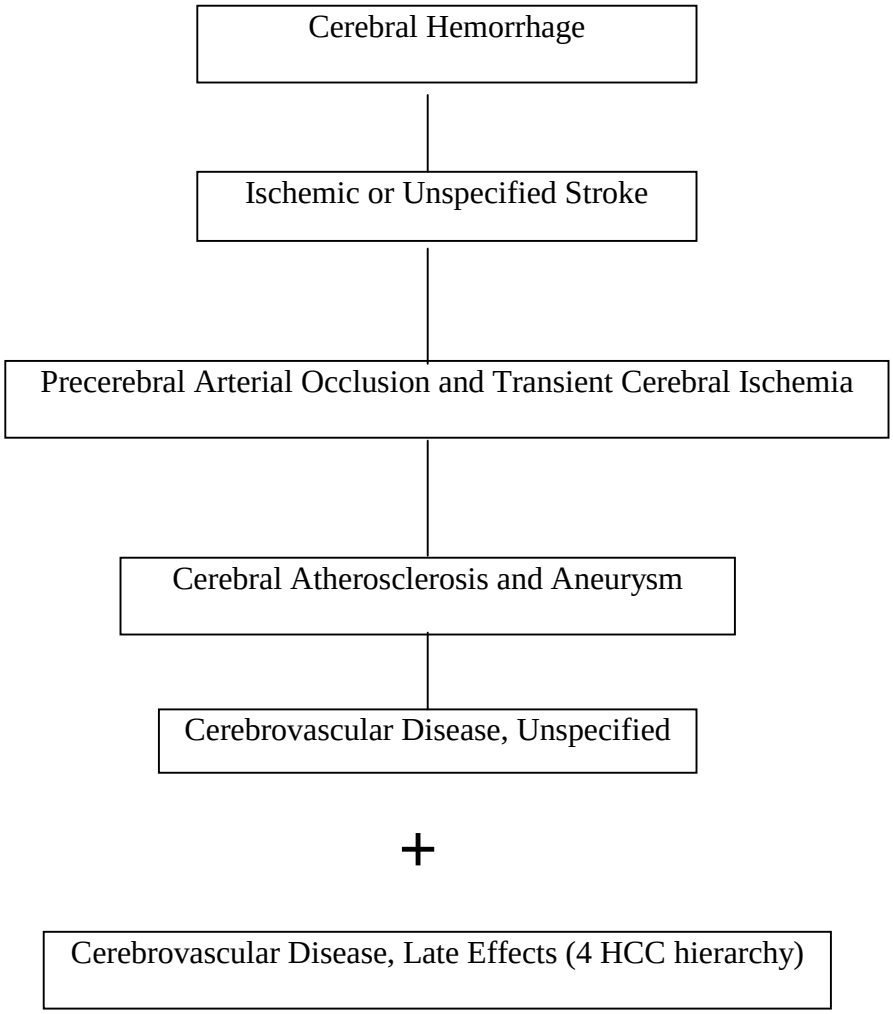
Coronary Heart Disease HCCs



SOURCE: Health Economics Research, Inc.

Table 3-9

Cerebrovascular Disease HCCs



SOURCE: Health Economics Research, Inc.

Table 3-10

Mental Illness HCCs

Cognitive Disorders (3 HCCs)

+

Drug/Alcohol Abuse (3 HCC Hierarchy)

+

Psychiatric Disorders (7 HCCs)

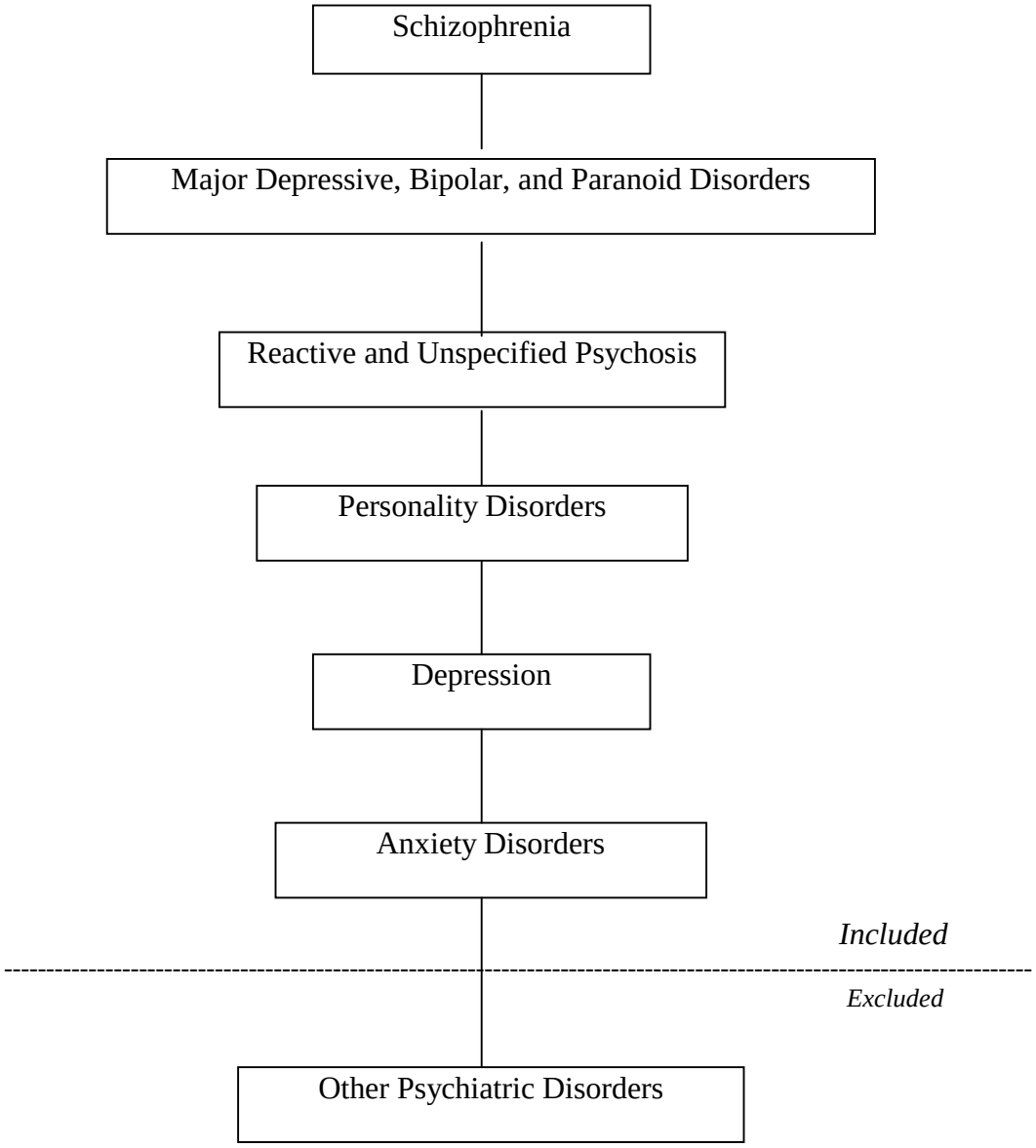
+

Mental Retardation/Developmental Delay (6 HCC hierarchy)

SOURCE: Health Economics Research, Inc.

Table 3-11

Psychiatric HCCs



SOURCE: Health Economics Research, Inc.

4

Diagnosis-Based Risk Adjustment Models

In this chapter, we use the Medicare 1996/1997 5 percent sample analytic data described in Chapter 2 to estimate, develop, refine, and evaluate DCG/HCC prospective diagnosis-based risk adjustment models. A series of regression models are fit to the data, modified to enhance clinical credibility, and examined for their performance as risk adjustment models. We calculate measures of predictive accuracy of models at the individual level and for significant subgroups of Medicare beneficiaries.

We first fit a simple age/sex model to serve as a baseline. Then we add two additional demographic markers (presence of a state Medicaid "buy-in" and "originally-disabled") and dummy markers for each Hierarchical Condition Category (HCC) diagnostic category. We next examine different payment weights for Medicare beneficiaries currently entitled by disability, and exclude discretionary diagnoses and constrain certain coefficients to preserve monotonicity (see Chapter 3). Then we examine interactions among diagnostic categories and select a few for inclusion in our base model. Once the base model is established, its predictive accuracy is evaluated for a set of subgroups of the Medicare population. Finally, the Medicaid and originally disabled demographic factors are calibrated by age/sex category for the base model, and a payment multiplier for the "working aged" Medicare subpopulation is calibrated.

4.1 Age/Sex Model

In every prospective model, regression is used to predict total 1997 Medicare expenditures from a set of predictors that include 24 age/sex cells. We first estimated the model with only these age and sex predictors (Table 4-1). Consistent with previous research, the age/sex model explains about 1 percent of variation in Medicare expenditures among individual enrollees (e.g., Ellis *et al*., 1996). Nevertheless, mean expenditures differ substantially by age/sex cell, ranging from $3,292 for 0-34 year old males to $9,262 for 89-94 year old males. Medicare expenditures rise with age, with two exceptions. The oldest of the under-age-65 people who are entitled to Medicare because of disability are more expensive than the 65-69 year-olds (the vast majority of whom are not disabled). Also, expenditures peak for both males and females at age 89-94. Among beneficiaries entitled by disability (those under age 65), expenditures are greater for females than males. But elderly male Medicare beneficiaries are more expensive than equally old females.

4.2 Adding Diagnoses

In Model 1 of Table 4-2, we add HCC diagnostic categories to the age/sex model[1]. Beneficiaries are marked for having any number of distinct medical problems (HCCs) on the basis of their 1996 diagnoses. We also include markers for two new demographic factors: 1996 Medicaid enrollment and originally-disabled status.

[1] HCCs 185-189 and 173 are based on DME and procedures, respectively, and are not considered until Chapter 6.

This model explains fully 11.54 percent of the variation in 1997 expenditures. Not surprisingly, the age/sex coefficients in this model are lower than in the age/sex model because they now represent the costs of people with no serious diagnosed medical problems in the previous year. Medicaid and originally-disabled markers have substantial coefficients of $810 and $1,261, respectively.

Most diagnostic categories (HCCs) have coefficients that are either positive or essentially zero. But a few diagnoses have coefficients that are significantly negative. The reasons for significant negative coefficients are not clear, but could range from substitution of Medicaid services for Medicare (e.g., mental retardation?), underservice (e.g., mental retardation?), correlation of certain diagnoses with age and either unmeasured better health among younger age groups or less intensive treatment of older age groups (e.g., appendicitis? genital disorders? cataract? hearing loss?), to possible use of certain "diagnoses" coded during visits with essentially well patients (e.g., high cholesterol?, which is included in HCC 24 Other Endocrine/Metabolic/Nutritional Disorders). As discussed below, we chose to exclude all variables with negative coefficients.

4.3 Adding “Disabled” Interactions

Approximately 12 percent of Medicare beneficiaries are entitled to Medicare because they are under 65 years of age and have a medical condition that prevents them from working (these are the “disabled”). At age 65, these beneficiaries become entitled to Medicare because of age (and we designate them as “aged” and “originally disabled”).

Clinically, it is plausible that the nature and severity of some diagnoses might differ between the disabled and the elderly. For example, a diagnosis that is a disabling condition may be more severe. The accuracy of prediction and clinical validity of a risk adjustment model may be improved by allowing some differences between the disabled and aged. Thus, we considered allowing coefficient differences for some diagnoses (HCCs) for the Medicare subpopulation entitled by disability.

Ideally we would calibrate the model separately on aged and disabled subsamples. But the subsample of beneficiaries entitled by disability in our 5 percent sample was not large enough to permit this, and we leave completely separate calibration for future work. However, we can obtain information about disabled/elderly parameter differences by estimating the model by subpopulation with the sample we do have, and comparing coefficients.

In Table 4-3, we present the results of a comparison of HCC coefficients estimated separately on aged and disabled subpopulations using our 5 percent sample. Table 4-3a shows aged and disabled sample sizes by HCC. We evaluated coefficient differences for inclusion in the prospective DCG/HCC risk adjustment model. The criteria we used to evaluate differences were:

- magnitude of difference;
- statistical significance of difference;
- clinical plausibility/significance of difference;
- number of aged and disabled beneficiaries involved in the comparison; and
- inclusion of the diagnostic category (HCC) in the prospective payment model.

Because we are making multiple comparisons, and because of the possibility of overfitting due to expenditure outliers, we focussed on differences with a t-statistic of more than 4. Among these differences, we included those that have the most clinical plausibility and significance. In addition, we included several differences with smaller t-statistics because of other considerations discussed below. We also consulted our previous analysis of aged/disabled differences with the 1991/1992 database (Pope *et al*., 1998) for validation of differences.

The 9 aged/disabled differences we included in the model are shown in Table 4-4. Table 4-3 shows a large and statistically significant coefficient difference for HCC 1, HIV/AIDS. Moreover, this was a difference included in our previous DCG/HCC model (Pope *et al*., 1998). But the negative aged parameter estimate (which is insignificantly different from zero) is implausible. Therefore, we chose to not allow an aged/disabled difference for HIV/AIDS, but instead to allow one for HCC 5, Opportunistic Infections, which frequently occur among HIV/AIDS patients. Several large and statistically significant differences exist for HCCs not included in the payment model, such as for HCC 23 Disorders of Fluid/Electrolyte/Acid-Base Balance (Table 4-3). But we did not allow coefficient differences for the disabled because these diagnoses are not included in our payment model (see Chapter 3 for discussion of why certain diagnoses are excluded from payment models).

We included aged/disabled differences for all three HCCs in the "hematological" hierarchy included in the payment model, HCCs 44, 45, and 46. The aged/disabled difference is particularly pronounced for HCC 44 Severe Hematological Disorders, which

includes hemophilia and sickle cell anemia. The aged/disabled differences are less pronounced for the other two hematological HCCs, especially HCC 45 Disorders of Immunity, but allowing differences for all three HCCs accurately captures expenditure differences among these related HCCs for both aged and disabled populations. Differences in costs for hematological disorders were also allowed in our previous analysis of the 1991/1992 dataset (Pope *et al*., 1998).

In the mental health area, aged/disabled differences were allowed for substance abuse (both psychoses and dependence) and for Schizophrenia. These differences were also allowed in our previous DCG/HCC model (Pope *et al*., 1998). However, Major Depressive, Bipolar, and Paranoid Disorders (HCC 55) have lower estimated incremental costs among the disabled than the elderly. No difference was permitted here because of concerns about clinical plausibility.

The two additional aged/disabled differences that we incorporated are for multiple sclerosis (HCC 72) and cystic fibrosis (HCC 107). The cystic fibrosis difference has a t-statistic of less than 4, and sample sizes are quite small. However, this difference is large and clinically plausible, because the most severe cystic fibrosis cases are not expected to survive until age 65. Validation of this difference in additional datasets is desirable.

When added to the regression model, the 9 disabled interaction terms increase the percentage of expenditure variation explained only slightly (11.54% and 11.57% are the R-squares for Models 1 and 2 in Table 4-2, respectively). This is partly because the disabled comprise only a small proportion (around 12 percent) of the Medicare population. But the coefficient estimates of the disabled interactions are substantial and

statistically significant, ranging from $1,390 for schizophrenia to $6,079 for cystic fibrosis. Table 4-4 shows that the incremental payments for these 9 conditions are substantially different for the aged and disabled[2]. We conclude that although predictive power is raised only slightly, these selected interactions should be included in the model to improve its payment accuracy and face validity for important subgroups of disabled Medicare beneficiaries.

4.4 Exclusions and Constraints

The next step in our analysis was to impose diagnostic exclusions and constraints on estimated coefficients. This is reflected in Model 3 of Table 4-2. As discussed in Chapter 3, discretionary diagnoses, as determined by clinical judgment, are excluded from prospective payment models. We excluded any remaining diagnoses with negative coefficient estimates because we do not want to penalize health plans for recording diagnoses (the principle of monotonicity—see Chapter 3).

Also to satisfy monotonicity, in cases where diagnostic hierarchies are violated, we constrained coefficients. A diagnostic hierarchy is "violated" when the estimated coefficient a higher-ranked condition (HCC) is smaller than the estimated coefficient of a lower-ranked HCC in the same hierarchy. In these cases, the coefficients of the higher- and lower-ranked HCCs are constrained to be the same. In Table 4-2, these constraints are indicated by vertical bars. For example, in Model 2, the coefficient of HCC 26

[2] The incremental payments in Table 4-4 are derived from the coefficients of the "base" model, Model 5 in Table 4-2. The base model is discussed below in Section 4.6.

Cirrhosis of Liver, $1,831, is smaller than the coefficient of HCC 27 Chronic Hepatitis, $1,837. But HCC 26 is higher-ranked than HCC 27 in the "liver" hierarchy. Therefore, in Model 3, the coefficients of HCCs 26 and 27 are constrained to be equal. The estimated constrained coefficient of $2,035 for this pair is a modest increase over the two coefficients separately, and reflects the exclusion of many other diagnoses (HCCs) from Model 3.

Altogether, the exclusions and constraints reduce the number of model parameters from 217 in Model 2 to 122 in Model 3 (Table 4-2). This represents a reduction of 44 percent in the number of parameters. Nevertheless, the percentage of individual expenditure variation explained (R-Square) falls only from 11.57 percent to 11.10 percent. Although excluding discretionary diagnoses and imposing constraints does sacrifice predictive power, the loss is relatively limited. We believe that this is a tradeoff worth making, that is, sacrificing a limited amount of predictive ability to improve model incentives and fairness as a payment system.

4.5 Adding Diagnosis Interactions

As discussed in Chapter 3, the DCG/HCC model captures the combined effect of multiple unrelated conditions by accumulating the sum of their individual effects. For example, the model postulates that the combined incremental costs of diabetes and congestive heart failure is the sum of the incremental cost of diabetes alone, and of the incremental cost of congestive heart failure alone. The assumption of additivity is empirically testable. The combined effect of multiple diagnoses need not equal the sum

of their individual effects. If the additivity assumption does not hold for a particular combination of diseases, the predictive accuracy and clinical face validity of the risk adjustment model can be improved by incorporating these nonlinearities.

We implement the empirical test of the additivity assumption through the use of "interaction terms" in the multiple regression analysis. Interaction terms allow the combined effect of multiple diagnoses to differ from their individual effects. If the combined effect is greater than the sum of the individual effects, the interaction term will be positive. If the combined effect is less than the sum of the individual effects, the interaction term will be negative. Operationally, to test an interaction between diabetes and congestive heart failure for example, individual variables for the two conditions separately continue to be included in the model, but an interaction term identifying beneficiaries diagnosed with both conditions is also included.

The number of possible interaction terms among all HCCs is extremely large. It is not possible to empirically test all two-way interactions, let alone higher-order interactions. Moreover, the frequency of many interactions is so low that it would not be feasible to test all possible interactions. Thus, we maintain the assumption that most interaction terms are zero, and focus our tests for interaction effects on a small number of common, high-cost conditions. We identified 6 high-cost chronic conditions that are commonly diagnosed in the Medicare population, and that our clinical panel expected might exhibit nonzero interactions. They are:

1. diabetes (HCCs 15-20);
2. congestive heart failure (HCC 80);

3. coronary artery disease (HCCs 81-84);
4. cerebrovascular disease (HCCs 95-103);
5. vascular disease (HCCs 104-105); and
6. chronic obstructive pulmonary disease (HCC 108).

Note that several of these conditions encompass multiple HCCs; in these cases any beneficiary classified into any one of the HCCs is classified as having the condition.

We began by examining all 57 2-, 3-, 4-, 5-, and 6-way interactions among these 6 conditions. We found that none of the 4-, 5-, and 6-way interactions were significant enough to include in the DCG/HCC model. Therefore, we focussed on the 35 2- and 3-way interactions among the 6 conditions. In addition, we examined the 3 2- and 3-way interactions of diabetes and congestive heart failure with renal failure (HCC 131), for a total of 38 interactions. (We examined only limited renal failure interactions because it has a relatively small sample size.)

Descriptive statistics for the 38 diagnosis interactions we examined are shown in Table 4-5. The diagnosis combinations that occur most frequently involve coronary artery disease, which is itself very frequent in the Medicare population. The most frequent combination is coronary artery disease and congestive heart failure, which occurs in 95,980 beneficiaries, or about 7 percent of the sample of 1.4 million. Many of the 2-way interactions occur in 30,000 to 70,000 sample beneficiaries. Three-way interactions are less frequent, occurring in 10,000 to 30,000 sample beneficiaries. The combination of diabetes, congestive heart failure, and renal failure occurs in only 5,210 beneficiaries. Expenditures are higher with the presence of more comorbid conditions.

For example, the 47,995 beneficiaries diagnosed with diabetes and congestive heart failure in 1996 have mean 1997 expenditures of $15,962, but the 15,204 of these beneficiaries also diagnosed with chronic obstructive pulmonary disease have average expenditures of $20,322.

In Model 4 of Table 4-2, we add all 38 diagnosis interaction terms to Model 3 of that table. Strikingly, the percentage of expenditure variation explained (R-square) increases barely at all, from 11.10 percent to 11.16 percent. Allowing the combined effect of conditions to differ from the sum of their individual effects improves predictive power only slightly. To be sure, we examined only a few of the many possible diagnosis interactions among our HCCs. But the interactions we studied are among the most frequent and high cost Medicare conditions. We find it implausible that the interactions we did not analyze would add substantially more predictive power than the ones we did analyze. We conclude that our maintained assumption of additivity, at least from the perspective of predictive power, is well-supported empirically. Purely from the perspective of predictive power, there is little reason to add any interaction terms to the model.

However, some of the estimated coefficients of the interaction terms are substantial in magnitude and statistically significant (see Model 4 of Table 4-2). This suggests that adding certain diagnosis interaction terms to the model will improve its predictive accuracy for important subgroups and clinical face validity. We evaluated diagnosis interactions for inclusion in the model using three criteria:

- magnitude of interaction;

- statistical significance of interaction; and
- clinical plausibility/significance of interaction.

Because we are making multiple comparisons, and to guard against overfitting, we focussed on interaction terms with t-statistics of 4 or greater. Among the 38 interactions, 6 have t statistics of 4 or more. We chose to include all 6 in our base payment model.

The 6 included diagnosis interactions are summarized in Table 4-6. Although this need not be true, all 6 interactions are positive, that is, the combined effect of the multiple diagnoses exceeds the sum of their individual effects. The largest interaction effects are among congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD), and among diabetes, CHF, and renal failure.

4.6 Base Payment Model

Model 5 of Table 4-2 is our base prospective risk adjustment payment model. It incorporates the following elements:

- 24 age/sex cells;
- prior year Medicaid enrollment;
- originally disabled status;
- 101 HCC diagnostic categories;
- 12 coefficient constraints involving 27 diagnostic categories (HCCs);
- 9 diagnosis payment differences for beneficiaries currently entitled by disability; and
- 6 payment differences for combinations of diagnoses.

Our base model does not include any procedure or durable medical equipment (DME) codes. It is defined from demographic information available in Medicare enrollment files and ICD-9-CM diagnosis codes only.

In the remainder of this report, we use Model 5 of Table 4-2 as our baseline against which alternative models are compared and evaluated. We note that the R-square of our base model is 11.15 percent. This is the R-square on the estimation sample. Previous experience (Ellis *et al*., 1996; Pope *et al*., 1998) indicates that the R-square will be roughly 10 percent lower in a validation sample, so a validation R-square of approximately 10 percent or slightly higher may be expected. We also remind the reader that all R-squares in this report are estimated using 1996/1997 Medicare fee-for-service data; they may differ when other years of data or populations are analyzed. In particular, the predictive accuracy of these models for the Medicare managed care population is unknown.

4.7 Accuracy of Base Model for Medicare Subgroups

It is desirable to evaluate the predictive accuracy of risk adjustment models for the mean expenditures of important subgroups of populations, as well the percentage of individual expenditure variation predicted. Health plans may select enrollees based on observable characteristics of subgroups, or have disproportionately few or many of certain subgroups of beneficiaries based on their characteristics (e.g., provider networks or geographic locations). For these reasons, it is important to predict accurately for

subgroups to ensure their access to care and fairness in payment to the health plans enrolling them.

4.7.1 Definition of Validation Groups

We defined a large number of subgroups of the Medicare population to use in measuring the accuracy of our risk adjustment models. They are shown, together with descriptive statistics for them, in Table 4-7. The "validation groups" are divided into demographic groups, groups diagnosed with certain conditions, groups diagnosed with certain combinations of conditions, groups with certain ranges or types of prior year (1996) or prediction year (1997) expenditures, groups utilizing certain types of durable medical equipment (DME) in the base year (1996), and groups with certain numbers of hospital admissions in the base (1996) or prediction (1997) years.

Many of these Medicare subgroups have been used in our previous work (Ellis *et al*., 1996; Pope *et al*., 1998). Innovations for this project are in the definition of groups with multiple diagnoses, with home health or DME expenditures, and with DME utilization. Adding groups with combinations of diagnoses aids in evaluating the predictive accuracy of alternative models for beneficiaries with multiple diagnoses. Beneficiaries with high home health or DME expenditures or utilization are more likely to be functionally impaired. Adding these groups allows a partial evaluation of how well models predict expenditures for functionally impaired beneficiaries, without using survey data such as the Medicare Current Beneficiary Survey.

The diagnosis-based validation groups were assigned using diagnoses from hospitals, physicians, clinically-trained nonphysicians, and facility types including home health agencies, ambulatory surgery centers, skilled nursing facilities, and hospice (Source=1-6, see Chapter 2). This differs from the diagnoses used to calibrate our risk adjustment models in this chapter, which consist of hospital, physician, and clinically-trained nonphysician diagnoses only (Source=1-5). We defined the validation groups including the additional facility diagnoses to make the prediction of expenditures for these groups more challenging. It is not surprising that our risk adjustment models predict expenditures almost exactly for validation groups defined using the same sources of diagnoses because most of the diagnoses are explicitly included in the risk adjustment models. Evaluating model performance for groups defined using additional sources of diagnoses is more informative. Chapter 5 contains a thorough evaluation of the sensitivity and accuracy of our models calibrated using different diagnosis sources.

4.7.2 Measuring Predictive Accuracy for Groups

For this project, we did not divide our sample into an "estimation sample" and a "validation sample". Instead, we chose to use our entire 5 percent sample for model development and estimation. This was done because we needed the largest possible sample sizes to estimate the expenditures of rare diseases, and to analyze disabled and diagnostic interaction terms. We also use the entire 5 percent sample for validation. Because we validate on the same sample as we estimated on, our results are likely to slightly overstate the true predictive accuracy of our models. Previous experience

indicates that this model "overfitting" is present with the sample sizes and number of model parameters that we employ, but not very large (e.g., on the order of 10 percent with R-square—see Ellis *et al*., 1996, Pope *et al*., 1998, and Pope *et al*., 1999). However, in this project we estimate models with larger numbers of parameters than previously because of the additional clinical detail of our classification system (more HCCs), and because of our added disabled and diagnosis interaction terms. Overfitting becomes more of a concern as the number of categories with smaller sample sizes rises. Nevertheless, we believe that the "validation" results presented in this report represent an accurate, albeit slightly overstated, indication of the predictive accuracy of our models.

Percentage of individual expenditure variation predicted is measured by the R-square statistic, while predictive accuracy for groups is measured by the "predictive ratio". The predictive ratio is the ratio of mean predicted expenditures to mean actual expenditures. A predictive ratio of 1.00 indicates precisely accurate prediction; a ratio less than 1.00 indicates underprediction; and a ratio of more than 1.00 indicates overprediction.

4.7.3 Results

Table 4-8 shows predictive ratios for three risk adjustment models:

- age/sex, based on Table 4-1.
- the "all HCC model", based on Model 1 of Table 4-2. It includes age, sex, prior year Medicaid enrollment, originally disabled status, and all HCC diagnostic categories.
- the base DCG/HCC model, Model 5 of Table 4-2, which includes the elements discussed in Section 4.6 above.

As expected, all three models predict exactly for all enrollees, aged/disabled, and the age/sex cells. It is a property of the multiple linear regression technique used to estimate the models that it predicts the mean of the dependent variable (1997 expenditures) accurately. Age/sex cells are included in the models, and thus they are also predicted accurately. Aged versus disabled current entitlement status is defined exactly by age under 65 versus 65 and over. Given the age cells included in the models, the difference in mean expenditures by entitlement status is also predicted exactly. Medicaid and originally disabled are substantially underpredicted in the age/sex model, but predicted exactly in the other two models, where they are included variables. Race, on the other hand, is not included in any of the models, and mean expenditures for blacks are slightly overpredicted.

Mean expenditures for beneficiaries diagnosed with certain illnesses are severely underpredicted by the age/sex model. But the all HCC and base HCC models, which adjust for diagnoses, predict most quite accurately. Some of the slight underprediction is due to the definition of the validation groups including non-hospital facility diagnoses (e.g., home health agency) whereas the HCC models were calibrated excluding these diagnoses (see Section 4.7.1 above). A few diagnoses are predicted relatively less accurately by the HCC models, although still much better than the age/sex model. These include depression (underpredicted), breast cancer (overpredicted), and lung/pancreas cancer (underpredicted). Arthritis is predicted well by the all HCC model, but less accurately by the base HCC model. This is because arthritis is one of the "discretionary" diagnoses excluded from the base model (see Chapter 3).

The HCC models also predict the mean expenditures of beneficiaries with combinations of diagnoses much more accurately than the age/sex model. The all HCC model (which does not include any special adjustments for multiple diagnoses) predicts quite credibly for combinations of the diagnoses. But the base HCC model, which incorporates diagnostic "interaction" terms (see Section 4.5), predicts even more accurately. For example, the all HCC model underpredicts the mean expenditures of beneficiaries with diabetes, heart failure, and renal failure by 12 percent, while the base HCC model underpredicts by only 2 percent.

Among prior year expenditure quintiles, the all HCC model predicts more accurately than the base HCC model. This is the price that is paid for excluding discretionary diagnoses in the base HCC model. Note that the biggest differences in accuracy of prediction are at the low expenditure end, which is more associated with discretionary diagnoses. Among the top 1 percent of prior year expenditures, the base HCC model does as well as the all HCC model, because these beneficiaries are presumably suffering from very serious, life threatening illnesses that are included in both models.

When percentiles of 1997 expenditures of all types (total, home health or DME) are used all models predict poorly. This is consistent with the finding that 90% of all variation in spending the following year is inherently random and unpredictable. What matters most for risk adjustment models is their ability to match payments to expected costs, not actual costs. For further discussion, see Ellis *et al*., 1996b and Pope *et al*., 1998c.

Only 10 percent of prospective sample beneficiaries utilize any prior year (1996) home health services (Table 4-7). But those with any spending are on average very expensive in the following year (1997). Mean 1997 total expenditures for the entire prospective sample are $5,314, but $15,359 (nearly three times as much) for 1996 home health utilizers (Table 4-7). Mean 1997 total expenditures for beneficiaries with prior year home health spending are underpredicted by about 60 percent by the age/sex model (Table 4-8). The HCC models reduce this substantially, but there is still about a 25 percent underprediction of total expenditures, on average. The extent of total expenditure underprediction increases with greater prior year home health spending (Table 4-8). The HCC models predict mean total expenditures accurately for beneficiaries in the first and second quintiles of prior year home health expenditures, but predict only about a third of mean total expenditures for those beneficiaries with the highest prior year home health expenditures.

About 16 percent of the prospective sample has nonzero prior year DME utilization (Table 4-7). As is true of home health utilizers, total expenditures for DME utilizers are well above average, $11,356 in 1997 versus $5,314 for the entire sample (Table 4-7). The HCC models also underpredict mean total expenditures for DME utilizers (Table 4-8). Similar to home health utilization, the underprediction is greater for beneficiaries with higher prior year DME utilization. Overall, however, the underprediction of total expenditures is not as large as it is with home health utilizers: 18 percent on average for DME utilizers versus 25 percent for home health utilizers in the base HCC model. Expenditures are also underpredicted for beneficiaries utilizing

particular types of DME in the base year—oxygen, wheelchairs, and walkers—although the diagnosis-based HCC models do considerably better than the age/sex model.

Home health and DME utilizers are subsets of beneficiaries whose following year total expenditures are substantially underpredicted by diagnosis-based models. This is perhaps not surprising. Home health and DME utilization is presumably related to poor functional status, and it has previously been shown that diagnosis-based models underpredict expenditures for the functionally impaired (Pope *et al*., 1998). A diagnosis of multiple sclerosis, for example, does not distinguish between those who are only mildly affected by the disease, and those who are highly impaired by it. We will investigate in Chapters 5 and 6 of this report whether the HCC model's underprediction can be reduced by including diagnoses from home health claims in assigning diagnostic categories (Chapter 5), or including utilization of DME as a risk adjuster (Chapter 6).

Hospital admissions groups were the last set of validation groups we examined. Table 4-8 shows that the HCC models predict accurately across groups of beneficiaries defined by number of prior year admissions, except for an underprediction for those with 3 or more admissions.

4.8 Calibration of Medicaid and Originally Disabled Factors by Age/Sex Category

The effects of prior year Medicaid enrollment and originally disabled status on expenditures may vary across the 24 age/sex cells. In other models estimated for this report, for simplicity we include only a single Medicaid and a single originally disabled

factor, independent of age and sex. The purpose of this section is to investigate differences in these effects by age and sex in the base model, Model 5 of Table 4-2.

Table 4-9 presents estimates of the base HCC model with Medicaid and originally disabled interacted with each of the 24 age/sex cells[3]. In addition, the number of observations in each interacted category is listed. Some instabilities in the coefficient estimates occur because of small sample sizes. The sample sizes are useful should actuarial smoothing of the demographic coefficient estimates be undertaken (as was done for the PIP-DCG model, see Pope *et al*., 1999).

The effect of Medicaid is smaller among the youngest and oldest Medicare age groups. The effect of originally disabled may also decline among the oldest age groups, although there are virtually no sample beneficiaries originally entitled by disability age 89 or older. Differences in the effects of Medicaid and originally disabled by sex are not pronounced, but there appears to be some tendency for their impacts to be higher among women in many age ranges.

Allowing the effect of Medicaid to vary by age results in more plausible coefficient estimates for some of the age/sex cell coefficients. For example, in the base model (Model 5 of Table 4-2), the parameter estimate for "male, 0-34" is only $211. This is a very low estimate of the annual medical expenditures of beneficiaries in this cell, albeit it would only apply to beneficiaries without any diagnoses included in the

[3] Beneficiaries originally entitled by disability who turn 65 in 1997 will receive fractional values for both the age cell 65-69, and for the original disability status variable. The interaction between these two variables would result in a squared fraction which is less preferred than using the fraction without squaring. For this model we have avoided this problem by setting the originally disabled variable equal to 1 for these beneficiaries.

base model, and not Medicaid-enrolled. When the effect of Medicaid is estimated specifically for this cell, the age-sex coefficient rises to $681, a more plausible value (Table 4-9). When the single estimated Medicaid impact of $927 is applied to all age ranges (Table 4-2), the age/sex coefficient for male 0-34 is forced to an implausibly low value. When the more accurate Medicaid effect of $260 is estimated for this age/sex cell (Table 4-9), the age/sex coefficient assumes a more reasonable value.

4.9 Calibration of a Working Aged Multiplier

Working aged refers to aged Medicare beneficiaries (age 65 years or more) with private group health insurance coverage from their or their spouse's employer. Medicare expenses are much less for the working aged than the non-working aged because, by law, their private group health insurance is the primary payer for their medical care. For this reason, working aged beneficiaries were excluded from the prospective sample used to estimate and validate models (see Chapter 2).

To predict payments for the working aged, we use a "second stage" multiplier (see Pope *et al*., 1999, Chapter 6 for more discussion). Expenditures are first predicted using the base prospective payment model (Model 5 of Table 4-2). Predicted expenditures are then multiplied by a fraction to adjust them downwards for working aged status. This fraction is applied to predicted payments for any months a beneficiary is in working aged status in the prediction year (1997 in our sample).

Table 4-10 shows mean actual and predicted 1997 expenditures by age and sex for the working aged sample. Overall, actual expenditures for the working aged are about

29 percent of expenditures predicted by the base model. The expenditure ratio is higher for females than males, and tends to increase with age. But variations in the expenditure ratio by age and sex are relatively limited, suggesting that a single multiplier for all age/sex groups is sufficiently accurate.

An analysis of an unbiased multiplicative adjustment was conducted in one of our previous projects (Pope *et al*., 1999, Chapter 6). The unbiased multiplier predicts expenditures for the working aged correctly on average. The formula to calculate an unbiased multiplier for working aged is as follows (see details, Pope, 1999, Chapter 6):

β^{wa}= [(APY97TAD-PEXP97)/WAF97AD*PEXP97] + 1

where

β^{wa} is a multiplier for working aged months,

APY97TAD= mean of actual annualized expenditures in 1997,

PEXP97 = mean of predicted annualized expenditures in 1997, and

WAF97AD=fraction of 1997 sample eligible months in working aged status.

Inserting the necessary data from our 1996/1997 working aged sample,

β^{wa}=[(1188.84-3343.60)/2986.86]+1 =0.2786.[4]

Rounding to two decimal places, we have

β^{wa} = 0.28.

[4] The means of APY97TAD, PEXP97, and WAF97AD*PEXP97 for the working aged are from computer output D9PR23A.OUT. The weighting variable is ELFR97AD.

This multiplier is slightly higher than the multiplier of 0.21 that we calculated for the PIP-DCG model (Pope *et al*., 1999, Chapter 6).

The accuracy of open-ended working aged spells in HCFA's administrative data is open to question. Many of these spells may have ended, but the ending date was never collected and recorded in HCFA's database. We tested the sensitivity of our working aged multiplier by imposing a 5 year time limit on working aged spells. Using the modified data, we recalculate the multiplier as

β^{wa}=[(1338.43-3244.95)/2635.95]+1 =.2767.[5]

Rounding to two decimal places, we have

β^{wa} = 0.28.

The multiplier when spells are limited to 5 years is the same to two decimal places. For months in which a beneficiary is in working aged status, the payment formula is

0.28 • (base prospective model predicted expenditure)/12.

[5] The means of APY97TAD, PEXP97, and WAF97AD5*PEXP97 for the working aged up to 5-year are from computer output D9PR25D.OUT. The weighting variable is ELFR97AD.

Table 4-1

Age/Sex Model

Number of Observations:	1,394,701
R-Square	0.0097
Adjusted R-Square	0.0097
Dependent Variable Mean:	5,314
Root Mean Square Error:	13,756
Model Parameters	24
Computer Output:	D9pr03b.prt (#1, 4)

Variable	Parameter Estimate	t-ratio
Male, 0-34	$3,292	24.95
Male, 35-44	3,841	40.63
Male, 45-54	4,060	47.08
Male, 55-59	4,692	39.42
Male, 60-64	5,448	50.71
Male, 65-69	4,033	92.81
Male, 70-74	4,831	126.40
Male, 75-79	6,038	139.22
Male, 80-84	7,209	130.73
Male, 85-89	8,423	104.42
Male, 90-94	9,262	65.36
Male, 95+	8,508	29.28
Female, 0-34	3,636	21.99
Female, 35-44	4,231	35.51
Female, 45-54	4,811	46.32
Female, 55-59	5,318	39.89
Female, 60-64	6,382	53.14
Female, 65-69	3,538	90.47
Female, 70-74	4,230	128.38
Female, 75-79	5,286	149.56
Female, 80-84	6,386	155.84
Female, 85-89	7,477	142.78
Female, 90-94	8,141	104.34
Female, 95+	7,395	56.13

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-2

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Number of Observations:		1,394,701		1,394,701		1,394,701		1,394,701		1,394,701	
R-Square		0.1154		0.1157		0.1110		0.1116		0.1115	
Adjusted R-Square		0.1153		0.1156		0.1109		0.1115		0.1114	
Dependent Variable Mean:		5,314		5,314		5,314		5,314		5,314	
Root Mean Square Error:		13,001		12,999		13,034		13,029		13,030	
Model Parameters		208		217		122		160		127	
Computer Output:		D9pr03b.prt (#2, 5)		D9pr03b.prt (#3, 6)		D9pr03e.out (#1,3)		D9pr03d.out		D9pr03g.out	
Variable	**Label**	**Parameter Estimate**	**t-ratio**	**Parameter Estimate**	**t-ratio**	**Parameter Estimate**	**t-ratio**	**Parameter Estimate**	**t-ratio**	**Parameter Estimate**	**t-ratio**
	Demographic Factors										
	Male, 0-34	$306	2.37	$118	0.91	$195	1.51	$207	1.60	$211	1.63
	Male, 35-44	403	4.24	182	1.89	324	3.40	358	3.77	360	3.79
	Male, 45-54	600	7.09	429	5.04	613	7.27	677	8.02	676	8.01
	Male, 55-59	890	7.79	756	6.61	964	8.45	1,047	9.17	1,042	9.14
	Male, 60-64	1,358	13.14	1,228	11.85	1,383	13.43	1,471	14.27	1,468	14.25
	Male, 65-69	1,249	27.26	1,273	27.77	1,394	32.62	1,465	34.02	1,462	34.14
	Male, 70-74	1,697	40.05	1,719	40.57	1,855	48.79	1,936	50.35	1,932	50.69
	Male, 75-79	2,261	47.63	2,282	48.06	2,453	56.82	2,540	58.25	2,536	58.59
	Male, 80-84	2,742	47.24	2,760	47.56	2,991	54.99	3,083	56.30	3,080	56.53
	Male, 85-89	3,461	42.92	3,477	43.12	3,781	48.34	3,891	49.57	3,883	49.59
	Male, 90-94	4,031	29.52	4,045	29.62	4,431	32.72	4,567	33.68	4,557	33.64
	Male, 95+	3,321	12.04	3,327	12.06	3,774	13.68	3,924	14.22	3,919	14.21
	Female, 0-34	462	2.82	275	1.68	378	2.35	400	2.49	403	2.51
	Female, 35-44	660	5.57	460	3.87	608	5.19	648	5.53	648	5.53
	Female, 45-54	745	7.22	579	5.58	817	8.02	883	8.65	880	8.63
	Female, 55-59	885	6.85	746	5.76	1,052	8.19	1,138	8.86	1,134	8.84
	Female, 60-64	1,440	12.32	1,310	11.19	1,646	14.21	1,728	14.91	1,724	14.89
	Female, 65-69	922	21.17	948	21.76	1,152	30.05	1,215	31.47	1,212	31.57
	Female, 70-74	1,251	31.99	1,276	32.61	1,544	47.05	1,616	48.62	1,613	48.98
	Female, 75-79	1,718	41.46	1,740	41.98	2,088	59.04	2,169	60.47	2,165	61.00
	Female, 80-84	2,165	46.81	2,183	47.18	2,626	63.99	2,722	65.48	2,716	65.95
	Female, 85-89	2,649	47.10	2,661	47.31	3,190	61.13	3,310	62.79	3,305	63.13
	Female, 90-94	2,962	37.45	2,967	37.53	3,562	46.60	3,721	48.37	3,710	48.43
	Female, 95+	2,253	17.61	2,254	17.62	2,819	22.23	2,997	23.57	2,984	23.52
	Prior Year Medicaid	810	23.14	815	23.27	919	26.50	931	26.84	927	26.74
	Originally Disabled	1,261	26.65	1,300	27.42	1,387	29.31	1,391	29.40	1,392	29.41
HCC1	HIV/AIDS	3,398	10.47	2,511	7.51	2,674	7.99	2,681	8.01	2,676	7.99
HCC2	Septicemia/Shock	3,029	25.53	3,023	25.49	3,543	30.29	3,517	30.06	3,518	30.09
HCC3	Central Nervous System Infection	935	4.80	916	4.70	1,065	5.46	1,082	5.55	1,075	5.51
HCC4	Tuberculosis	663	2.83	650	2.78	651	2.77	701	2.99	693	2.96

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC5	Opportunistic Infections	4,965	16.80	3,891	11.46	4,174	12.27	4,123	12.12	4,122	12.12
HCC6	Other Infectious Diseases	336	9.96	337	10.01	0	.	0	.	0	.
HCC7	Metastatic Cancer and Acute Leukemia	6,548	56.41	6,578	56.66	7,832	70.24	7,876	70.64	7,871	70.60
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	3,676	28.96	3,702	29.17	4,209	33.38	4,237	33.61	4,237	33.61
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	2,081	20.47	2,099	20.64	2,565	25.45	2,585	25.66	2,587	25.67
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	649	13.57	652	13.64	974	21.60	991	21.97	990	21.95
HCC11	Other Respiratory and Heart Neoplasms	396	1.69	406	1.73	0	.	0	.	0	.
HCC12	Other Digestive and Urinary Neoplasms	91	1.28	97	1.36	0	.	0	.	0	.
HCC13	Other Neoplasms	-6	-0.11	-6	-0.13	0	.	0	.	0	.
HCC14	Benign Neoplasms of Skin, Breast, Eye	-296	-7.03	-295	-7.01	0	.	0	.	0	.
HCC15	Diabetes with Renal Manifestation	4,607	22.81	4,611	22.83	4,796	23.70	3,988	18.97	4,098	19.84
HCC16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	2,754	29.75	2,757	29.79	2,976	32.20	2,506	24.84	2,650	27.91
HCC17	Diabetes with Acute Complications	2,241	15.83	2,242	15.83	2,492	17.57	2,081	14.24	2,167	15.12
HCC18	Diabetes with Ophthalmologic Manifestation	1,359	12.16	1,361	12.18	1,357	12.12	1,083	9.36	1,148	10.17
HCC19	Diabetes with No or Unspecified Complications	912	22.79	914	22.84	999	25.12	700	13.85	764	17.80
HCC20	Type I Diabetes Mellitus	1,983	29.76	1,981	29.74	2,090	31.32	1,961	29.23	1,982	29.59
HCC21	Protein-Calorie Malnutrition	2,689	20.63	2,705	20.75	3,177	24.44	3,198	24.60	3,185	24.50
HCC22	Other Significant Endocrine and Metabolic Disorders	739	6.45	731	6.38	1,186	10.37	1,198	10.48	1,197	10.47
HCC23	Disorders of Fluid/Electrolyte/Acid-Base Balance	1,053	20.28	1,056	20.34	0	.	0	.	0	.
HCC24	Other Endocrine/Metabolic/Nutritional Disorders	-364	-13.00	-367	-13.09	0	.	0	.	0	.
HCC25	End-Stage Liver Disease	4,906	16.47	4,789	16.07	5,142	17.24	5,159	17.30	5,157	17.30
HCC26	Cirrhosis of Liver	1,901	8.99	1,831	8.66	2,035	11.27	2,041	11.30	2,041	11.31
HCC27	Chronic Hepatitis	2,009	5.85	1,837	5.35	2,035	11.27	2,041	11.30	2,041	11.31
HCC28	Acute Liver Failure/Disease	-192	-0.49	-397	-1.02	0	.	0	.	0	.
HCC29	Other Hepatitis and Liver Disease	712	6.00	692	5.83	0	.	0	.	0	.
HCC30	Gallbladder and Biliary Tract Disorders	-209	-2.20	-201	-2.12	0	.	0	.	0	.
HCC31	Intestinal Obstruction/Perforation	1,615	18.26	1,622	18.33	2,221	25.72	2,222	25.74	2,219	25.71
HCC32	Pancreatic Disease	1,239	9.02	1,193	8.69	1,543	11.37	1,539	11.34	1,543	11.38
HCC33	Inflammatory Bowel Disease	955	5.99	966	6.06	1,313	8.24	1,328	8.35	1,324	8.32
HCC34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	660	12.81	661	12.82	1,063	21.66	1,067	21.74	1,067	21.75
HCC35	Appendicitis	-1,269	-3.73	-1,276	-3.75	0	.	0	.	0	.
HCC36	Other Gastrointestinal Disorders	125	4.04	125	4.04	0	.	0	.	0	.
HCC37	Bone/Joint/Muscle Infections/Necrosis	2,133	16.69	2,116	16.56	2,699	21.23	2,685	21.13	2,705	21.29
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1,444	23.56	1,447	23.62	1,508	25.28	1,523	25.53	1,520	25.48
HCC39	Disorders of the Vertebrae and Spinal Discs	619	13.80	623	13.88	0	.	0	.	0	.
HCC40	Osteoarthritis of Hip or Knee	1,213	22.78	1,218	22.88	0	.	0	.	0	.
HCC41	Osteoporosis and Other Bone/Cartilage Disorders	604	12.49	606	12.54	0	.	0	.	0	.

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC42	Congenital/Developmental Skeletal and Connective Tissue Disorders	-156	-0.40	-153	-0.39	0	.	0	.	0	.
HCC43	Other Musculoskeletal and Connective Tissue Disorders	232	8.20	232	8.20	0	.	0	.	0	.
HCC44	Severe Hematological Disorders	5,165	31.75	4,630	26.73	4,941	28.54	4,935	28.52	4,930	28.49
HCC45	Disorders of Immunity	3,139	19.42	2,811	15.80	3,578	20.21	3,602	20.35	3,603	20.36
HCC46	Coagulation Defects and Other Specified Hematological Disorders	855	11.11	679	8.44	761	9.49	760	9.49	763	9.52
HCC47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	611	14.49	614	14.55	0	.	0	.	0	.
HCC48	Delirium and Encephalopathy	1,282	11.93	1,306	12.14	1,512	14.10	1,506	14.04	1,501	14.00
HCC49	Dementia	363	6.24	406	6.97	594	10.37	612	10.69	602	10.51
HCC50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	586	4.41	595	4.48	0	.	0	.	0	.
HCC51	Drug/Alcohol Psychosis	1,970	10.38	436	1.86	1,171	7.32	1,186	7.42	1,183	7.39
HCC52	Drug/Alcohol Dependence	2,179	14.84	1,163	5.38	1,171	7.32	1,186	7.42	1,183	7.39
HCC53	Drug/Alcohol Abuse, Without Dependence	636	6.54	625	6.42	0	.	0	.	0	.
HCC54	Schizophrenia	2,605	27.27	1,612	9.49	2,233	33.79	2,239	33.90	2,239	33.91
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	2,034	28.64	2,016	28.36	2,233	33.79	2,239	33.90	2,239	33.91
HCC56	Reactive and Unspecified Psychosis	233	2.16	245	2.27	630	11.19	640	11.37	639	11.35
HCC57	Personality Disorders	571	1.81	549	1.74	630	11.19	640	11.37	639	11.35
HCC58	Depression	381	5.81	382	5.83	630	11.19	640	11.37	639	11.35
HCC59	Anxiety Disorders	196	1.33	201	1.36	428	2.89	443	3.00	441	2.98
HCC60	Other Psychiatric Disorders	160	2.40	165	2.49	0	.	0	.	0	.
HCC61	Profound Mental Retardation/Developmental Disability	-2,103	-5.43	-2,046	-5.28	0	.	0	.	0	.
HCC62	Severe Mental Retardation/Developmental Disability	-2,052	-4.74	-2,014	-4.65	0	.	0	.	0	.
HCC63	Moderate Mental Retardation/Developmental Disability	-1,446	-3.68	-1,412	-3.59	0	.	0	.	0	.
HCC64	Mild/Unspecified Mental Retardation/Developmental Disability	-1,224	-7.64	-1,185	-7.39	0	.	0	.	0	.
HCC65	Other Developmental Disability	-978	-2.15	-987	-2.17	0	.	0	.	0	.
HCC66	Attention Deficit Disorder	1,640	2.53	1,577	2.44	0	.	0	.	0	.
HCC67	Quadriplegia, Other Extensive Paralysis	6,732	25.03	6,758	25.12	6,855	25.55	6,895	25.70	6,902	33.64
HCC68	Paraplegia	6,535	20.92	6,548	20.96	6,870	21.99	6,937	22.21	6,902	33.64
HCC69	Spinal Cord Disorders/Injuries	2,210	17.40	2,224	17.51	2,458	19.50	2,464	19.56	2,464	19.55
HCC70	Muscular Dystrophy	2,050	3.62	2,039	3.60	2,113	3.72	2,149	3.79	2,148	3.79
HCC71	Polyneuropathy	1,445	17.81	1,443	17.80	1,743	21.54	1,722	21.28	1,731	21.39
HCC72	Multiple Sclerosis	3,018	14.51	1,858	5.93	2,111	6.72	2,134	6.80	2,127	6.77
HCC73	Parkinson's and Huntington's Diseases	2,007	20.41	2,033	20.67	2,224	22.60	2,243	22.79	2,241	22.78
HCC74	Seizure Disorders and Convulsions	1,218	16.25	1,202	16.03	1,250	16.80	1,255	16.88	1,253	16.85
HCC75	Coma, Brain Compression/Anoxic Damage	3,160	9.80	3,158	9.80	3,194	9.89	3,190	9.88	3,168	9.82
HCC76	Mononeuropathy, Other Neurological Conditions/Injuries	205	3.62	207	3.66	0	.	0	.	0	.

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC77	Respirator Dependence/Tracheostomy Status	7,545	20.93	7,533	20.90	7,992	34.38	7,687	33.04	7,713	33.16
HCC78	Respiratory Arrest	8,362	28.04	8,365	28.05	7,992	34.38	7,687	33.04	7,713	33.16
HCC79	Cardio-Respiratory Failure and Shock	3,414	40.19	3,413	40.18	3,558	41.96	3,380	39.74	3,390	39.87
HCC80	Congestive Heart Failure	2,456	55.52	2,461	55.64	2,578	61.84	1,928	23.83	1,824	34.81
HCC81	Acute Myocardial Infarction	751	6.52	762	6.61	1,411	33.64	1,387	25.64	1,389	32.94
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	1,457	22.32	1,460	22.37	1,411	33.64	1,387	25.64	1,389	32.94
HCC83	Angina Pectoris/Old Myocardial Infarction	980	18.19	982	18.22	1,411	33.64	1,387	25.64	1,389	32.94
HCC84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	805	21.61	807	21.68	916	24.90	941	19.43	929	25.18
HCC85	Heart Infection/Inflammation, Except Rheumatic	1,237	6.69	1,222	6.61	1,404	7.58	1,371	7.41	1,381	7.46
HCC86	Valvular and Rheumatic Heart Disease	900	18.89	902	18.94	1,055	22.25	1,055	22.26	1,059	22.34
HCC87	Major Congenital Cardiac/Circulatory Defect	717	1.06	699	1.03	774	1.14	735	1.08	749	1.10
HCC88	Other Congenital Heart/Circulatory Disease	177	0.92	176	0.92	0	.	0	.	0	.
HCC89	Hypertensive Heart and Renal Disease or Encephalopathy	346	2.08	342	2.06	492	2.97	483	2.91	488	2.94
HCC90	Hypertensive Heart Disease	130	2.02	129	2.01	166	2.64	224	3.55	217	3.44
HCC91	Hypertension	167	6.25	165	6.17	0	.	0	.	0	.
HCC92	Specified Heart Arrhythmias	806	17.92	820	18.24	869	19.67	877	19.85	880	19.93
HCC93	Other Heart Rhythm and Conduction Disorders	356	7.03	355	7.01	0	.	0	.	0	.
HCC94	Other and Unspecified Heart Disease	407	3.98	406	3.97	0	.	0	.	0	.
HCC95	Cerebral Hemorrhage	495	3.00	515	3.12	1,626	26.21	1,606	20.74	1,469	22.39
HCC96	Ischemic or Unspecified Stroke	1,523	23.59	1,534	23.76	1,626	26.21	1,606	20.74	1,469	22.39
HCC97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	720	12.48	725	12.57	863	16.20	852	11.60	705	12.31
HCC98	Cerebral Atherosclerosis and Aneurysm	343	2.00	348	2.03	863	16.20	852	11.60	705	12.31
HCC99	Cerebrovascular Disease, Unspecified	1,039	5.40	1,040	5.41	863	16.20	852	11.60	705	12.31
HCC100	Hemiplegia/Hemiparesis	2,285	18.68	2,278	18.62	2,492	20.95	2,493	20.82	2,439	20.46
HCC101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	1,055	4.65	1,090	4.81	1,168	5.16	1,152	5.06	1,091	4.81
HCC102	Speech, Language, Cognitive, Perceptual Deficits	235	1.39	240	1.42	572	6.23	577	6.14	510	5.52
HCC103	Cerebrovascular Disease Late Effects, Unspecified	515	4.86	520	4.91	572	6.23	577	6.14	510	5.52
HCC104	Vascular Disease with Complications	2,995	33.58	2,999	33.63	3,277	37.09	3,120	29.07	3,254	36.83
HCC105	Vascular Disease	985	23.33	993	23.51	1,234	29.96	1,161	17.04	1,246	30.26
HCC106	Other Circulatory Disease	374	8.25	377	8.30	0	.	0	.	0	.
HCC107	Cystic Fibrosis	2,887	4.83	1,670	2.50	2,219	60.08	1,893	34.06	1,826	43.46
HCC108	Chronic Obstructive Pulmonary Disease	1,984	52.44	1,992	52.63	2,219	60.08	1,893	34.06	1,826	43.46
HCC109	Fibrosis of Lung and Other Chronic Lung Disorders	538	5.75	531	5.68	785	8.39	889	9.50	886	9.46
HCC110	Asthma	232	2.82	226	2.75	405	4.95	438	5.35	437	5.34
HCC111	Aspiration and Specified Bacterial Pneumonias	4,064	29.54	4,068	29.57	4,311	31.35	4,217	30.64	4,204	30.56
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess	1,376	8.02	1,375	8.01	1,705	9.93	1,660	9.67	1,652	9.62
HCC113	Viral and Unspecified Pneumonia, Pleurisy	1,089	20.87	1,088	20.85	1,343	25.91	1,316	25.39	1,316	25.40

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC114	Pleural Effusion/Pneumothorax	790	8.67	800	8.79	1,000	11.02	891	9.80	905	9.96
HCC115	Other Lung Disorders	104	2.48	102	2.42	0	.	0	.	0	.
HCC116	Legally Blind	282	1.26	283	1.27	0	.	0	.	0	.
HCC117	Major Eye Infections/Inflammations	471	2.03	473	2.04	0	.	0	.	0	.
HCC118	Retinal Detachment	-204	-1.23	-204	-1.22	0	.	0	.	0	.
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1,852	11.66	1,849	11.65	1,852	11.71	1,857	11.74	1,865	11.80
HCC120	Diabetic and Other Vascular Retinopathies	618	8.69	615	8.66	652	9.21	663	9.37	661	9.34
HCC121	Retinal Disorders, Except Detachment and Vascular Retinopathies	39	0.84	40	0.85	0	.	0	.	0	.
HCC122	Glaucoma	61	1.58	61	1.57	0	.	0	.	0	.
HCC123	Cataract	-176	-6.47	-176	-6.46	0	.	0	.	0	.
HCC124	Other Eye Disorders	-131	-2.92	-138	-3.09	0	.	0	.	0	.
HCC125	Significant Ear, Nose, and Throat Disorders	223	1.82	224	1.83	0	.	0	.	0	.
HCC126	Hearing Loss	-209	-3.26	-206	-3.20	0	.	0	.	0	.
HCC127	Other Ear, Nose, Throat, and Mouth Disorders	-162	-5.83	-164	-5.93	0	.	0	.	0	.
HCC128	Kidney Transplant Status	2,444	6.63	2,315	6.26	2,556	6.90	2,692	7.27	2,691	7.27
HCC129	End Stage Renal Disease	0	.	0	.	0	.	0	.	0	.
HCC130	Dialysis Status	13,985	21.35	13,849	21.15	13,910	21.19	13,934	21.23	13,955	21.26
HCC131	Renal Failure	3,227	32.18	3,229	32.20	3,573	35.90	2,541	15.68	2,487	18.33
HCC132	Nephritis	1,573	6.88	1,565	6.85	1,801	7.87	1,873	8.17	1,892	8.26
HCC133	Urinary Obstruction and Retention	517	8.53	519	8.57	0	.	0	.	0	.
HCC134	Incontinence	1,238	14.94	1,245	15.02	0	.	0	.	0	.
HCC135	Urinary Tract Infection	531	13.90	536	14.04	0	.	0	.	0	.
HCC136	Other Urinary Tract Disorders	488	9.27	490	9.31	0	.	0	.	0	.
HCC137	Female Infertility	-47	-0.04	-81	-0.07	0	.	0	.	0	.
HCC138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	-254	-3.19	-256	-3.22	0	.	0	.	0	.
HCC139	Other Female Genital Disorders	-265	-5.97	-269	-6.07	0	.	0	.	0	.
HCC140	Male Genital Disorders	-284	-6.72	-286	-6.76	0	.	0	.	0	.
HCC141	Ectopic Pregnancy	302	0.14	143	0.06	0	.	0	.	0	.
HCC142	Miscarriage/Abortion	-1,173	-0.92	-1,195	-0.93	0	.	0	.	0	.
HCC143	Completed Pregnancy With Major Complications	-701	-0.48	-701	-0.49	0	.	0	.	0	.
HCC144	Completed Pregnancy With Complications	1,031	1.34	966	1.26	0	.	0	.	0	.
HCC145	Completed Pregnancy Without Complications (Normal Delivery)	443	0.31	327	0.23	0	.	0	.	0	.
HCC146	Uncompleted Pregnancy With Complications	3,021	1.96	2,864	1.85	3,214	2.08	3,246	2.10	3,242	2.10
HCC147	Uncompleted Pregnancy With No or Minor Complications	872	1.16	768	1.03	906	1.21	926	1.23	921	1.23
HCC148	Decubitus Ulcer of Skin	3,878	33.15	3,891	33.26	4,330	37.14	4,292	36.81	4,293	36.85
HCC149	Chronic Ulcer of Skin, Except Decubitus	1,923	21.71	1,923	21.71	2,411	27.60	2,416	27.67	2,416	27.67
HCC150	Extensive Third-Degree Burns	6,335	3.18	6,093	3.06	6,307	3.15	6,358	3.18	6,376	3.19

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC151	Other Third-Degree and Extensive Burns	2,181	3.59	2,123	3.50	0	.	0	.	0	.
HCC152	Cellulitis, Local Skin Infection	1,093	23.06	1,091	23.04	0	.	0	.	0	.
HCC153	Other Dermatological Disorders	94	3.15	95	3.19	0	.	0	.	0	.
HCC154	Severe Head Injury	4,177	4.28	4,177	4.28	4,073	4.17	4,147	4.24	4,127	4.22
HCC155	Major Head Injury	969	8.27	956	8.15	1,047	9.01	1,063	9.16	1,062	9.15
HCC156	Concussion or Unspecified Head Injury	38	0.11	41	0.12	0	.	0	.	0	.
HCC157	Vertebral Fractures	2,017	17.36	2,032	17.50	2,357	20.63	2,362	20.68	2,362	20.67
HCC158	Hip Fracture/Dislocation	467	5.19	489	5.44	1,031	11.67	1,055	11.94	1,050	11.88
HCC159	Major Fracture, Except of Skull, Vertebrae, or Hip	740	8.01	741	8.02	0	.	0	.	0	.
HCC160	Internal Injuries	66	0.31	62	0.29	0	.	0	.	0	.
HCC161	Traumatic Amputation[1]	3,463	11.73	3,466	11.74	3,768	17.63	3,611	16.87	3,688	17.26
HCC162	Other Injuries	458	13.94	457	13.89	0	.	0	.	0	.
HCC163	Poisonings and Allegic Reactions	405	6.64	395	6.48	0	.	0	.	0	.
HCC164	Major Complications of Medical Care and Trauma	560	7.35	551	7.24	1,047	13.94	1,059	14.11	1,062	14.14
HCC165	Other Complications of Medical Care	-56	-0.55	-55	-0.54	0	.	0	.	0	.
HCC166	Major Symptoms, Abnormalities	569	18.38	564	18.22	0	.	0	.	0	.
HCC167	Minor Symptoms, Signs, Findings	2	0.07	-2	-0.05	0	.	0	.	0	.
HCC168	Extremely Low Birthweight Neonates	5,527	0.98	5,442	0.97	0	.	0	.	0	.
HCC169	Very Low Birthweight Neonates	-2,732	-0.36	-2,751	-0.37	0	.	0	.	0	.
HCC170	Serious Perinatal Problem Affecting Newborn	1,848	6.48	1,844	6.47	0	.	0	.	0	.
HCC171	Other Perinatal Problems Affecting Newborn	606	1.97	606	1.97	0	.	0	.	0	.
HCC172	Normal, Single Birth	2,402	0.87	2,500	0.91	0	.	0	.	0	.
HCC173	Major Organ Transplant	0	.	0	.	0	.	0	.	0	.
HCC174	Major Organ Transplant Status	3,717	7.91	3,404	7.23	3,423	7.26	3,542	7.51	3,532	7.49
HCC175	Other Organ Transplant/Replacement	663	2.82	646	2.75	0	.	0	.	0	.
HCC176	Artificial Openings for Feeding or Elimination	1,996	12.32	1,977	12.20	2,237	13.80	2,285	14.10	2,271	14.02
HCC177	Amputation Status, Lower Limb/Amputation Complications[1]	3,792	12.60	3,786	12.58	3,768	17.63	3,611	16.87	3,688	17.26
HCC178	Amputation Status, Upper Limb	632	0.60	589	0.56	0	.	0	.	0	.
HCC179	Post-Surgical States/Aftercare/Elective	-10	-0.29	-12	-0.33	0	.	0	.	0	.
HCC180	Radiation Therapy	1,579	8.44	1,582	8.46	0	.	0	.	0	.
HCC181	Chemotherapy	5,435	29.46	5,472	29.65	0	.	0	.	0	.
HCC182	Rehabilitation	170	2.11	168	2.10	0	.	0	.	0	.
HCC183	Screening/Observation/Special Exams	-243	-9.58	-250	-9.84	0	.	0	.	0	.
HCC184	History of Disease	0	0.00	-4	-0.11	0	.	0	.	0	.
HCC185	Oxygen	0	.	0	.	0	.	0	.	0	.
HCC186	CPAP/IPPB/Nebulizers	0	.	0	.	0	.	0	.	0	.
HCC187	Patient Lifts, Power Operated Vehicles, Beds	0	.	0	.	0	.	0	.	0	.
HCC188	Wheelchairs, Commodes	0	.	0	.	0	.	0	.	0	.
HCC189	Walkers	0	.	0	.	0	.	0	.	0	.

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
D_HCC5	DISABLED*OPPORTUNISTIC INFECTIONS	--	--	3,904	5.70	3,825	5.57	3,882	5.65	3,892	5.67
D_HCC44	DISABLED*SEVERE HEMATOLOGICAL DISORDERS	--	--	4,646	9.32	4,671	9.35	4,759	9.52	4,760	9.53
D_HCC45	DISABLED*DISORDERS OF IMMUNITY	--	--	1,661	3.95	1,101	2.61	1,101	2.62	1,103	2.62
D_HCC46	DISABLED*COAGULATION DEFECTS	--	--	1,974	7.43	1,978	7.43	2,003	7.52	1,999	7.51
D_HCC51	DISABLED*DRUG/ALCOHOL PSYCHOSIS	--	--	4,257	10.81	3,981	11.20	4,003	11.27	4,010	11.29
D_HCC52	DISABLED*DRUG/ALCOHOL DEPENDENCE	--	--	1,825	6.25	2,150	8.48	2,165	8.54	2,173	8.58
D_HCC54	DISABLED* SCHIZOPHRENIA	--	--	1,390	6.80	884	6.88	894	6.96	893	6.95
D_HCC72	DISABLED* MULTIPLE SCLEROSIS	--	--	2,109	5.03	2,105	5.01	2,075	4.94	2,085	4.96
D_HCC107	DISABLED* CYSTIC FIBROSIS	--	--	6,079	4.06	5,689	4.23	6,136	4.56	6,188	4.60
INT1	DM *CHF	--	--	--	--	--	--	687	4.57	1,036	11.97
INT2	DM *CVD	--	--	--	--	--	--	860	6.22	559	6.31
INT3	CHF *COPD	--	--	--	--	--	--	1,420	10.01	1,590	18.74
INT4	COPD*CVD *CAD	--	--	--	--	--	--	916	4.41	521	4.53
INT5	RF*CHF	--	--	--	--	--	--	1,391	5.65	1,435	6.27
INT6	RF*CHF*DM	--	--	--	--	--	--	1,693	4.16	1,680	5.88
INT7	DM *COPD	--	--	--	--	--	--	-64	-0.45	--	--
INT8	DM *VD	--	--	--	--	--	--	377	2.78	--	--
INT9	DM *CAD	--	--	--	--	--	--	45	0.46	--	--
INT10	CHF *CVD	--	--	--	--	--	--	-151	-0.86	--	--
INT11	CHF *VD	--	--	--	--	--	--	-326	-1.91	--	--
INT12	CHF *CAD	--	--	--	--	--	--	-81	-0.72	--	--
INT13	COPD*CVD	--	--	--	--	--	--	-88	-0.55	--	--
INT14	COPD*VD	--	--	--	--	--	--	211	1.41	--	--
INT15	COPD*CAD	--	--	--	--	--	--	-415	-3.78	--	--
INT16	CVD *VD	--	--	--	--	--	--	-367	-2.66	--	--
INT17	CVD *CAD	--	--	--	--	--	--	-157	-1.36	--	--
INT18	VD *CAD	--	--	--	--	--	--	-72	-0.61	--	--
INT19	DM *CHF *COPD	--	--	--	--	--	--	423	2.03	--	--
INT20	DM *CHF *CVD	--	--	--	--	--	--	-648	-2.99	--	--
INT21	DM *CHF *VD	--	--	--	--	--	--	568	2.70	--	--
INT22	DM *CHF *CAD	--	--	--	--	--	--	178	0.99	--	--
INT23	DM *COPD*CVD	--	--	--	--	--	--	-116	-0.49	--	--
INT24	DM *COPD*VD	--	--	--	--	--	--	42	0.19	--	--
INT25	DM *COPD*CAD	--	--	--	--	--	--	57	0.29	--	--
INT26	DM *CVD *VD	--	--	--	--	--	--	-714	-3.49	--	--
INT27	DM *CVD *CAD	--	--	--	--	--	--	141	0.74	--	--
INT28	DM *VD *CAD	--	--	--	--	--	--	183	0.98	--	--
INT29	CHF *COPD*CVD	--	--	--	--	--	--	-467	-2.11	--	--
INT30	CHF *COPD*VD	--	--	--	--	--	--	-296	-1.42	--	--
INT31	CHF *COPD*CAD	--	--	--	--	--	--	418	2.34	--	--

Table 4-2 (continued)

Hierarchical Condition Categories Prospective Risk Adjustment Models

		1		2		3		4		5	
		All HCCs		All HCCs, Disabled Interactions		Exclusions, Constraints, Disabled Interactions		Excl, Constr, All Dx Interactions		Base Model (Selected Dx Interactions)	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
INT32	CHF *CVD *VD	--	--	--	--	--	--	254	1.20	--	--
INT33	CHF *CVD *CAD	--	--	--	--	--	--	119	0.60	--	--
INT34	CHF *VD *CAD	--	--	--	--	--	--	579	3.02	--	--
INT35	COPD*CVD *VD	--	--	--	--	--	--	-20	-0.09	--	--
INT36	COPD*VD *CAD	--	--	--	--	--	--	284	1.45	--	--
INT37	CVD *VD *CAD	--	--	--	--	--	--	193	1.04	--	--
INT38	RF*DM	--	--	--	--	--	--	-156	-0.53	--	--

NOTES:

Diagnoses assigned using Source=1-5.

[1]Coefficients of HCCs 161 and 177 are constrained to be equal in Model 3, 4, and 5.

"|" means coefficients of HCCs are constrained to be equal in Model 3, 4, and 5.

DM= diabetes mellitus (HCCs 15-20)

CHF= congestive heart failure (HCC 80)

COPD= chronic obstructive pulmonary disease (HCC 108)

CVD= cerebrovascular disease (HCCs 95-103)

VD= vascular disease (HCCs 104-105)

CAD= coronary artery disease (HCCs 81-84)

RF=renal failure (HCC 131)

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-3

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC1	HIV/AIDS	3,196	-380	3,576	4.22
HCC2	Septicemia/Shock	2,256	3,088	-831	-2.23
HCC3	Central Nervous System Infection	799	862	-64	-0.13
HCC4	Tuberculosis	1,438	403	1,035	1.81
HCC5	Opportunistic Infections	6,489	4,047	2,441	3.58
HCC6	Other Infectious Diseases	383	331	52	0.49
HCC7	Metastatic Cancer and Acute Leukemia	8,200	6,506	1,694	3.73
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	2,750	3,809	-1,059	-2.27
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	2,041	2,108	-67	-0.20
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	106	699	-592	-2.61
HCC11	Other Respiratory and Heart Neoplasms	-604	510	-1,114	-1.46
HCC12	Other Digestive and Urinary Neoplasms	-292	143	-435	-1.57
HCC13	Other Neoplasms	-92	8	-100	-0.52
HCC14	Benign Neoplasms of Skin, Breast, Eye	-555	-266	-289	-1.96
HCC15	Diabetes with Renal Manifestation	3,178	4,709	-1,530	-2.83
HCC16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	2,016	2,813	-797	-2.57
HCC17	Diabetes with Acute Complications	1,338	2,352	-1,014	-2.55
HCC18	Diabetes with Ophthalmologic Manifestation	-327	1,516	-1,843	-4.92
HCC19	Diabetes with No or Unspecified Complications	482	957	-475	-3.55
HCC20	Type I Diabetes Mellitus	1,601	2,028	-427	-2.12
HCC21	Protein-Calorie Malnutrition	2,249	2,798	-549	-1.32
HCC22	Other Significant Endocrine and Metabolic Disorders	1,972	488	1,485	4.64
HCC23	Disorders of Fluid/Electrolyte/Acid-Base Balance	2,056	952	1,104	6.56
HCC24	Other Endocrine/Metabolic/Nutritional Disorders	-213	-385	172	1.80
HCC25	End-Stage Liver Disease	5,946	4,321	1,625	2.32
HCC26	Cirrhosis of Liver	1,186	2,024	-837	-1.74
HCC27	Chronic Hepatitis	1,682	1,762	-81	-0.11

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC28	Acute Liver Failure/Disease	841	-1,081	1,922	2.33
HCC29	Other Hepatitis and Liver Disease	1,182	572	610	2.00
HCC30	Gallbladder and Biliary Tract Disorders	609	-306	915	3.18
HCC31	Intestinal Obstruction/Perforation	1,414	1,644	-230	-0.81
HCC32	Pancreatic Disease	1,253	1,134	119	0.33
HCC33	Inflammatory Bowel Disease	2,039	731	1,308	2.95
HCC34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	719	648	72	0.44
HCC35	Appendicitis	-1,592	-1,277	-315	-0.35
HCC36	Other Gastrointestinal Disorders	264	107	157	1.56
HCC37	Bone/Joint/Muscle Infections/Necrosis	2,287	1,994	293	0.85
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1,037	1,491	-453	-2.48
HCC39	Disorders of the Vertebrae and Spinal Discs	402	649	-246	-1.75
HCC40	Osteoarthritis of Hip or Knee	1,210	1,239	-29	-0.13
HCC41	Osteoporosis and Other Bone/Cartilage Disorders	1,355	551	804	4.48
HCC42	Congenital/Developmental Skeletal and Connective Tissue Disorders	329	-440	769	0.83
HCC43	Other Musculoskeletal and Connective Tissue Disorders	72	251	-178	-1.99
HCC44	Severe Hematological Disorders	8,207	4,722	3,485	7.11
HCC45	Disorders of Immunity	3,824	2,906	918	2.21
HCC46	Coagulation Defects and Other Specified Hematological Disorders	1,849	746	1,103	4.21
HCC47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	1,069	586	482	3.27
HCC48	Delirium and Encephalopathy	2,288	1,105	1,183	4.12
HCC49	Dementia	894	410	484	1.93
HCC50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	761	567	194	0.54

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC51	Drug/Alcohol Psychosis	3,697	603	3,095	7.79
HCC52	Drug/Alcohol Dependence	2,537	1,266	1,270	4.31
HCC53	Drug/Alcohol Abuse, Without Dependence	600	445	155	0.74
HCC54	Schizophrenia	2,790	1,713	1,077	5.20
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	1,556	2,166	-610	-4.01
HCC56	Reactive and Unspecified Psychosis	789	263	526	1.41
HCC57	Personality Disorders	478	390	89	0.14
HCC58	Depression	-83	470	-553	-3.20
HCC59	Anxiety Disorders	213	166	47	0.14
HCC60	Other Psychiatric Disorders	-239	234	-473	-2.64
HCC61	Profound Mental Retardation/Developmental Disability	-2,303	-1,413	-890	-0.77
HCC62	Severe Mental Retardation/Developmental Disability	-1,893	-3,563	1,669	1.40
HCC63	Moderate Mental Retardation/Developmental Disability	-1,160	-3,140	1,981	1.90
HCC64	Mild/Unspecified Mental Retardation/Developmental Disability	-1,016	-2,479	1,462	3.57
HCC65	Other Developmental Disability	-761	-1,223	462	0.51
HCC66	Attention Deficit Disorder	2,265	640	1,625	1.24
HCC67	Quadriplegia, Other Extensive Paralysis	5,824	6,200	-376	-0.69
HCC68	Paraplegia	4,786	6,811	-2,025	-3.21
HCC69	Spinal Cord Disorders/Injuries	1,459	2,329	-871	-2.66
HCC70	Muscular Dystrophy	1,636	1,870	-234	-0.21
HCC71	Polyneuropathy	1,543	1,403	139	0.60
HCC72	Multiple Sclerosis	3,610	1,873	1,738	4.16
HCC73	Parkinson's and Huntington's Diseases	1,912	2,055	-143	-0.32
HCC74	Seizure Disorders and Convulsions	813	1,292	-478	-3.07
HCC75	Coma, Brain Compression/Anoxic Damage	2,921	3,078	-157	-0.21
HCC76	Mononeuropathy, Other Neurological Conditions/Injuries	627	130	497	3.04
HCC77	Respirator Dependence/Tracheostomy Status	10,164	6,548	3,616	4.26
HCC78	Respiratory Arrest	10,021	8,076	1,945	2.24

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC79	Cardio-Respiratory Failure and Shock	4,009	3,316	693	2.60
HCC80	Congestive Heart Failure	2,548	2,466	82	0.49
HCC81	Acute Myocardial Infarction	418	828	-409	-0.99
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	1,500	1,461	39	0.17
HCC83	Angina Pectoris/Old Myocardial Infarction	889	996	-108	-0.54
HCC84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	616	827	-211	-1.33
HCC85	Heart Infection/Inflammation, Except Rheumatic	1,191	1,180	11	0.02
HCC86	Valvular and Rheumatic Heart Disease	1,041	901	140	0.74
HCC87	Major Congenital Cardiac/Circulatory Defect	1,495	395	1,099	0.68
HCC88	Other Congenital Heart/Circulatory Disease	-23	192	-216	-0.39
HCC89	Hypertensive Heart and Renal Disease or Encephalopathy	-1,499	525	-2,024	-3.60
HCC90	Hypertensive Heart Disease	179	127	52	0.21
HCC91	Hypertension	81	169	-89	-0.95
HCC92	Specified Heart Arrhythmias	864	844	20	0.09
HCC93	Other Heart Rhythm and Conduction Disorders	1,274	279	995	5.23
HCC94	Other and Unspecified Heart Disease	817	371	447	1.24
HCC95	Cerebral Hemorrhage	223	562	-339	-0.63
HCC96	Ischemic or Unspecified Stroke	1,526	1,549	-23	-0.09
HCC97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	677	743	-65	-0.25
HCC98	Cerebral Atherosclerosis and Aneurysm	1,607	274	1,333	1.94
HCC99	Cerebrovascular Disease, Unspecified	453	1,094	-641	-0.81
HCC100	Hemiplegia/Hemiparesis	1,093	2,431	-1,338	-3.61
HCC101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	516	1,458	-942	-2.10
HCC102	Speech, Language, Cognitive, Perceptual Deficits	-1,077	341	-1,418	-2.42
HCC103	Cerebrovascular Disease Late Effects, Unspecified	653	525	129	0.32
HCC104	Vascular Disease with Complications	2,813	3,041	-229	-0.75

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC105	Vascular Disease	1,192	994	198	1.18
HCC106	Other Circulatory Disease	508	362	147	0.87
HCC107	Cystic Fibrosis	7,383	1,725	5,657	3.84
HCC108	Chronic Obstructive Pulmonary Disease	2,183	1,975	208	1.66
HCC109	Fibrosis of Lung and Other Chronic Lung Disorders	1,191	438	753	2.54
HCC110	Asthma	273	197	76	0.37
HCC111	Aspiration and Specified Bacterial Pneumonias	3,770	4,095	-325	-0.76
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess	-461	1,568	-2,029	-3.69
HCC113	Viral and Unspecified Pneumonia, Pleurisy	1,558	1,028	530	3.19
HCC114	Pleural Effusion/Pneumothorax	1,573	785	788	2.37
HCC115	Other Lung Disorders	130	102	28	0.22
HCC116	Legally Blind	1,631	13	1,618	2.73
HCC117	Major Eye Infections/Inflammations	-279	546	-825	-1.14
HCC118	Retinal Detachment	1,011	-303	1,314	2.13
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1,856	1,881	-25	-0.05
HCC120	Diabetic and Other Vascular Retinopathies	1,603	543	1,060	3.66
HCC121	Retinal Disorders, Except Detachment and Vascular Retinopathies	-286	54	-339	-1.09
HCC122	Glaucoma	418	44	373	1.95
HCC123	Cataract	442	-199	641	4.35
HCC124	Other Eye Disorders	179	-198	377	3.00
HCC125	Significant Ear, Nose, and Throat Disorders	767	168	599	1.48
HCC126	Hearing Loss	-518	-180	-338	-1.36
HCC127	Other Ear, Nose, Throat, and Mouth Disorders	-133	-177	44	0.52
HCC128	Kidney Transplant Status	1,984	3,108	-1,124	-1.23
HCC129	End Stage Renal Disease	0	0	0	.
HCC130	Dialysis Status	14,053	13,490	563	0.39
HCC131	Renal Failure	4,155	3,160	995	2.86

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC132	Nephritis	1,228	1,596	-368	-0.60
HCC133	Urinary Obstruction and Retention	795	489	306	1.52
HCC134	Incontinence	1,289	1,239	50	0.18
HCC135	Urinary Tract Infection	941	500	441	3.50
HCC136	Other Urinary Tract Disorders	361	507	-146	-0.79
HCC137	Female Infertility	-189	--	.	.
HCC138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	-625	-219	-406	-1.57
HCC139	Other Female Genital Disorders	-259	-268	9	0.07
HCC140	Male Genital Disorders	-28	-302	274	1.73
HCC141	Ectopic Pregnancy	108	--	.	.
HCC142	Miscarriage/Abortion	-1,236	--	.	.
HCC143	Completed Pregnancy With Major Complications	-764	--	.	.
HCC144	Completed Pregnancy With Complications	917	--	.	.
HCC145	Completed Pregnancy Without Complications (Normal Delivery)	157	--	.	.
HCC146	Uncompleted Pregnancy With Complications	2,466	--	.	.
HCC147	Uncompleted Pregnancy With No or Minor Complications	675	--	.	.
HCC148	Decubitus Ulcer of Skin	6,909	3,486	3,423	9.46
HCC149	Chronic Ulcer of Skin, Except Decubitus	2,116	1,901	215	0.73
HCC150	Extensive Third-Degree Burns	7,511	5,269	2,242	0.51
HCC151	Other Third-Degree and Extensive Burns	3,399	1,289	2,110	1.62
HCC152	Cellulitis, Local Skin Infection	1,610	1,007	602	4.19
HCC153	Other Dermatological Disorders	52	94	-42	-0.41
HCC154	Severe Head Injury	1,448	5,544	-4,096	-2.05
HCC155	Major Head Injury	1,279	862	417	1.39
HCC156	Concussion or Unspecified Head Injury	-272	73	-345	-0.35
HCC157	Vertebral Fractures	1,736	2,096	-360	-0.71

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC158	Hip Fracture/Dislocation	1,233	518	715	1.75
HCC159	Major Fracture, Except of Skull, Vertebrae, or Hip	869	704	165	0.57
HCC160	Internal Injuries	103	13	91	0.15
HCC161	Traumatic Amputation	4,439	3,184	1,254	1.61
HCC162	Other Injuries	334	471	-137	-1.43
HCC163	Poisonings and Allegic Reactions	661	324	337	1.98
HCC164	Major Complications of Medical Care and Trauma	1,776	360	1,416	5.97
HCC165	Other Complications of Medical Care	629	-156	784	2.49
HCC166	Major Symptoms, Abnormalities	470	571	-101	-1.05
HCC167	Minor Symptoms, Signs, Findings	-237	25	-262	-2.46
HCC168	Extremely Low Birthweight Neonates	-3,214	10,267	-13,481	-1.17
HCC169	Very Low Birthweight Neonates	0	-2,608	2,608	0.35
HCC170	Serious Perinatal Problem Affecting Newborn	373	2,032	-1,660	-1.98
HCC171	Other Perinatal Problems Affecting Newborn	150	695	-545	-0.63
HCC172	Normal, Single Birth	5,472	1,405	4,067	0.66
HCC173	Major Organ Transplant	n/a	n/a	n/a	n/a
HCC174	Major Organ Transplant Status	3,042	2,869	173	0.18
HCC175	Other Organ Transplant/Replacement	2,340	487	1,852	2.23
HCC176	Artificial Openings for Feeding or Elimination	2,567	1,759	808	1.75
HCC177	Amputation Status, Lower Limb/Amputation Complications	3,455	3,661	-207	-0.30
HCC178	Amputation Status, Upper Limb	-533	709	-1,242	-0.50
HCC179	Post-Surgical States/Aftercare/Elective	389	-41	430	3.15
HCC180	Radiation Therapy	1,569	1,582	-13	-0.01
HCC181	Chemotherapy	4,753	5,540	-787	-1.18
HCC182	Rehabilitation	1,295	38	1,257	5.04
HCC183	Screening/Observation/Special Exams	-186	-268	83	1.04
HCC184	History of Disease	586	-50	636	4.25
HCC185	Oxygen	n/a	n/a	n/a	n/a

Table 4-3 (continued)

HCC Parameter Difference by Aged Versus Disabled

Variable	Label	Disabled Parameter Estimate	Aged Parameter Estimate	Coefficient Difference (Disabled-Aged)	t Statistic for Difference
HCC186	CPAP/IPPB/Nebulizers	n/a	n/a	n/a	n/a
HCC187	Patient Lifts, Power Operated Vehicles, Beds	n/a	n/a	n/a	n/a
HCC188	Wheelchairs, Commodes	n/a	n/a	n/a	n/a
HCC189	Walkers	n/a	n/a	n/a	n/a

OUTPUT: D9pr14.ou2

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-3a

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
1	HIV/AIDS	319	292	1,447	1,383
2	Septicemia/Shock	14,559	12,318	1,762	1,594
3	Central Nervous System Infection	3,869	3,606	961	917
4	Tuberculosis	2,663	2,478	656	633
5	Opportunistic Infections	1,700	1,482	575	519
6	Other Infectious Diseases	199,209	187,296	21,861	21,279
7	Metastatic Cancer and Acute Leukemia	16,265	13,250	1,114	931
8	Lung, Upper Digestive Tract, and Other Severe Cancers	11,603	10,122	908	827
9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	16,619	15,509	1,685	1,598
10	Breast, Prostate, Colorectal and Other Cancers and Tumors	92,317	88,347	3,685	3,566
11	Other Respiratory and Heart Neoplasms	2,979	2,787	331	317
12	Other Digestive and Urinary Neoplasms	35,996	34,705	2,506	2,431
13	Other Neoplasms	74,708	72,171	5,197	5,089
14	Benign Neoplasms of Skin, Breast, Eye	112,246	109,729	9,993	9,800
15	Diabetes with Renal Manifestation	4,497	3,924	1,108	974
16	Diabetes with Neurologic or Peripheral Circulatory Manifesta	26,191	24,333	3,030	2,874
17	Diabetes with Acute Complications	8,575	7,891	1,463	1,399
18	Diabetes with Ophthalmologic Manifestation	17,896	17,079	2,134	2,059
19	Diabetes with No or Unspecified Complications	133,775	126,975	15,211	14,746
20	Type I Diabetes Mellitus	57,930	53,796	9,494	8,989
21	Protein-Calorie Malnutrition	12,123	9,934	1,296	1,173
22	Other Significant Endocrine and Metabolic Disorders	12,217	11,329	2,037	1,942
23	Disorders of Fluid/Electrolyte/Acid-Base Balance	88,118	78,984	9,507	8,891
24	Other Endocrine/Metabolic/Nutritional Disorders	311,103	301,371	29,185	28,533
25	End-Stage Liver Disease	1,725	1,491	507	448
26	Cirrhosis of Liver	3,165	2,884	1,066	1,006
27	Chronic Hepatitis	959	907	553	537
28	Acute Liver Failure/Disease	852	775	392	374

Table 4-3a (continued)

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
29	Other Hepatitis and Liver Disease	10,966	10,169	2,302	2,212
30	Gallbladder and Biliary Tract Disorders	19,218	18,008	2,510	2,407
31	Intestinal Obstruction/Perforation	24,791	22,373	2,736	2,597
32	Pancreatic Disease	8,503	7,846	1,740	1,643
33	Inflammatory Bowel Disease	6,064	5,773	1,027	1,000
34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal D	74,099	69,542	8,456	8,173
35	Appendicitis	1,305	1,227	253	246
36	Other Gastrointestinal Disorders	245,306	234,542	26,712	26,009
37	Bone/Joint/Muscle Infections/Necrosis	9,989	9,250	1,895	1,800
38	Rheumatoid Arthritis and Inflammatory Connective Tissue Dise	46,171	44,051	6,613	6,437
39	Disorders of the Vertebrae and Spinal Discs	95,243	91,613	11,826	11,548
40	Osteoarthritis of Hip or Knee	66,896	64,558	3,989	3,886
41	Osteoporosis and Other Bone/Cartilage Disorders	88,053	83,440	6,537	6,313
42	Congenital/Developmental Skeletal and Connective Tissue Diso	916	874	251	248
43	Other Musculoskeletal and Connective Tissue Disorders	337,554	322,165	38,666	37,696
44	Severe Hematological Disorders	6,857	5,885	883	806
45	Disorders of Immunity	6,389	5,638	1,373	1,267
46	Coagulation Defects and Other Specified Hematological Disord	30,204	28,135	2,985	2,824
47	Iron Deficiency and Other/Unspecified Anemias and Blood Dise	119,900	111,066	10,221	9,767
48	Delirium and Encephalopathy	15,246	13,596	2,674	2,571
49	Dementia	71,504	63,287	3,164	3,026
50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	9,078	8,263	1,598	1,554
51	Drug/Alcohol Psychosis	3,470	3,160	1,820	1,742
52	Drug/Alcohol Dependence	4,012	3,672	4,793	4,638
53	Drug/Alcohol Abuse, Without Dependence	13,560	12,684	6,394	6,200
54	Schizophrenia	6,374	5,992	15,241	15,046
55	Major Depressive, Bipolar, and Paranoid Disorders	26,396	24,664	12,725	12,432
56	Reactive and Unspecified Psychosis	16,677	14,738	1,343	1,305

Table 4-3a (continued)

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
57	Personality Disorders	908	838	890	872
58	Depression	37,161	34,926	7,459	7,257
59	Anxiety Disorders	6,245	5,959	1,903	1,870
60	Other Psychiatric Disorders	35,788	33,926	6,725	6,568
61	Profound Mental Retardation/Developmental Disability	154	145	1,015	1,006
62	Severe Mental Retardation/Developmental Disability	150	141	784	772
63	Moderate Mental Retardation/Developmental Disability	196	188	927	918
64	Mild/Unspecified Mental Retardation/Developmental Disability	1,348	1,261	5,818	5,751
65	Other Developmental Disability	505	473	356	348
66	Attention Deficit Disorder	173	164	242	240
67	Quadriplegia, Other Extensive Paralysis	1,202	1,031	1,422	1,379
68	Paraplegia	857	784	1,012	987
69	Spinal Cord Disorders/Injuries	9,771	8,988	2,038	1,971
70	Muscular Dystrophy	281	257	285	273
71	Polyneuropathy	26,624	25,001	4,410	4,184
72	Multiple Sclerosis	1,830	1,714	2,368	2,290
73	Parkinson's and Huntington's Diseases	19,037	17,424	899	861
74	Seizure Disorders and Convulsions	22,713	20,842	13,446	13,119
75	Coma, Brain Compression/Anoxic Damage	1,536	1,273	424	392
76	Mononeuropathy, Other Neurological Conditions/Injuries	51,311	49,378	8,113	7,921
77	Respirator Dependence/Tracheostomy Status	1,217	1,029	336	310
78	Respiratory Arrest	2,012	1,695	295	256
79	Cardio-Respiratory Failure and Shock	28,090	24,573	3,331	3,059
80	Congestive Heart Failure	154,606	140,101	10,596	9,899
81	Acute Myocardial Infarction	14,331	13,009	1,212	1,129
82	Unstable Angina and Other Acute Ischemic Heart Disease	45,936	43,178	4,519	4,318
83	Angina Pectoris/Old Myocardial Infarction	66,828	63,112	5,297	5,087
84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Diseas	161,218	152,077	8,589	8,252

Table 4-3a (continued)

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
85	Heart Infection/Inflammation, Except Rheumatic	4,924	4,493	651	601
86	Valvular and Rheumatic Heart Disease	94,384	88,048	6,148	5,850
87	Major Congenital Cardiac/Circulatory Defect	305	287	81	79
88	Other Congenital Heart/Circulatory Disease	4,255	3,997	631	603
89	Hypertensive Heart and Renal Disease or Encephalopathy	6,238	5,725	653	589
90	Hypertensive Heart Disease	43,890	42,311	3,080	3,008
91	Hypertension	424,755	410,253	33,160	32,261
92	Specified Heart Arrhythmias	118,529	109,653	4,489	4,239
93	Other Heart Rhythm and Conduction Disorders	73,561	69,693	5,655	5,437
94	Other and Unspecified Heart Disease	15,993	15,258	1,458	1,400
95	Cerebral Hemorrhage	6,656	6,038	688	649
96	Ischemic or Unspecified Stroke	56,391	51,308	3,893	3,699
97	Precerebral Arterial Occlusion and Transient Cerebral Ischem	57,019	54,145	2,753	2,649
98	Cerebral Atherosclerosis and Aneurysm	5,932	5,475	388	369
99	Cerebrovascular Disease, Unspecified	4,665	4,338	287	276
100	Hemiplegia/Hemiparesis	13,858	12,379	1,659	1,572
101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	1,780	1,643	1,746	1,712
102	Speech, Language, Cognitive, Perceptual Deficits	6,746	6,032	590	561
103	Cerebrovascular Disease Late Effects, Unspecified	17,047	15,474	1,216	1,144
104	Vascular Disease with Complications	24,239	22,129	2,397	2,247
105	Vascular Disease	125,956	116,580	7,631	7,296
106	Other Circulatory Disease	93,782	88,663	7,338	7,050
107	Cystic Fibrosis	395	380	97	94
108	Chronic Obstructive Pulmonary Disease	158,107	146,551	17,075	16,326
109	Fibrosis of Lung and Other Chronic Lung Disorders	19,794	18,233	2,317	2,210
110	Asthma	21,741	21,048	5,184	5,095
111	Aspiration and Specified Bacterial Pneumonias	10,855	8,880	1,276	1,149
112	Pneumococcal Pneumonia, Empyema, Lung Abscess	5,929	5,307	674	623

Table 4-3a (continued)

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
113	Viral and Unspecified Pneumonia, Pleurisy	74,527	67,723	8,334	7,924
114	Pleural Effusion/Pneumothorax	25,738	22,162	2,054	1,838
115	Other Lung Disorders	101,545	97,936	14,179	13,903
116	Legally Blind	3,200	2,872	580	561
117	Major Eye Infections/Inflammations	2,996	2,815	366	353
118	Retinal Detachment	5,963	5,734	500	474
119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	7,047	6,625	1,259	1,169
120	Diabetic and Other Vascular Retinopathies	42,997	40,977	3,185	3,025
121	Retinal Disorders, Except Detachment and Vascular Retinopath	90,843	86,994	1,783	1,734
122	Glaucoma	130,342	125,318	5,082	4,942
123	Cataract	367,281	354,053	9,422	9,100
124	Other Eye Disorders	86,455	83,066	14,321	14,044
125	Significant Ear, Nose, and Throat Disorders	10,946	10,435	1,160	1,132
126	Hearing Loss	42,792	40,912	3,065	3,003
127	Other Ear, Nose, Throat, and Mouth Disorders	293,058	281,871	43,518	42,541
128	Kidney Transplant Status	304	257	1,191	1,023
129	End Stage Renal Disease	.	.	.	.
130	Dialysis Status	341	289	124	108
131	Renal Failure	20,257	17,258	1,907	1,666
132	Nephritis	3,117	2,850	599	572
133	Urinary Obstruction and Retention	54,392	50,822	5,710	5,499
134	Incontinence	25,721	24,093	2,451	2,384
135	Urinary Tract Infection	152,451	142,504	15,800	15,301
136	Other Urinary Tract Disorders	71,134	66,905	6,319	6,094
137	Female Infertility	.	.	133	132
138	Pelvic Inflammatory Disease and Other Specified Female Genit	26,588	25,747	3,105	3,040
139	Other Female Genital Disorders	97,150	94,413	13,969	13,705
140	Male Genital Disorders	138,459	132,911	8,666	8,411

Table 4-3a (continued)

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
141	Ectopic Pregnancy	.	.	35	34
142	Miscarriage/Abortion	.	.	105	104
143	Completed Pregnancy With Major Complications	.	.	84	82
144	Completed Pregnancy With Complications	.	.	298	293
145	Completed Pregnancy Without Complications (Normal Delivery)	.	.	83	83
146	Uncompleted Pregnancy With Complications	.	.	75	71
147	Uncompleted Pregnancy With No or Minor Complications	.	.	308	305
148	Decubitus Ulcer of Skin	14,166	12,000	1,762	1,640
149	Chronic Ulcer of Skin, Except Decubitus	22,729	21,120	2,373	2,275
150	Extensive Third-Degree Burns	33	31	12	11
151	Other Third-Degree and Extensive Burns	341	321	142	139
152	Cellulitis, Local Skin Infection	87,604	82,103	11,701	11,290
153	Other Dermatological Disorders	268,145	258,199	22,394	21,922
154	Severe Head Injury	128	112	69	66
155	Major Head Injury	11,676	10,693	2,441	2,372
156	Concussion or Unspecified Head Injury	1,220	1,149	202	200
157	Vertebral Fractures	13,802	12,705	715	682
158	Hip Fracture/Dislocation	24,534	22,302	1,118	1,076
159	Major Fracture, Except of Skull, Vertebrae, or Hip	19,611	18,421	2,431	2,352
160	Internal Injuries	3,508	3,237	548	527
161	Traumatic Amputation	1,904	1,684	369	337
162	Other Injuries	183,107	174,746	29,856	29,160
163	Poisonings and Allegic Reactions	44,623	41,939	7,672	7,428
164	Major Complications of Medical Care and Trauma	32,933	30,284	4,221	4,007
165	Other Complications of Medical Care	15,798	14,893	2,039	1,948
166	Major Symptoms, Abnormalities	461,404	434,671	55,865	54,045
167	Minor Symptoms, Signs, Findings	220,301	212,909	23,596	23,118
168	Extremely Low Birthweight Neonates	4	3	2	2

Table 4-3a (continued)

Frequency of HCCs by Aged Versus Disabled

HCC	Label	Aged		Disabled	
		Frequency	Person Years	Frequency	Person Years
169	Very Low Birthweight Neonates	3	3	284	269
170	Serious Perinatal Problem Affecting Newborn	1,977	1,820	262	257
171	Other Perinatal Problems Affecting Newborn	1,656	1,536	6	6
172	Normal, Single Birth	17	16	.	.
174	Major Organ Transplant Status	357	336	481	444
175	Other Organ Transplant/Replacement	2,985	2,842	268	259
176	Artificial Openings for Feeding or Elimination	6,928	5,951	1,080	1,007
177	Amputation Status, Lower Limb/Amputation Complications	1,656	1,453	494	464
178	Amputation Status, Upper Limb	128	118	36	34
179	Post-Surgical States/Aftercare/Elective	184,340	175,126	12,768	12,304
180	Radiation Therapy	5,485	4,822	271	235
181	Chemotherapy	6,001	4,985	512	430
182	Rehabilitation	27,363	25,859	3,295	3,192
183	Screening/Observation/Special Exams	747,450	716,051	69,340	67,466
184	History of Disease	127,578	120,769	9,963	9,528
185	Oxygen	.	.	.	.
186	CPAP/IPPB/Nebulizers	.	.	.	.
187	Patient Lifts, Power Operated Vehicles, Beds	.	.	.	.
188	Wheelchairs, Commodes	.	.	.	.
189	Walkers	.	.	.	.

OUTPUT: D9PR14AB.out.

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-4

Payment Differences for the Disabled: Differences Included in Base Model

HCC	Incremental Payments	
	Elderly	Disabled
Opportunistic Infections (e.g., AIDS-, cancer-related)	$4,122	$8,013
Severe Hematological Disorders (e.g., hemophilia, sickle cell anemia)	$4,930	$9,690
Disorders of Immunity	$3,603	$4,706
Coagulation Defects and Other Hematological Disorders	$763	$2,762
Drug/Alcohol Psychoses	$1,183	$5,193
Drug/Alcohol Dependence	$1,183	$3,356
Schizophrenia	$2,239	$3,132
Multiple Sclerosis	$2,127	$4,212
Cystic Fibrosis	$1,826	$8,014

NOTE: From Table 4-2.

SOURCE: Health Economics Research, Inc.

Table 4-5

Descriptive Statistics for Beneficiaries with Selected Multiple Diagnoses

Diagnosis Combination	Frequency	1997 Person Years	1997 Mean Expenditures[1]	Std. Err. of the Mean[1]	Std. Dev.[1]	Coefficient of Variation[1]
DM *CHF	47,995	43,113	$15,962	$127	$26,402	165%
DM *COPD	33,786	30,938	14,745	144	25,345	172
DM *CVD	37,883	34,693	14,214	131	24,383	172
DM *VD	42,233	38,632	14,726	129	25,403	172
DM *CAD	77,314	71,867	12,398	85	22,692	183
CHF *COPD	53,053	47,024	16,253	124	26,927	166
CHF *CVD	39,744	35,077	16,014	141	26,337	164
CHF *VD	45,294	39,721	16,630	140	27,936	168
CHF *CAD	95,980	86,729	13,911	83	24,368	175
COPD*CVD	32,038	28,820	15,120	150	25,387	168
COPD*VD	39,004	35,018	15,273	143	26,729	175
COPD*CAD	69,864	63,950	13,446	96	24,175	180
CVD *VD	46,494	42,246	13,541	117	24,019	177
CVD *CAD	67,768	62,311	12,734	91	22,786	179
VD *CAD	72,150	66,036	13,414	95	24,294	181
DM *CHF *COPD	15,204	13,366	20,322	262	30,266	149
DM *CHF *CVD	13,554	11,885	19,668	272	29,626	151
DM *CHF *VD	15,683	13,621	20,783	269	31,350	151
DM *CHF *CAD	31,655	28,263	17,409	164	27,631	159
DM *COPD*CVD	8,402	7,461	19,675	336	29,042	148
DM *COPD*VD	10,349	9,195	20,031	317	30,397	152
DM *COPD*CAD	18,244	16,460	17,652	214	27,453	156
DM *CVD *VD	13,965	12,541	17,619	251	28,103	160
DM *CVD *CAD	20,513	18,616	16,528	195	26,617	161
DM *VD *CAD	22,906	20,715	17,341	195	28,064	162
CHF *COPD*CVD	13,688	11,776	20,071	274	29,774	148
CHF *COPD*VD	17,206	14,764	20,204	260	31,551	156
CHF *COPD*CAD	33,374	29,453	17,796	165	28,246	159
CHF *CVD *VD	16,160	13,942	19,049	254	30,050	158
CHF *CVD *CAD	27,133	23,924	17,212	178	27,550	160
CHF *VD *CAD	31,066	27,217	17,960	177	29,243	163
COPD*CVD *VD	13,104	11,551	17,933	267	28,642	160
COPD*CVD *CAD	18,783	16,752	17,348	212	27,449	158
COPD*VD *CAD	22,578	20,115	17,523	205	29,059	166
CVD *VD *CAD	26,169	23,644	15,596	171	26,247	168
RF*CHF	11,613	9,390	21,853	390	37,839	173
RF*DM	8,501	7,092	20,891	421	35,413	170
RF*CHF*DM	5,210	4,159	25,770	622	40,141	156

[1] Expenditures are annualized and weighted by the fraction of the year eligible.

NOTES:
DM= diabetes mellitus
CHF= congestive heart failure
COPD= chronic obstructive pulmonary disease
CVD= cerebrovascular disease
VD= vascular disease
CAD= coronary artery disease
RF=renal failure
Diagnoses assigned using Source=1-5.

OUTPUT: D9pr03h.cor and D9pr03h.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-6

Interactions Among Diagnoses: Interactions Included in Base Model

Diagnoses	Incremental Payment		
	Dx Sum[1]	Dx Interaction[2]	Total
Diabetes+CHF	$4,474	$1,036	$5,510
Diabetes+CVD	3,355	559	3,914
CHF+COPD	3,650	1,590	5,240
COPD+CVD+CAD	3,460	521	3,981
CHF+Renal Failure	4,311	1,435	5,746
Diabetes+CHF+Renal Failure[3]	8,094	4,151	12,245

NOTES:
CHF=congestive heart failure, CVD=cerebrovascular disease, COPD=chronic obstructive pulmonary disease, CAD=coronary artery disease.
From Table 4-2.

[1] Sum of individual effects of diagnoses. For the first two rows, diabetes is assumed to be "diabetes with circulatory manifestation", and for the last row diabetes is assumed to be "diabetes with renal manifestation".

[2] Interactive effect of diagnoses.

[3] Includes interactive effects of rows 1 and 5 as well as the three-way interactive effect.

SOURCE: Health Economics Research, Inc.

Table 4-7

Frequencies and Mean Expenditures by Validation Group

Group Label	Frequency	1997 Person Years	1997 Mean Expenditures[2]
ALL ENROLLEES	1,394,701	1,338,647	$5,314
Demographics			
AGED	1,238,205	1,181,767	5,413
DISABLED	162,629	154,665	4,559
FEMALE, <=34	7,622	6,919	3,650
FEMALE, 35-44	15,162	13,330	4,236
FEMALE, 45-54	20,316	17,554	4,812
FEMALE, 55-59	13,910	10,660	5,339
FEMALE, 60-64	17,019	13,128	6,252
FEMALE, 65-69	153,494	123,930	3,582
FEMALE, 70-74	225,947	174,769	4,240
FEMALE, 75-79	196,701	151,771	5,279
FEMALE, 80-84	147,547	112,884	6,374
FEMALE, 85-89	92,649	69,128	7,445
FEMALE, 90-94	43,172	31,136	8,095
FEMALE, 95 OR OLDER	14,971	10,909	7,434
MALE, <=34	12,020	10,874	3,305
MALE, 35-44	24,118	21,181	3,839
MALE, 45-54	29,337	25,460	4,068
MALE, 55-59	17,566	13,373	4,699
MALE, 60-64	21,445	16,408	5,377
MALE, 65-69	125,359	100,385	4,078
MALE, 70-74	169,401	129,841	4,839
MALE, 75-79	131,758	100,803	6,021
MALE, 80-84	82,691	62,353	7,189
MALE, 85-89	40,000	29,135	8,380
MALE,90-94	13,531	9,438	9,203
MALE, 95 OR OLDER	3,212	2,242	8,551
RACE = BLACK	58,863	56,823	5,118
RACE = OTHER	1,335,838	1,281,825	5,323
ORIGINALLY DISABLED, 1997	95,601	86,726	8,148
MEDICAID, 1996	209,897	200,394	7,277
Diagnoses, 1996[1]			
ANY 1996 CHRONIC CONDITION	975,795	931,308	6,569
DEPRESSION	72,781	68,504	9,976
ALCOHOL / DRUG DEPENDENCE	11,499	10,831	11,970
HYPERTENSIVE HEART/RENAL DISEASE	112,893	106,514	9,031
BENIGN/UNSPECIFIED HYPERTENSION	589,348	563,412	6,769
DIABETES WITH COMPLICATIONS	63,652	59,201	12,800
DIABETES WITHOUT COMPLICATIONS	200,951	189,919	9,035
HEART FAILURE / CARDIOMYOPATHY	155,673	140,855	12,797
ACUTE MYOCARDIAL INFARCTION	28,586	26,178	12,538
OTHER HEART DISEASE	347,618	327,338	8,950
CHRONIC OBSTRUCTIVE PULMONARY DISEASE	243,639	228,826	9,145
COLORECTAL CANCER	17,195	15,814	9,556
BREAST CANCER	29,749	28,316	6,619
LUNG/PANCREAS CANCER	11,311	9,120	15,437
OTHER STROKE	70,713	64,635	12,084
INTRACEREBRAL HEMORRHAGE	4,034	3,668	13,148
HIP FRACTURE	21,061	19,120	11,484
ARTHRITIS	270,140	258,628	7,393

Table 4-7 (continued)

Frequencies and Mean Expenditures by Validation Group

Group Label	Frequency	1997 Person Years	Mean Expenditures[2]
Multiple Diagnoses			
DIABETES, CORONARY ARTERY DISEASE	79,081	73,466	12,550
DIABETES, CEREBROVASCULAR DISEASE	39,666	36,292	14,445
HEART FAILURE, COPD	55,109	48,848	16,382
CORONARY ARTERY DISEASE, VASCULAR DISEASE	74,694	68,312	13,590
COPD, CORONARY ARTERY DISEASE	71,854	65,697	13,608
HEART FAILURE, RENAL FAILURE	12,103	9,809	21,902
DIABETES, HEART FAILURE, RENAL FAILURE	5,460	4,368	26,003
COPD, CEREBROVASCULAR DISEASE, CORONARY ARTERY DISEASE	19,958	17,768	17,514
DIABETES, CEREBROVASCULAR DISEASE, VASCULAR DISEASE	14,810	13,278	17,898
Expenditures			
FIRST (LOWEST) QUINTILE, 1996 EXPEND	278,939	270,960	1,885
SECOND QUINTILE, 1996 EXPEND	278,941	271,509	2,688
MIDDLE QUINTILE, 1996 EXPEND	278,940	270,259	3,886
FOURTH QUINTILE, 1996 EXPEND	278,940	268,646	5,686
FIFTH (HIGHEST) QUINTILE,1996 EXPEND	278,941	257,272	12,807
Top 5 percent 1996	69,736	61,743	20,610
Top 1 percent 1996	13,948	11,851	32,578
FIRST (LOWEST) QUINTILE, 1997 EXPEND	278,938	266,369	27
SECOND QUINTILE, 1997 EXPEND	278,941	274,039	284
MIDDLE QUINTILE, 1997 EXPEND	278,941	273,830	891
FOURTH QUINTILE, 1997 EXPEND	278,940	272,685	3,155
FIFTH (HIGHEST) QUINTILE,1997 EXPEND	278,941	251,724	23,534
No home health spending 1996	1,255,390	1,211,548	4,260
Home health spending > 0 1996	139,311	127,100	15,359
HHA spending>0:FIRST (LOWEST) QUINTILE, 1996	29,668	27,520	10,029
HHA spending>0:SECOND QUINTILE, 1996	29,196	27,042	10,626
HHA spending>0:MIDDLE QUINTILE, 1996	28,136	25,735	13,049
HHA spending>0:FOURTH QUINTILE, 1996	26,639	23,981	16,803
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1996	25,672	22,822	28,483
HHA spending>0: top 10% of HHA spending 1996	12,803	11,298	34,924
HHA spending>0: top 5% of HHA spending 1996	6,360	5,594	41,981
No home health spending 1997	1,236,031	1,190,677	3,122
Home health spending > 0 1997	158,670	147,971	22,949
HHA spending>0:FIRST (LOWEST) QUINTILE, 1997	31,494	30,493	14,737
HHA spending>0:SECOND QUINTILE, 1997	31,672	30,298	17,196
HHA spending>0:MIDDLE QUINTILE, 1997	31,724	29,811	20,778
HHA spending>0:FOURTH QUINTILE, 1997	31,802	28,957	25,865
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1997	31,978	28,412	37,205
HHA spending>0: top 10% of HHA spending 1997	15,968	14,129	43,641
HHA spending>0: top 5% of HHA spending 1997	7,987	7,061	51,024
No DME spending 1996	1,172,915	1,132,321	4,213
DME spending > 0 1996	221,786	206,327	11,356
DME spending>0:FIRST (LOWEST) QUINTILE, 1996	48,292	46,052	7,663
DME spending>0:SECOND QUINTILE, 1996	46,432	43,736	9,527
DME spending>0:MIDDLE QUINTILE, 1996	45,434	42,688	9,730
DME spending>0:FOURTH QUINTILE, 1996	42,830	39,446	12,711
DME spending>0:FIFTH (HIGHEST) QUINTILE,1996	38,798	34,405	19,087
DME spending>0: top 10% of DME spending 1996	19,888	17,528	20,944
DME spending>0: top 5% of DME spending 1996	9,623	8,400	24,313
No DME spending 1997	1,145,230	1,101,907	3,291

Table 4-7 (continued)

Frequencies and Mean Expenditures by Validation Group

Group Label	Frequency	1997 Person Years	Mean Expenditures[2]
DME spending > 0 1997	249,471	236,740	14,729
DME spending>0:FIRST (LOWEST) QUINTILE, 1997	49,913	49,152	8,504
DME spending>0:SECOND QUINTILE, 1997	50,125	48,732	12,486
DME spending>0:MIDDLE QUINTILE, 1997	49,746	47,770	12,054
DME spending>0:FOURTH QUINTILE, 1997	49,533	46,479	17,085
DME spending>0:FIFTH (HIGHEST) QUINTILE,1997	50,154	44,607	24,451
DME spending>0: top 10% of DME spending 1997	25,261	22,725	24,551
DME spending>0: top 5% of DME spending 1997	12,442	11,086	30,535
DME			
oxygen supplies/equipment (DME)	26,577	23,249	18,910
wheelchairs (DME)	37,573	33,734	17,258
walkers (DME)	28,579	26,352	13,327
HOSPITAL ADMISSIONS			
0 1996 HOSP ADMISSIONS	1,132,087	1,095,404	3,960
1 1996 HOSP ADMISSIONS	168,705	158,648	8,887
2 1996 HOSP ADMISSIONS	56,904	52,316	12,826
3+ 1996 HOSP ADMISSIONS	37,005	32,279	21,536
0 1997 HOSP ADMISSIONS	1,090,813	1,060,126	1,300
1 1997 HOSP ADMISSIONS	187,722	172,597	12,619
2 1997 HOSP ADMISSIONS	67,865	61,851	25,258
3+ 1997 HOSP ADMISSIONS	48,301	44,073	45,258

NOTES:

[1] Validation group diagnoses assigned using Source=1-6.

[2] Expenditures are annualized and weighted by the fraction of the year eligible.

OUTPUT: D9pr07aa.out and D9pr02vc.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-8

Predictive Ratios for Age/Sex, All HCC, and Base HCC Models

Group Label	1 Age/Sex	2 All HCC	3 Base HCC
ALL ENROLLEES	1.00	1.00	1.00
Demographics			
AGED	1.00	1.00	1.00
DISABLED	1.00	1.00	1.00
FEMALE, <=34	1.00	1.00	1.00
FEMALE, 35-44	1.00	1.00	1.00
FEMALE, 45-54	1.00	1.00	1.00
FEMALE, 55-59	1.00	1.00	1.00
FEMALE, 60-64	1.00	1.00	1.00
FEMALE, 65-69	1.00	1.00	1.00
FEMALE, 70-74	1.00	1.00	1.00
FEMALE, 75-79	1.00	1.00	1.00
FEMALE, 80-84	1.00	1.00	1.00
FEMALE, 85-89	1.00	1.00	1.00
FEMALE, 90-94	1.00	1.00	1.00
FEMALE, 95 OR OLDER	1.00	1.00	1.00
MALE, <=34	1.00	1.00	1.00
MALE, 35-44	1.00	1.00	1.00
MALE, 45-54	1.00	1.00	1.00
MALE, 55-59	1.00	1.00	1.00
MALE, 60-64	1.00	1.00	1.00
MALE, 65-69	1.00	1.00	1.00
MALE, 70-74	1.00	1.00	1.00
MALE, 75-79	1.00	1.00	1.00
MALE, 80-84	1.00	1.00	1.00
MALE, 85-89	1.00	1.00	1.00
MALE, 90-94	1.00	1.00	1.00
MALE, 95 OR OLDER	1.00	1.00	1.00
RACE = BLACK	0.99	1.04	1.04
RACE = OTHER	1.00	1.00	1.00
ORIGINALLY DISABLED, 1997	0.60	1.00	1.00
MEDICAID, 1996	0.71	1.00	1.00
Diagnoses 1996[1]			
ANY 1996 CHRONIC CONDITION	0.83	1.00	0.98
DEPRESSION	0.54	0.93	0.92
ALCOHOL / DRUG DEPENDENCE	0.39	0.96	0.97
HYPERTENSIVE HEART/RENAL DISEASE	0.61	0.96	0.95
BENIGN/UNSPECIFIED HYPERTENSION	0.81	0.99	0.96
DIABETES WITH COMPLICATIONS	0.42	0.96	0.96
DIABETES WITHOUT COMPLICATIONS	0.59	0.99	0.99
HEART FAILURE / CARDIOMYOPATHY	0.47	0.97	0.97
ACUTE MYOCARDIAL INFARCTION	0.45	0.97	0.98
OTHER HEART DISEASE	0.64	0.99	0.98
CHRONIC OBSTRUCTIVE PULMONARY DISEASE	0.59	0.99	0.99

Table 4-8 (continued)

Predictive Ratios for Age/Sex, All HCC, and Base HCC Models

Group Label	1 Age/Sex	2 All HCC	3 Base HCC
COLORECTAL CANCER	0.60	0.99	0.98
BREAST CANCER	0.79	1.07	1.08
LUNG/PANCREAS CANCER	0.35	0.91	0.90
OTHER STROKE	0.49	0.97	0.96
INTRACEREBRAL HEMORRHAGE	0.44	0.98	1.04
HIP FRACTURE	0.56	0.99	0.99
ARTHRITIS	0.76	0.97	0.91
Multiple Diagnoses			
DIABETES, CORONARY ARTERY DISEASE	0.44	0.96	0.98
DIABETES, CEREBROVASCULAR DISEASE	0.39	0.94	0.98
HEART FAILURE, COPD	0.36	0.93	0.98
CORONARY ARTERY DISEASE, VASCULAR DISEASE	0.43	0.97	0.97
COPD, CORONARY ARTERY DISEASE	0.42	0.97	0.99
HEART FAILURE, RENAL FAILURE	0.28	0.93	0.98
DIABETES, HEART FAILURE, RENAL FAILURE	0.22	0.88	0.98
COPD, CEREBROVASCULAR DISEASE, CORONARY ARTERY DISEASE	0.33	0.94	0.99
DIABETES, CEREBROVASCULAR DISEASE, VASCULAR DISEASE	0.32	0.95	0.99
Expenditures			
FIRST (LOWEST) QUINTILE, 1996 EXPEND	2.66	1.07	1.23
SECOND QUINTILE, 1996 EXPEND	1.93	1.15	1.23
MIDDLE QUINTILE, 1996 EXPEND	1.37	1.14	1.14
FOURTH QUINTILE, 1996 EXPEND	0.95	1.05	1.02
FIFTH (HIGHEST) QUINTILE,1996 EXPEND	0.44	0.89	0.86
Top 5 percent 1996	0.28	0.79	0.77
Top 1 percent 1996	0.17	0.69	0.69
FIRST (LOWEST) QUINTILE, 1997 EXPEND	187.82	96.78	104.22
SECOND QUINTILE, 1997 EXPEND	18.14	13.33	13.73
MIDDLE QUINTILE, 1997 EXPEND	5.94	5.74	5.71
FOURTH QUINTILE, 1997 EXPEND	1.72	2.01	1.97
FIFTH (HIGHEST) QUINTILE,1997 EXPEND	0.24	0.38	0.37
No home health spending 1996	1.23	1.09	1.10
Home health spending > 0 1996	0.39	0.77	0.75
HHA spending>0:FIRST (LOWEST) QUINTILE, 1996	0.58	1.02	0.99
HHA spending>0:SECOND QUINTILE, 1996	0.56	1.02	0.98
HHA spending>0:MIDDLE QUINTILE, 1996	0.46	0.91	0.88
HHA spending>0:FOURTH QUINTILE, 1996	0.36	0.77	0.75
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.22	0.47	0.46
HHA spending>0: top 10% of HHA spending 1996	0.18	0.39	0.39
HHA spending>0: top 5% of HHA spending 1996	0.15	0.34	0.33
No home health spending 1997	1.68	1.53	1.54
Home health spending > 0 1997	0.26	0.41	0.41
HHA spending>0:FIRST (LOWEST) QUINTILE, 1997	0.40	0.54	0.53
HHA spending>0:SECOND QUINTILE, 1997	0.34	0.48	0.47
HHA spending>0:MIDDLE QUINTILE, 1997	0.29	0.44	0.43
HHA spending>0:FOURTH QUINTILE, 1997	0.24	0.40	0.39
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1997	0.17	0.33	0.32
HHA spending>0: top 10% of HHA spending 1997	0.14	0.30	0.29
HHA spending>0: top 5% of HHA spending 1997	0.12	0.27	0.26
No DME spending 1996	1.25	1.08	1.09
DME spending > 0 1996	0.49	0.84	0.82
DME spending>0:FIRST (LOWEST) QUINTILE, 1996	0.72	0.99	0.94
DME spending>0:SECOND QUINTILE, 1996	0.59	0.94	0.89

Table 4-8 (continued)

Predictive Ratios for Age/Sex, All HCC, and Base HCC Models

Group Label	1 Age/Sex	2 All HCC	3 Base HCC
DME spending>0:MIDDLE QUINTILE, 1996	0.57	0.92	0.89
DME spending>0:FOURTH QUINTILE, 1996	0.44	0.84	0.82
DME spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.29	0.66	0.65
DME spending>0: top 10% of DME spending 1996	0.26	0.59	0.59
DME spending>0: top 5% of DME spending 1996	0.22	0.57	0.57
No DME spending 1997	1.60	1.40	1.41
DME spending > 0 1997	0.38	0.58	0.57
DME spending>0:FIRST (LOWEST) QUINTILE, 1997	0.65	0.79	0.76
DME spending>0:SECOND QUINTILE, 1997	0.45	0.60	0.58
DME spending>0:MIDDLE QUINTILE, 1997	0.46	0.67	0.65
DME spending>0:FOURTH QUINTILE, 1997	0.32	0.55	0.54
DME spending>0:FIFTH (HIGHEST) QUINTILE,1997	0.23	0.48	0.47
DME spending>0: top 10% of DME spending 1997	0.22	0.50	0.50
DME spending>0: top 5% of DME spending 1997	0.18	0.44	0.44
DME			
oxygen supplies/equipment (DME)	0.29	0.65	0.65
wheelchairs (DME)	0.34	0.69	0.68
walkers (DME)	0.45	0.88	0.84
HOSPITAL ADMISSIONS			
0 1996 HOSP ADMISSIONS	1.33	1.01	1.03
1 1996 HOSP ADMISSIONS	0.63	1.06	1.02
2 1996 HOSP ADMISSIONS	0.44	1.01	0.98
3+ 1996 HOSP ADMISSIONS	0.26	0.83	0.82
0 1997 HOSP ADMISSIONS	4.02	3.50	3.53
1 1997 HOSP ADMISSIONS	0.45	0.57	0.56
2 1997 HOSP ADMISSIONS	0.23	0.34	0.34
3+ 1997 HOSP ADMISSIONS	0.12	0.25	0.24

NOTES:

[1] Validation group diagnoses assigned using Source=1-6.

OUTPUT: D9pr07aa.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-9

Base HCC Model with Medicaid and Ever Disabled Factors Interacted with Age/Sex

Number of Observations:	1,394,701	
R-Square	0.1116	
Adjusted R-Square	0.1115	
Dependent Variable Mean:	5,314	
Root Mean Square Error:	13,029	
Model Parameters	162	
Computer Output:	D9pr03i.out	

Variable	Label	Parameter Estimate	t-ratio	Number of Observations for Interacted Categories[2]
	Age/Sex			
	Male, 0-34	681	2.95	--
	Male, 35-44	494	3.69	--
	Male, 45-54	763	7.53	--
	Male, 55-59	995	7.57	--
	Male, 60-64	1,441	12.52	--
	Male, 65-69	1,486	31.81	--
	Male, 70-74	1,921	47.46	--
	Male, 75-79	2,528	55.17	--
	Male, 80-84	3,098	53.79	--
	Male, 85-89	3,865	46.44	--
	Male, 90-94	4,682	32.21	--
	Male, 95+	4,042	13.21	--
	Female, 0-34	554	1.83	--
	Female, 35-44	655	3.69	--
	Female, 45-54	784	5.63	--
	Female, 55-59	917	5.41	--
	Female, 60-64	1,659	11.17	--
	Female, 65-69	1,165	28.24	--
	Female, 70-74	1,561	44.64	--
	Female, 75-79	2,166	57.26	--
	Female, 80-84	2,678	60.51	--
	Female, 85-89	3,441	60.18	--
	Female, 90-94	4,012	46.53	--
	Female, 95+	3,333	21.93	--
	Demographic Interactions			
	Male, 0-34* Medicaid	260	0.95	7,851
	Male, 35-44* Medicaid	679	3.76	11,866
	Male, 45-54* Medicaid	668	3.85	8,867
	Male, 55-59* Medicaid	1,120	4.33	3,676
	Male, 60-64* Medicaid	1,083	4.30	3,628
	Male, 65-69 * Medicaid	755	4.79	8,134
	Male, 70-74* Medicaid	1,137	7.63	8,957
	Male, 75-79* Medicaid	1,328	7.67	6,550
	Male, 80-84* Medicaid	1,349	6.35	4,410
	Male, 85-89* Medicaid	964	3.72	3,038
	Male, 89-94* Medicaid	1	0.00	1,349
	Male, 95+* Medicaid	268	0.38	443
	Female, 0-34* Medicaid	723	2.05	5,174
	Female, 35-44* Medicaid	917	3.99	8,133
	Female, 45-54* Medicaid	1,130	5.73	8,891

Table 4-9 (continued)

Base HCC Model with Medicaid and Ever Disabled Factors Interacted with Age/Sex

Variable	Label	Parameter Estimate	t-ratio	Number of Observations for Interacted Categories[2]
	Female, 55-59* Medicaid	1,435	5.63	5,004
	Female, 60-64* Medicaid	1,071	4.62	5,688
	Female, 65-69* Medicaid	1,089	9.12	15,509
	Female, 70-74* Medicaid	1,302	13.15	21,767
	Female, 75-79* Medicaid	935	9.03	19,827
	Female, 80-84* Medicaid	1,270	11.22	16,939
	Female, 85-89* Medicaid	312	2.40	13,354
	Female, 89-94* Medicaid	-401	-2.29	7,729
	Female, 95+* Medicaid	-195	-0.72	3,607
	Male, 65-69 * Originally Disabled	1,342	11.95	17,966
	Male, 70-74* Originally Disabled	1,391	11.28	13,552
	Male, 75-79* Originally Disabled	1,224	8.24	9,111
	Male, 80-84* Originally Disabled	761	3.69	4,657
	Male, 85-89* Originally Disabled	1,716	4.40	1,259
	Male, 89-94* Originally Disabled	-4,756	-0.40	1
	Male, 95+* Originally Disabled	0	.	0
	Female, 65-69* Originally Disabled	1,688	13.39	13,829
	Female, 70-74* Originally Disabled	1,581	11.65	10,839
	Female, 75-79* Originally Disabled	1,392	9.33	8,844
	Female, 80-84* Originally Disabled	1,217	6.75	6,003
	Female, 85-89* Originally Disabled	212	0.65	1,771
	Female, 89-94* Originally Disabled	23,911	2.09	2
	Female, 95+* Originally Disabled	29,519	2.27	1
HCC1	HIV/AIDS	2,705	8.08	--
HCC2	Septicemia/Shock	3,516	30.07	--
HCC3	Central Nervous System Infection	1,072	5.50	--
HCC4	Tuberculosis	687	2.93	--
HCC5	Opportunistic Infections	4,119	12.11	--
HCC6	Other Infectious Diseases	0	.	--
HCC7	Metastatic Cancer and Acute Leukemia	7,871	70.60	--
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	4,241	33.64	--
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	2,587	25.67	--
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	992	21.99	--
HCC11	Other Respiratory and Heart Neoplasms	0	.	--
HCC12	Other Digestive and Urinary Neoplasms	0	.	--
HCC13	Other Neoplasms	0	.	--
HCC14	Benign Neoplasms of Skin, Breast, Eye	0	.	--
HCC15	Diabetes with Renal Manifestation	4,085	19.78	--
HCC16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	2,644	27.84	-- --
HCC17	Diabetes with Acute Complications	2,157	15.05	--
HCC18	Diabetes with Ophthalmologic Manifestation	1,143	10.13	--
HCC19	Diabetes with No or Unspecified Complications	758	17.65	--
HCC20	Type I Diabetes Mellitus	1,975	29.49	--
HCC21	Protein-Calorie Malnutrition	3,193	24.57	--
HCC22	Other Significant Endocrine and Metabolic Disorders	1,199	10.49	--
HCC23	Disorders of Fluid/Electrolyte/Acid-Base Balance	0	.	--
HCC24	Other Endocrine/Metabolic/Nutritional Disorders	0	.	--
HCC25	End-Stage Liver Disease	5,152	17.28	--
HCC26	Cirrhosis of Liver	2,038	11.29	--
HCC27	Chronic Hepatitis	2,038	11.29	--
HCC28	Acute Liver Failure/Disease	0	.	--

Table 4-9 (continued)

Base HCC Model with Medicaid and Ever Disabled Factors Interacted with Age/Sex

Variable	Label	Parameter Estimate	t-ratio	Number of Observations for Interacted Categories[2]
HCC29	Other Hepatitis and Liver Disease	0	.	--
HCC30	Gallbladder and Biliary Tract Disorders	0	.	--
HCC31	Intestinal Obstruction/Perforation	2,216	25.67	--
HCC32	Pancreatic Disease	1,544	11.38	--
HCC33	Inflammatory Bowel Disease	1,328	8.34	--
HCC34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	1,066	21.71	-- --
HCC35	Appendicitis	0	.	--
HCC36	Other Gastrointestinal Disorders	0	.	--
HCC37	Bone/Joint/Muscle Infections/Necrosis	2,704	21.28	--
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1,515	25.40	-- --
HCC39	Disorders of the Vertebrae and Spinal Discs	0	.	--
HCC40	Osteoarthritis of Hip or Knee	0	.	--
HCC41	Osteoporosis and Other Bone/Cartilage Disorders	0	.	--
HCC42	Congenital/Developmental Skeletal and Connective Tissue Disorders	0	.	-- --
HCC43	Other Musculoskeletal and Connective Tissue Disorders	0	.	--
HCC44	Severe Hematological Disorders	4,926	28.46	--
HCC45	Disorders of Immunity	3,606	20.38	--
HCC46	Coagulation Defects and Other Specified Hematological Disorders	762	9.52	-- --
HCC47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	0	.	-- --
HCC48	Delirium and Encephalopathy	1,501	14.00	--
HCC49	Dementia	630	10.97	--
HCC50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	0	.	--
HCC51	Drug/Alcohol Psychosis	1,164	7.27	--
HCC52	Drug/Alcohol Dependence	1,164	7.27	--
HCC53	Drug/Alcohol Abuse, Without Dependence	0	.	--
HCC54	Schizophrenia	2,223	33.64	--
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	2,223	33.64	--
HCC56	Reactive and Unspecified Psychosis	639	11.35	--
HCC57	Personality Disorders	639	11.35	--
HCC58	Depression	639	11.35	--
HCC59	Anxiety Disorders	440	2.97	--
HCC60	Other Psychiatric Disorders	0	.	--
HCC61	Profound Mental Retardation/Developmental Disability	0	.	--
HCC62	Severe Mental Retardation/Developmental Disability	0	.	--
HCC63	Moderate Mental Retardation/Developmental Disability	0	.	--
HCC64	Mild/Unspecified Mental Retardation/Developmental Disability	0	.	--
HCC65	Other Developmental Disability	0	.	--
HCC66	Attention Deficit Disorder	0	.	--
HCC67	Quadriplegia, Other Extensive Paralysis	6,897	33.61	--
HCC68	Paraplegia	6,897	33.61	--
HCC69	Spinal Cord Disorders/Injuries	2,456	19.49	--
HCC70	Muscular Dystrophy	2,150	3.79	--
HCC71	Polyneuropathy	1,728	21.35	--
HCC72	Multiple Sclerosis	2,101	6.69	--
HCC73	Parkinson's and Huntington's Diseases	2,237	22.74	--
HCC74	Seizure Disorders and Convulsions	1,245	16.73	--
HCC75	Coma, Brain Compression/Anoxic Damage	3,167	9.81	--
HCC76	Mononeuropathy, Other Neurological Conditions/Injuries	0	.	--

Table 4-9 (continued)

Base HCC Model with Medicaid and Ever Disabled Factors Interacted with Age/Sex

Variable	Label	Parameter Estimate	t-ratio	Number of Observations for Interacted Categories[2]
HCC77	Respirator Dependence/Tracheostomy Status	7,704	33.13	--
HCC78	Respiratory Arrest	7,704	33.13	--
HCC79	Cardio-Respiratory Failure and Shock	3,386	39.82	--
HCC80	Congestive Heart Failure	1,824	34.81	--
HCC81	Acute Myocardial Infarction	1,386	32.88	--
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	1,386	32.88	--
HCC83	Angina Pectoris/Old Myocardial Infarction	1,386	32.88	--
HCC84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	930	25.20	-- --
HCC85	Heart Infection/Inflammation, Except Rheumatic	1,381	7.46	--
HCC86	Valvular and Rheumatic Heart Disease	1,055	22.27	--
HCC87	Major Congenital Cardiac/Circulatory Defect	763	1.12	--
HCC88	Other Congenital Heart/Circulatory Disease	0	.	--
HCC89	Hypertensive Heart and Renal Disease or Encephalopathy	481	2.90	--
HCC90	Hypertensive Heart Disease	212	3.36	--
HCC91	Hypertension	0	.	--
HCC92	Specified Heart Arrhythmias	880	19.93	--
HCC93	Other Heart Rhythm and Conduction Disorders	0	.	--
HCC94	Other and Unspecified Heart Disease	0	.	--
HCC95	Cerebral Hemorrhage	1,466	22.35	--
HCC96	Ischemic or Unspecified Stroke	1,466	22.35	--
HCC97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	704	12.30	-- --
HCC98	Cerebral Atherosclerosis and Aneurysm	704	12.30	--
HCC99	Cerebrovascular Disease, Unspecified	704	12.30	--
HCC100	Hemiplegia/Hemiparesis	2,429	20.38	--
HCC101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	1,088	4.80	--
HCC102	Speech, Language, Cognitive, Perceptual Deficits	512	5.54	--
HCC103	Cerebrovascular Disease Late Effects, Unspecified	512	5.54	--
HCC104	Vascular Disease with Complications	3,257	36.86	--
HCC105	Vascular Disease	1,252	30.40	--
HCC106	Other Circulatory Disease	0	.	--
HCC107	Cystic Fibrosis	1,819	43.30	--
HCC108	Chronic Obstructive Pulmonary Disease	1,819	43.30	--
HCC109	Fibrosis of Lung and Other Chronic Lung Disorders	885	9.46	--
HCC110	Asthma	434	5.31	--
HCC111	Aspiration and Specified Bacterial Pneumonias	4,208	30.58	--
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess	1,651	9.62	--
HCC113	Viral and Unspecified Pneumonia, Pleurisy	1,319	25.45	--
HCC114	Pleural Effusion/Pneumothorax	907	9.99	--
HCC115	Other Lung Disorders	0	.	--
HCC116	Legally Blind	0	.	--
HCC117	Major Eye Infections/Inflammations	0	.	--
HCC118	Retinal Detachment	0	.	--
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1,856	11.73	--
HCC120	Diabetic and Other Vascular Retinopathies	656	9.28	--
HCC121	Retinal Disorders, Except Detachment and Vascular Retinopathies	0	.	-- --
HCC122	Glaucoma	0	.	--
HCC123	Cataract	0	.	--
HCC124	Other Eye Disorders	0	.	--
HCC125	Significant Ear, Nose, and Throat Disorders	0	.	--
HCC126	Hearing Loss	0	.	--

Table 4-9 (continued)

Base HCC Model with Medicaid and Ever Disabled Factors Interacted with Age/Sex

Variable	Label	Parameter Estimate	t-ratio	Number of Observations for Interacted Categories[2]
HCC127	Other Ear, Nose, Throat, and Mouth Disorders	0	.	--
HCC128	Kidney Transplant Status	2,681	7.24	--
HCC129	End Stage Renal Disease	0	.	--
HCC130	Dialysis Status	13,942	21.24	--
HCC131	Renal Failure	2,489	18.34	--
HCC132	Nephritis	1,896	8.27	--
HCC133	Urinary Obstruction and Retention	0	.	--
HCC134	Incontinence	0	.	--
HCC135	Urinary Tract Infection	0	.	--
HCC136	Other Urinary Tract Disorders	0	.	--
HCC137	Female Infertility	0	.	--
HCC138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	0	.	-- --
HCC139	Other Female Genital Disorders	0	.	--
HCC140	Male Genital Disorders	0	.	--
HCC141	Ectopic Pregnancy	0	.	--
HCC142	Miscarriage/Abortion	0	.	--
HCC143	Completed Pregnancy With Major Complications	0	.	--
HCC144	Completed Pregnancy With Complications	0	.	--
HCC145	Completed Pregnancy Without Complications (Normal Delivery)	0	.	-- --
HCC146	Uncompleted Pregnancy With Complications	3,210	2.07	--
HCC147	Uncompleted Pregnancy With No or Minor Complications	917	1.22	--
HCC148	Decubitus Ulcer of Skin	4,304	36.94	--
HCC149	Chronic Ulcer of Skin, Except Decubitus	2,409	27.60	--
HCC150	Extensive Third-Degree Burns	6,359	3.18	--
HCC151	Other Third-Degree and Extensive Burns	0	.	--
HCC152	Cellulitis, Local Skin Infection	0	.	--
HCC153	Other Dermatological Disorders	0	.	--
HCC154	Severe Head Injury	4,124	4.22	--
HCC155	Major Head Injury	1,063	9.16	--
HCC156	Concussion or Unspecified Head Injury	0	.	--
HCC157	Vertebral Fractures	2,350	20.56	--
HCC158	Hip Fracture/Dislocation	1,051	11.89	--
HCC159	Major Fracture, Except of Skull, Vertebrae, or Hip	0	.	--
HCC160	Internal Injuries	0	.	--
HCC161	Traumatic Amputation[1]	3,689	17.26	--
HCC162	Other Injuries	0	.	--
HCC163	Poisonings and Allegic Reactions	0	.	--
HCC164	Major Complications of Medical Care and Trauma	1,062	14.14	--
HCC165	Other Complications of Medical Care	0	.	--
HCC166	Major Symptoms, Abnormalities	0	.	--
HCC167	Minor Symptoms, Signs, Findings	0	.	--
HCC168	Extremely Low Birthweight Neonates	0	.	--
HCC169	Very Low Birthweight Neonates	0	.	--
HCC170	Serious Perinatal Problem Affecting Newborn	0	.	--
HCC171	Other Perinatal Problems Affecting Newborn	0	.	--
HCC172	Normal, Single Birth	0	.	--
HCC173	Major Organ Transplant	0	.	--
HCC174	Major Organ Transplant Status	3,535	7.50	--
HCC175	Other Organ Transplant/Replacement	0	.	--
HCC176	Artificial Openings for Feeding or Elimination	2,275	14.04	--
HCC177	Amputation Status, Lower Limb/Amputation Complications[1]	3,689	17.26	--

Table 4-9 (continued)

Base HCC Model with Medicaid and Ever Disabled Factors Interacted with Age/Sex

Variable	Label	Parameter Estimate	t-ratio	Number of Observations for Interacted Categories[2]
HCC178	Amputation Status, Upper Limb	0	.	--
HCC179	Post-Surgical States/Aftercare/Elective	0	.	--
HCC180	Radiation Therapy	0	.	--
HCC181	Chemotherapy	0	.	--
HCC182	Rehabilitation	0	.	--
HCC183	Screening/Observation/Special Exams	0	.	--
HCC184	History of Disease	0	.	--
HCC185	Oxygen	0	.	--
HCC186	CPAP/IPPB/Nebulizers	0	.	--
HCC187	Patient Lifts, Power Operated Vehicles, Beds	0	.	--
HCC188	Wheelchairs, Commodes	0	.	--
HCC189	Walkers	0	.	--
D_HCC5	DISABLED*OPPORTUNISTIC INFECTIONS	3,897	5.68	--
D_HCC44	DISABLED*SEVERE HEMATOLOGICAL DISORDERS	4,776	9.56	--
D_HCC45	DISABLED*DISORDERS OF IMMUNITY	1,111	2.64	--
D_HCC46	DISABLED*COAGULATION DEFECTS	2,006	7.53	--
D_HCC51	DISABLED*DRUG/ALCOHOL PSYCHOSIS	4,043	11.37	--
D_HCC52	DISABLED*DRUG/ALCOHOL DEPENDENCE	2,211	8.72	--
D_HCC54	DISABLED* SCHIZOPHRENIA	919	7.13	--
D_HCC72	DISABLED* MULTIPLE SCLEROSIS	2,122	5.05	--
D_HCC107	DISABLED* CYSTIC FIBROSIS	6,169	4.58	--
INT1	DM *CHF	1,038	11.99	--
INT2	DM *CVD	560	6.32	--
INT3	CHF *COPD	1,590	18.75	--
INT4	COPD*CVD *CAD	524	4.55	--
INT5	RF*CHF	1,441	6.29	--
INT6	RF*CHF*DM	1,665	5.83	--

NOTES:

Diagnoses assigned using Source=1-5.

[1]Coefficients of HCCs 161 and 177 are constrained to be equal.

[2] Number of observations for interacted categories is person years

"|" means coefficients of HCCs are constrained to be equal.

DM= diabetes mellitus (HCCs 15-20)

CHF= congestive heart failure (HCC 80)

COPD= chronic obstructive pulmonary disease (HCC 108)

CVD= cerebrovascular disease (HCCs 95-103)

VD= vascular disease (HCCs 104-105)

CAD= coronary artery disease (HCCs 81-84)

RF=renal failure (HCC 131)

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 4-10

Mean Actual and Predicted Expenditures by Age and Sex for Working Aged

	Frequency	1997 Person Years	Actual Mean Payment	Mean Predicted Expenditures	Actual/ Predicted
Total	20,526	17,870	$945	$3,293	0.287
Male, Total	12,455	10,811	971	3,614	0.269
MALE <65[1]	229	120	1,064	5,652	0.188
MALE 65-69	5,768	5,071	781	3,177	0.246
MALE 70-74	3,950	3,482	1,040	3,537	0.294
MALE 75-79	1,786	1,536	1,173	4,325	0.271
MALE 80+	722	603	1,646	5,508	0.299
Female, Total	8,071	7,060	905	2,802	0.323
FEMALE <65[1]	63	27	1,685	5,698	0.296
FEMALE 65-69	3,774	3,300	709	2,402	0.295
FEMALE 70-74	2,664	2,343	772	2,772	0.278
FEMALE 75-79	1,118	1,000	1,190	3,398	0.350
FEMALE 80+	452	390	2,579	4,626	0.558

NOTES:

[1] Age is calculated as of January 1, 1997. People in this category turned 65 years old in 1997.
Weighting variable is WAM97AD/12 (taking both working and eligible months into account).

OUTPUT: D9pr23.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

5 Model Estimation and Validation with Additional Sources of Diagnoses

In Chapter 4, we estimated models based on diagnostic categories (HCCs) assigned from hospitals, physicians, and clinically-trained nonphysicians (psychologists, podiatrists, etc.). We found that these models generally performed well, but underpredicted the mean expenditures of some subgroups of beneficiaries, in particular those utilizing home health and durable medical equipment (DME) in the base year. One means of improving model performance may be to incorporate diagnoses from additional sources, or sites of care. For example, perhaps the expenditures of home health utilizers can be predicted more accurately if home health diagnoses are also used to assign diagnostic categories. If home health users also have doctor and hospital visits, and their diagnoses are recorded in these settings, one would expect little improvement from adding home health diagnoses. But if home health users do not have these other types of utilization, or if their complete diagnostic profiles are not recorded in other settings, then incorporating home health diagnoses could significantly improve model performance for this group. In this chapter, we calibrate models with alternative sources of diagnoses, and then evaluate their performance.

The potential benefit of additional sources of diagnoses is increased overall predictive power, and greater accuracy for particular subgroups of beneficiaries. We examine the magnitude of these benefits in the Medicare fee-for-service population in this chapter. There are potential benefits of collecting additional data types beyond

diagnoses for risk adjustment. First, these data can be valuable in profiling HMO costs, so that HMO cost data can be used in recalibrating future risk adjustment and payment models. If HMO coding and expenditure patterns are different from fee-for-service, recalibration using actual HMO data could be very important for payment accuracy. Second, additional data types are important for producing quality measures, many of which are based on whether certain types of care are being provided.

Adding sources of diagnoses also has disadvantages for Medicare managed care capitation payment. The most important disadvantage is that it may be costly to collect, process, and audit encounter data collection from additional sites of care. Not only must Medicare+Choice plans and providers incur the costs of recording, preparing, and submitting these additional encounter records (containing diagnoses) to HCFA, but HCFA would need to establish standards and procedures (including auditing) for collecting and processing the added information. The incremental benefits from using additional sources of diagnoses may not justify their costs.[1] A second disadvantage or question about additional sources of diagnoses is their clinical validity. Diagnoses established by clinicians or trained medical record personnel at hospitals or physicians' clinics are presumed to be more accurate than diagnoses submitted by home health agencies or DME suppliers in most instances. Strict Medicare rules defining diagnoses that are required in order for a beneficiary to be eligible for home health and DME may encourage these providers to code certain diagnoses in order to qualify for reimbursement

[1] Although we note that the size of the data flow from the alternative sources is relatively small compared to the flow from the very important physician source, which HCFA is already committed to collecting.

even if the patient has never been officially diagnosed for this condition by a clinician. Evaluating the data collection cost and clinical validity of alternative sources of diagnoses is beyond the scope of this report. But these costs/disadvantages of additional diagnosis sources should be kept in mind as we assess potential benefits in this chapter.

Another issue related to source of diagnoses is how sensitive predicted payments from the base risk adjustment model are to alternative sets of diagnoses. Medicare+Choice plans have different data systems and patterns of care. In practice, they are likely to submit diagnoses from somewhat different sites or types of care to HCFA. Ideally, the payment model would be relatively insensitive to variations in the types of diagnoses submitted. To analyze this issue, we conducted simulations of predicted payments with alternative sets of diagnoses, without recalibrating the parameters of the base payment model. Results of these simulations are reported in Section 5.3.

5.1 Alternative Models

Table 5-1 reviews the 9 categories (some with subcategories) into which we classified the diagnoses available on Medicare fee-for-service claims. The first 5 sources—hospital, physician, and clinically-trained nonphysician diagnoses--are the base set of diagnoses that we use to estimate our models, in particular our base prospective risk adjustment model, Model 5 of Table 4-2. For this analysis, we estimated our base model with six alternative sets of diagnoses:

1. Hospital and physicians only, excluding radiologists, anesthesiologists, and pathologists (RAPs) (Source = 1-3, 4a).
2. hospital, physician, clinically-trained nonphysician (base set of diagnoses; Sources 1-5);
3. Model 2 + home health agency (Source = 1-5, 6b);
4. Model 3 + skilled nursing facility (SNF), ambulatory surgery center (ASC), and hospice (Source = 1-6);
5. Model 4 + durable medical equipment (DME) (Source = 1-6 and 8a)[2]; and
6. Model 5 + clinical laboratory, radiology/imaging clinics, miscellaneous (includes all diagnoses, Source = 1-9).

Model 2 uses our base set of diagnoses, and is the baseline that other models should be compared to. Model 1 is the only model variant estimated with fewer diagnoses than our base model. It was motivated by concern that the diagnoses of radiologists, anesthesiologists, and pathologists (RAPs) may be less clinically valid in general than those of other physicians because RAPs are less likely to spend "face-to-face" time with patients. In addition, larger proportions of "rule out" diagnoses may appear on the claims of radiologists and pathologists in particular. Model 1 also excludes the diagnoses of clinically-trained nonphysicians—which may be less reliable--from the base set of diagnoses. Models 3-6 cumulatively add sources of diagnoses to the base set.

5.2 Results

Table 5-2 presents estimates of Models 2-6 defined in the previous section. Table 5-3 contains estimates of Model 1 together with Model 2 for comparison. Percentage of

[2] We also examined including DME diagnoses from Part B claims (Source 8b), but there were very few. For simplicity, we excluded these from our analyses.

individual expenditure variation (R-square) predicted by the alternative models is summarized in Table 5-4. Predictive ratios for the 6 models are shown in Table 5-5.

5.2.1 Excluding RAP and Clinically-Trained Nonphysician Diagnoses

Excluding radiologist, anesthesiologist, and pathologist (RAP) and clinically-trained nonphysician diagnoses from the base set of diagnoses reduces predictive power by a small, but detectable amount. The R-square falls from 11.15 percent to 11.03 percent (Table 5-4). This indicates that RAP and clinically-trained nonphysician diagnoses contain information not duplicated in other hospital or physician diagnoses that is useful in predicting future expenditures. But the gain in predictive accuracy is small enough that incurring substantial expenditures to obtain these diagnoses may not be warranted. On the other hand, it may be more expensive and complex in practice to exclude RAP diagnoses rather than to simply collect all physician diagnoses.

In general, the coefficient estimates of Model 1 are larger than those of Model 2 (Table 5-3). The smaller set of diagnoses of Model 1 appears to identify a smaller number of more severely ill beneficiaries. Most likely some of the RAP diagnoses reflect false positive values that are eventually ruled out. There are few differences in predictive accuracy by Medicare subgroup when the diagnoses are restricted to the Model 1 set (Table 5-5). Evaluating the clinical validity of the diagnoses excluded from Model 1 (RAP, clinically-trained nonphysician) is beyond the scope of this report. Therefore, we can reach no firm conclusions on whether excluding these diagnoses is appropriate other than to note that the impact of including them on predictive power is relatively small.

5.2.2 Adding Home Health Diagnoses

Adding home health agency diagnoses to the base set increases predictive power by a sizeable one-half percentage point, from 11.15 percent to 11.65 percent (Table 5-4). Apparently a substantial number of home health utilizers are not receiving duplicative diagnoses in other settings such as the hospital and physician office. There is no marked general difference in coefficient estimates by diagnostic category (HCC) when home health diagnoses are added (compare Models 1 and 2 in Table 5-2). Coefficients appear to be randomly higher or lower by HCC, indicating that home health diagnoses are identifying more beneficiaries of similar cost levels to those identified by hospital and physician diagnoses. One exception is HCC 148, Decubitus Ulcer of Skin, which has nearly a $1,000 higher coefficient when home health diagnoses are included.

The 25 most frequent diagnoses on home health claims are shown in Table 5-6. Some notable frequent diagnoses are heart failure, osteoarthritis, coronary atherosclerosis, chronic obstructive pulmonary disease (emphysema/chronic bronchitis), diabetes, and stroke (cerebrovascular accident). These diagnoses are unremarkable, but we did not attempt to validate them (e.g., against non-home health diagnoses). It is perhaps surprising that DxGroup 96.02 "cerebrovascular accident, unspecified" is so common since this is an acute stroke diagnosis. More likely, home health care is for the sequelae of stroke, and this diagnosis is miscoded (ICD-9-CM includes diagnosis codes for the "late effects" of stroke that should be coded for non-acute care).

Adding home health diagnoses improves the base model's predictive accuracy for home health utilizers, but not dramatically. Among all beneficiaries utilizing home

health in the base year, the percentage of mean total expenditures predicted by the model rises from 75 percent to 79 percent when home health diagnoses are added to hospital and physician diagnoses. Among beneficiaries with the highest 5 percent of prior year home health spending, the percentage of total expenditures predicted increases from 33 percent to 37 percent. The gains in predictive accuracy for beneficiaries grouped by total prior year expenditures are even smaller. For example, the percentage of mean total expenditure variation predicted rises from 86 percent to 88 percent for the top quintile of prior year spenders when home health diagnoses are added. Overall, adding home health diagnoses results in a noticeable, but not dramatic gain of the predictive accuracy of the base model.

5.2.3 Adding SNF, ASC, and Hospice Diagnoses

Adding skilled nursing facility (SNF), ambulatory surgery center (ASC), and hospice diagnoses to the base set plus home health diagnoses results in no increase in explanatory power for individuals (no change in R-square, Table 5-4). There is also no change in predictive accuracy for groups (no change in predictive ratios, Table 5-5). Differences in parameter estimates (Table 5-2) are inconsequential. Any information in SNF, ASC or hospice diagnoses with predictive value is duplicated in the base set of diagnoses or home health diagnoses. There appears to be no justification for incurring the expense of collecting diagnoses from these sites of care for risk adjustment. However, it may still be desirable to collect data on these patient encounters for model recalibration or computation of quality measures.

5.2.4 Adding Durable Medical Equipment Diagnoses

Adding durable medical equipment (DME) diagnoses, on the other hand, does improve predictive power by a noticeable amount (Table 5-4). The R-square rises from 11.65 percent to 11.85 percent. At least some DME utilizers are not receiving duplicative hospital, physician, or other facility (home health, SNF, ASC, hospice) diagnoses. The biggest difference in coefficient estimates (Table 5-2) is a lower estimate for HCCs 67 and 68 Quadriplegia and Paraplegia (whose coefficients are constrained to be equal to preserve monotonicity) when DME diagnoses are included. DME diagnoses identify more beneficiaries with these paralytic conditions, but the newly identified people have lower future costs than those identified through diagnoses on other claims. The 25 most frequent diagnoses on DME claims are shown in Table 5-7. Many diagnoses are also among the most frequent home health diagnoses (Table 5-6), including chronic obstructive pulmonary disease (emphysema/chronic bronchitis), osteoarthritis, diabetes, heart failure, and stroke (cerebrovascular accident).

Adding DME diagnoses improves predictive accuracy for prior year DME utilizers by a detectable, but small amount. For all prior year DME utilizers, the percentage of mean total expenditures predicted rises from 84 percent to 87 percent when DME diagnoses are included (Table 5-5). For the highest prior year DME utilizers the percentage of mean total expenditures predicted increases from 59 percent to 64 percent. Accuracy also improves for beneficiaries using particular types of DME. For example, among beneficiaries receiving wheelchairs in the base year, the percentage of mean total expenditures predicted grows from 72 percent to 77 percent when DME diagnoses are

added. The prediction of mean total expenditures for base year home health utilizers is also slightly improved by adding DME diagnoses. For example, the predictive ratio for the highest prior year home health utilizers increases from 37 percent to 39 percent. However, only very slight improvement in prediction across total expenditure quantiles occurs when DME diagnoses are added (Table 5-5). Overall, adding DME diagnoses results in a detectable, but small improvement in expenditure prediction.

5.2.5 Adding All Other Diagnoses

Adding the remaining diagnoses (Model 6) actually reduces the percentage of individual expenditure variation predicted slightly (Table 5-4). The R-square falls from 11.85 percent to 11.82 percent. The diagnoses added in Model 6 include clinical laboratory and radiology/imaging clinics, which may contain many rule out, false positive, etc. diagnoses that are inaccurate, or codes assigned by clinically-trained nonphysicians. Including these diagnoses in risk adjustment should be avoided.

5.3 Implications of Including or Omitting Diagnoses for Predicted Payments

This section examines the implications of erroneously including or omitting sets of diagnoses when calculating payments using the base prospective risk adjustment model (Model 5 of Table 4-2). Since Medicare+Choice plans may differ in practice settings and use of different provider specialties, one would expect variation in sources of diagnoses, even if there is no "gaming" to take advantage of the particular features of a

risk adjustment payment system. A desirable feature of a payment model is that the level of payments is relatively insensitive to variations in what diagnoses are included or omitted. Therefore, it is informative to consider the magnitude of the overpayment problem when diagnoses are included and underpayment when diagnoses are omitted. In practice, it may be unlikely that ALL diagnoses from a setting would be erroneously included or excluded. The simulations in this section establish upper or lower bounds for misreporting effects.

To address the misreporting issue, a series of simulations was performed adding or omitting sets of diagnoses when calculating predicted payments. Sets of diagnoses were added or excluded as previously defined in Section 5.1, and new diagnostic categories (HCCs) assigned to each person in light of the set of diagnoses considered. In all simulations, the parameters from the base payment model were used to calculate payments for demographic and diagnostic (HCC) variables. Demographic variables remain unchanged. The only changes made were in the assignment of HCCs. As in the base model, hierarchies and exclusions are made, and interactions between HCCs and disability status are also calculated. All simulations shown in this section did NOT recalibrate payment (regression) coefficients using the different diagnostic information.

Table 5-8 presents the results at an aggregate level for the inclusion and omission of various sets of diagnoses. The first column assigns each simulation a run number, while the second column lists the sources of diagnoses that are included in the simulation run. The Description column summarizes how the run differs from the base model, with each set of diagnoses excluded sequentially, rather than one at a time. The fourth column

shows the predicted payments, which as just described reflect payment parameters for the base model with HCCs recalculated using the diagnostic information shown. The final column expresses predicted payments as a ratio of the simulation run prediction to the base model prediction. Note that these are NOT predictive ratios, as used extensively elsewhere in this report. Rather, they are the ratio of predicted payments using the current set of diagnoses divided by predicted payments using the original, base model. Ratios greater than one indicate overpayment relative to the base model, while numbers less than one indicate underpayment relative to the base model. A ratio of one would indicate that payments are unaffected by including or omitting diagnoses, and that total payments remain $5,314.

A reassuring result is that predictions are relatively insensitive to whether diagnoses that appear on home health agency (HHA), or skilled nursing facility plus ambulatory surgery center claims are erroneously included, with predicted payments increasing by 1 and 2 percent respectively. Adding in diagnoses that appear on medical supplies/DME claims has a slightly greater further effect, raising predicted payments to 4 percent above the base level prediction. The "kitchen sink" approach of including any diagnosis regardless of its source increases payment to 7 percent above the base level amount, which is $246. Readers may differ on whether a potential 7 percent overpayment is a large or small amount. Our own interpretation is that 7 percent is a relatively small increment, given the magnitude of claims diagnoses that are being incorrectly included while calculating risk scores.

The bottom half of Table 5-8 simulates the impact of selectively omitting diagnoses when calculating payments. Omitting only diagnoses that are coded by clinically-trained nonphysicians reduces predictions by 2 percent, a relatively small reduction. Payments are much more dramatically affected by omitting all of the diagnoses that are coded by physicians, which reduces payments to $3,682, or 69 percent of the baseline prediction. Omitting hospital outpatient department diagnoses reduces payments by another 10 percent, to $3,133 (59 percent of base predictions). From this point on, dropping additional sets of diagnoses has relatively little impact. Dropping all secondary inpatient diagnoses reducing predicted payments to $2,560, 48 percent of the base model prediction. Note that in this case predicted payments are based only on principal inpatient room and board claims. Even when no diagnoses are used for calculating payments (and predictions are based on demographic factors only), predictions remain 43 percent of the base model level.

Table 5-9 provides an in-depth view of how including or omitting selected classes of diagnoses affects payments not only in aggregate, but also for the various validation groups that have been identified. In this table, the first two columns describe the validation groups, and the next two columns summarize mean actual and mean predicted payments from each validation group using parameters from the base model. The last 10 columns of Table 5-9 present the results of simulating each of the 10 simulation runs in ratio terms. The numerator of each ratio is the mean predicted payments for each run and for each validation group, while the denominator of each ratio is the mean prediction for the base model.

These detailed results by validation group reveal that including or omitting sets of diagnoses have a remarkably similar impact on many different Medicare subgroups. Adding only home health agency (HHA) diagnoses on average increases payments by 1 percent in the entire sample, but increases them by 3 percent for males and females aged 95 and older, and by as much as 3 percent for various quintiles of spending or selected chronic conditions. Adding HHA diagnoses is particularly effective at increasing payments to persons with significant HHA spending, as would be expected, increasing payments for selected high cost groups by as much as 12 percent. As further diagnoses are included, predicted spending in all groups rises, however there is considerable uniformity in predicted payments across diverse subsets of the population.

Simulations in which sets of diagnoses are omitted when predicting payments are shown in the last 5 columns of Table 5-9. Here again there is considerable similarity in the impact of omitting diagnoses on predicted payments by the various validation groups. The simulation using simulation 6, which omits providers who are clinically-trained nonphysicians, shows payments for every group that range from 94 percent to 100 percent of the base prediction, with an average of 98 percent. This seems to us to be a fairly tight range.

The final column of Table 5-9 is interesting in that it displays the magnitude of payments even if payments are based solely on the demographic characteristics of a population subsample rather than on both demographic and diagnostic information. Payments to the disabled Medicare population are noticeably more dependent on diagnostic payments than payments to aged Medicare enrollees, with the demographic

component being 28 percent of total for disabled sample versus 45 percent for the aged sample. Somewhat surprising is that the demographic component is higher for older age groups than for younger groups. For instance the demographic component contributes 50 percent of the total for males, aged 90-94, versus only 41 percent for females aged 65-69, and 23 percent for males aged 25-34. Apparently, spending that is not predicted by various chronic conditions play a larger role in the health costs of the oldest old than spending in younger groups. Not surprising is that diagnostic information plays a much larger role in various high expenditure quintiles and groups defined by chronic conditions, where spending predicted by demographics is estimated at only 7 to 12 percent for some validation groups.

Overall, we see these simulations as encouraging. Our assessment is that payments are moderately, not severely, affected by changes in the information used. Increases on the order of 1 or 2 percent occur from including home health, nursing facility and ambulatory surgery center diagnoses. Of course, a 7 percent overpayment is of concern if plans were to be allowed to include diagnoses appearing on all types of claims, but presumably this type of massive reclassifying would be subject to audit. Ignoring claims by all non-clinicians reduces payments by only 2 percent, a relatively modest impact. Excluding all physician claims has a dramatic effect and disproportionately affects certain chronic diseases, but it would be surprising if this were not true. We take the moderate sensitivity of predictions to rather broad simulations using different sets of diagnoses as a sign that we have successfully excluded some of the less serious, discretionary, and prevalent diagnoses from our DCG/HCC payment model.

Table 5-1

Classification of Sources of Diagnoses

Source Number	Sites of Care/Claim Type
1	hospital inpatient—principal diagnoses
2	hospital inpatient—secondary diagnoses
3	hospital outpatient department
4	physician
4a	physicians, excluding RAPs
4b	radiologist, anesthesiologist, pathologist (RAPs)
5	clinically-trained nonphysician (e.g., psychologist, therapist, podiatrist)
6	facility types
6a	ambulatory surgery center
6b	home health agency
6c	skilled nursing facility
6d	hospice
7	diagnostic testing
7a	non-laboratory, e.g., radiology imaging clinics
7b	clinical laboratory
8	durable medical equipment/medical supplies
8a	DME diagnosis from DME Standard Analytic File
8b	DME diagnosis from Part B file
9	other/miscellaneous

SOURCE: Health Economics Research, Inc.

Table 5-2

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

	Base				
	2	3	4	5	6
	Diagnoses Used for Estimation Added Cumulatively				
	Hosp, MD[1]	HHA[2]	SNF,ASC,HSP[3]	DME[4]	All Dxs[5]
Number of Observations:	1,394,701	1,394,701	1,394,701	1,394,701	1,394,701
R-Square	0.1115	0.1165	0.1165	0.1185	0.1182
Adjusted R-Square	0.1114	0.1164	0.1165	0.1184	0.1181
Dependent Variable Mean:	5,314	5,314	5,314	5,314	5,314
Root Mean Square Error:	13,030	12,993	12,993	12,978	12,980
Model Parameters	127	127	127	127	127
Computer Output:	D9pr03g.out	D9pr02za.prt	D9pr02xa.prt	D9pr02va.out	D9pr02ya.prt

Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
	Demographics										
	Male, 0-34	$211	1.63	$211	1.64	$216	1.67	$200	1.56	$185	1.44
	Male, 35-44	360	3.79	339	3.58	342	3.61	317	3.35	299	3.16
	Male, 45-54	676	8.01	626	7.44	630	7.49	600	7.14	575	6.84
	Male, 55-59	1,042	9.14	988	8.69	991	8.71	940	8.28	931	8.19
	Male, 60-64	1,468	14.25	1,406	13.69	1,410	13.72	1,365	13.30	1,344	13.08
	Male, 65-69	1,462	34.14	1,451	34.00	1,454	34.05	1,463	34.31	1,443	33.80
	Male, 70-74	1,932	50.69	1,900	49.99	1,903	50.07	1,902	50.10	1,879	49.39
	Male, 75-79	2,536	58.59	2,474	57.33	2,477	57.40	2,468	57.24	2,440	56.48
	Male, 80-84	3,080	56.53	2,971	54.67	2,974	54.72	2,946	54.25	2,916	53.63
	Male, 85-89	3,883	49.59	3,707	47.47	3,704	47.43	3,648	46.76	3,620	46.35
	Male, 90-94	4,557	33.64	4,334	32.07	4,325	32.01	4,194	31.07	4,158	30.79
	Male, 95+	3,919	14.21	3,613	13.13	3,608	13.11	3,456	12.57	3,440	12.51
	Female, 0-34	403	2.51	401	2.50	409	2.55	418	2.61	420	2.62
	Female, 35-44	648	5.53	617	5.28	623	5.34	634	5.43	614	5.26
	Female, 45-54	880	8.63	818	8.04	825	8.11	820	8.08	797	7.84
	Female, 55-59	1,134	8.84	1,053	8.23	1,061	8.29	1,026	8.02	1,007	7.87
	Female, 60-64	1,724	14.89	1,632	14.13	1,640	14.20	1,607	13.93	1,595	13.82
	Female, 65-69	1,212	31.57	1,187	30.99	1,190	31.07	1,194	31.21	1,175	30.66
	Female, 70-74	1,613	48.98	1,564	47.65	1,567	47.75	1,561	47.59	1,539	46.83
	Female, 75-79	2,165	61.00	2,081	58.78	2,083	58.85	2,061	58.26	2,037	57.46
	Female, 80-84	2,716	65.95	2,580	62.77	2,581	62.81	2,533	61.67	2,499	60.71
	Female, 85-89	3,305	63.13	3,106	59.41	3,104	59.38	3,022	57.81	2,984	56.99
	Female, 90-94	3,710	48.43	3,455	45.16	3,448	45.08	3,293	43.05	3,234	42.21
	Female, 95+	2,984	23.52	2,720	21.48	2,715	21.44	2,485	19.63	2,398	18.92
	Prior Year Medicaid	927	26.74	845	24.42	843	24.38	749	21.67	724	20.92
	Originally Disabled	1,392	29.41	1,284	27.20	1,285	27.21	1,201	25.46	1,209	25.63

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC1	HIV/AIDS	2,676	7.99	2,720	8.16	2,755	8.28	2,769	8.42	2,720	8.84
HCC2	Septicemia/Shock	3,518	30.09	3,246	28.07	3,175	27.52	3,009	26.63	2,794	25.75
HCC3	Central Nervous System Infection	1,075	5.51	1,152	6.07	1,109	5.87	1,144	6.46	1,185	6.94
HCC4	Tuberculosis	693	2.96	757	3.27	760	3.28	772	3.49	646	3.07
HCC5	Opportunistic Infections	4,122	12.12	4,043	12.03	3,975	11.89	4,001	12.05	4,000	12.47
HCC6	Other Infectious Diseases	0	.	0	.	0	.	0	.	0	.
HCC7	Metastatic Cancer and Acute Leukemia	7,871	70.60	7,855	71.37	7,834	71.32	7,503	70.05	7,401	70.25
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	4,237	33.61	4,210	33.68	4,188	33.55	4,263	34.54	4,148	34.49
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	2,587	25.67	2,601	26.04	2,587	25.92	2,501	25.37	2,446	25.50
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	990	21.95	1,023	22.82	1,024	22.87	994	22.43	942	21.77
HCC11	Other Respiratory and Heart Neoplasms	0	.	0	.	0	.	0	.	0	.
HCC12	Other Digestive and Urinary Neoplasms	0	.	0	.	0	.	0	.	0	.
HCC13	Other Neoplasms	0	.	0	.	0	.	0	.	0	.
HCC14	Benign Neoplasms of Skin, Breast, Eye	0	.	0	.	0	.	0	.	0	.
HCC15	Diabetes with Renal Manifestation	4,098	19.84	3,988	19.51	4,036	19.77	4,015	19.93	3,853	19.99
HCC16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	2,650	27.91	2,530	26.87	2,533	26.90	2,418	25.81	2,386	25.72
HCC17	Diabetes with Acute Complications	2,167	15.12	2,255	16.18	2,253	16.17	1,950	15.02	1,755	14.26
HCC18	Diabetes with Ophthalmologic Manifestation	1,148	10.17	1,065	9.47	1,088	9.68	1,032	9.10	988	8.69
HCC19	Diabetes with No or Unspecified Complications	764	17.80	658	15.35	663	15.46	613	14.22	500	11.98
HCC20	Type I Diabetes Mellitus	1,982	29.59	2,056	30.99	2,036	30.70	1,942	29.72	1,927	30.42
HCC21	Protein-Calorie Malnutrition	3,185	24.50	3,167	25.12	3,072	24.51	2,868	23.12	2,786	23.29
HCC22	Other Significant Endocrine and Metabolic Disorders	1,197	10.47	1,174	10.37	1,174	10.40	1,247	11.42	1,298	13.03
HCC23	Disorders of Fluid/Electrolyte/Acid-Base Balance	0	.	0	.	0	.	0	.	0	.
HCC24	Other Endocrine/Metabolic/Nutritional Disorders	0	.	0	.	0	.	0	.	0	.
HCC25	End-Stage Liver Disease	5,157	17.30	5,038	17.12	4,921	16.81	4,956	17.04	4,965	17.50
HCC26	Cirrhosis of Liver	2,041	11.31	2,093	11.69	2,084	11.65	2,071	11.60	1,988	11.54
HCC27	Chronic Hepatitis	2,041	11.31	2,093	11.69	2,084	11.65	2,071	11.60	1,988	11.54
HCC28	Acute Liver Failure/Disease	0	.	0	.	0	.	0	.	0	.
HCC29	Other Hepatitis and Liver Disease	0	.	0	.	0	.	0	.	0	.
HCC30	Gallbladder and Biliary Tract Disorders	0	.	0	.	0	.	0	.	0	.
HCC31	Intestinal Obstruction/Perforation	2,219	25.71	2,209	26.01	2,178	25.68	2,111	25.14	2,146	25.72
HCC32	Pancreatic Disease	1,543	11.38	1,596	11.98	1,600	12.03	1,617	12.32	1,607	12.66
HCC33	Inflammatory Bowel Disease	1,324	8.32	1,428	9.08	1,430	9.12	1,341	8.62	1,303	8.54
HCC34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	1,067	21.75	1,120	23.10	1,116	23.04	1,085	22.49	1,026	21.85

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC35	Appendicitis	0	.	0	.	0	.	0	.	0	.
HCC36	Other Gastrointestinal Disorders	0	.	0	.	0	.	0	.	0	.
HCC37	Bone/Joint/Muscle Infections/Necrosis	2,705	21.29	2,690	21.55	2,647	21.24	2,535	20.82	2,574	21.43
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1,520	25.48	1,629	27.70	1,625	27.64	1,634	28.16	1,564	28.26
HCC39	Disorders of the Vertebrae and Spinal Discs	0	.	0	.	0	.	0	.	0	.
HCC40	Osteoarthritis of Hip or Knee	0	.	0	.	0	.	0	.	0	.
HCC41	Osteoporosis and Other Bone/Cartilage Disorders	0	.	0	.	0	.	0	.	0	.
HCC42	Congenital/Developmental Skeletal and Connective Tissue Disorders	0	.	0	.	0	.	0	.	0	.
HCC43	Other Musculoskeletal and Connective Tissue Disorders	0	.	0	.	0	.	0	.	0	.
HCC44	Severe Hematological Disorders	4,930	28.49	4,969	29.11	4,975	29.19	4,962	29.23	4,073	26.65
HCC45	Disorders of Immunity	3,603	20.36	3,488	19.89	3,479	19.87	3,543	20.28	3,097	19.71
HCC46	Coagulation Defects and Other Specified Hematological Disorders	763	9.52	959	12.46	967	12.57	964	12.56	760	11.15
HCC47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	0	.	0	.	0	.	0	.	0	.
HCC48	Delirium and Encephalopathy	1,501	14.00	1,315	12.42	1,290	12.21	1,240	12.05	1,288	12.72
HCC49	Dementia	602	10.51	651	11.52	620	10.98	521	9.27	429	7.71
HCC50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	0	.	0	.	0	.	0	.	0	.
HCC51	Drug/Alcohol Psychosis	1,183	7.39	1,116	7.13	1,120	7.20	1,129	7.31	1,150	7.57
HCC52	Drug/Alcohol Dependence	1,183	7.39	1,116	7.13	1,120	7.20	1,129	7.31	1,150	7.57
HCC53	Drug/Alcohol Abuse, Without Dependence	0	.	0	.	0	.	0	.	0	.
HCC54	Schizophrenia	2,239	33.91	2,315	35.42	2,307	35.33	2,269	34.84	2,197	34.03
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	2,239	33.91	2,315	35.42	2,307	35.33	2,269	34.84	2,197	34.03
HCC56	Reactive and Unspecified Psychosis	639	11.35	862	15.67	857	15.61	814	14.97	752	14.05
HCC57	Personality Disorders	639	11.35	862	15.67	857	15.61	814	14.97	752	14.05
HCC58	Depression	639	11.35	862	15.67	857	15.61	814	14.97	752	14.05
HCC59	Anxiety Disorders	441	2.98	599	4.10	624	4.27	637	4.38	663	4.60
HCC60	Other Psychiatric Disorders	0	.	0	.	0	.	0	.	0	.
HCC61	Profound Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.	0	.
HCC62	Severe Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.	0	.
HCC63	Moderate Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.	0	.
HCC64	Mild/Unspecified Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.	0	.

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC65	Other Developmental Disability	0	.	0	.	0	.	0	.	0	.
HCC66	Attention Deficit Disorder	0	.	0	.	0	.	0	.	0	.
HCC67	Quadriplegia, Other Extensive Paralysis	6,902	33.64	6,745	198.34	6,731	34.03	5,707	32.12	5,662	32.14
HCC68	Paraplegia	6,902	33.64	6,745	198.34	6,731	34.03	5,707	32.12	5,662	32.14
HCC69	Spinal Cord Disorders/Injuries	2,464	19.55	2,531	20.55	2,522	20.55	2,326	19.83	2,320	20.05
HCC70	Muscular Dystrophy	2,148	3.79	2,308	4.18	2,239	4.07	2,091	4.08	2,129	4.22
HCC71	Polyneuropathy	1,731	21.39	1,765	22.10	1,773	22.22	1,833	23.24	1,770	22.85
HCC72	Multiple Sclerosis	2,127	6.77	2,151	7.04	2,137	7.01	1,977	6.71	1,793	6.22
HCC73	Parkinson's and Huntington's Diseases	2,241	22.78	2,257	23.29	2,249	23.23	2,166	22.62	2,105	22.12
HCC74	Seizure Disorders and Convulsions	1,253	16.85	1,249	16.99	1,253	17.06	1,154	15.82	1,050	14.80
HCC75	Coma, Brain Compression/Anoxic Damage	3,168	9.82	2,878	9.05	2,807	8.88	2,500	8.50	2,581	8.96
HCC76	Mononeuropathy, Other Neurological Conditions/Injuries	0	.	0	.	0	.	0	.	0	.
HCC77	Respirator Dependence/Tracheostomy Status	7,713	33.16	7,707	33.78	7,744	34.17	7,528	36.81	7,712	38.08
HCC78	Respiratory Arrest	7,713	33.16	7,707	33.78	7,744	34.17	7,528	36.81	7,712	38.08
HCC79	Cardio-Respiratory Failure and Shock	3,390	39.87	3,319	39.46	3,312	39.42	3,237	39.71	3,307	40.97
HCC80	Congestive Heart Failure	1,824	34.81	1,835	35.29	1,825	35.11	1,766	34.11	1,642	32.11
HCC81	Acute Myocardial Infarction	1,389	32.94	1,534	36.81	1,544	37.07	1,548	37.33	1,540	37.46
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	1,389	32.94	1,534	36.81	1,544	37.07	1,548	37.33	1,540	37.46
HCC83	Angina Pectoris/Old Myocardial Infarction	1,389	32.94	1,534	36.81	1,544	37.07	1,548	37.33	1,540	37.46
HCC84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	929	25.18	902	24.48	906	24.60	896	24.37	848	23.40
HCC85	Heart Infection/Inflammation, Except Rheumatic	1,381	7.46	1,458	7.99	1,423	7.81	1,419	7.91	1,527	8.82
HCC86	Valvular and Rheumatic Heart Disease	1,059	22.34	999	21.18	998	21.18	1,023	21.78	1,023	22.00
HCC87	Major Congenital Cardiac/Circulatory Defect	749	1.10	895	1.32	905	1.34	785	1.17	566	0.89
HCC88	Other Congenital Heart/Circulatory Disease	0	.	0	.	0	.	0	.	0	.
HCC89	Hypertensive Heart and Renal Disease or Encephalopathy	488	2.94	613	3.77	670	4.13	753	4.74	747	4.99
HCC90	Hypertensive Heart Disease	217	3.44	280	4.47	284	4.53	302	4.82	249	4.03
HCC91	Hypertension	0	.	0	.	0	.	0	.	0	.
HCC92	Specified Heart Arrhythmias	880	19.93	842	19.18	838	19.09	848	19.39	798	18.57
HCC93	Other Heart Rhythm and Conduction Disorders	0	.	0	.	0	.	0	.	0	.
HCC94	Other and Unspecified Heart Disease	0	.	0	.	0	.	0	.	0	.
HCC95	Cerebral Hemorrhage	1,469	22.39	1,576	24.40	1,559	24.15	1,652	26.17	1,571	25.25
HCC96	Ischemic or Unspecified Stroke	1,469	22.39	1,576	24.40	1,559	24.15	1,652	26.17	1,571	25.25
HCC97	Precerebral Arterial Occlusion and Transient	705	12.31	714	12.54	727	12.76	755	13.26	739	13.04

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
	Cerebral Ischemia										
HCC98	Cerebral Atherosclerosis and Aneurysm	705	12.31	714	12.54	727	12.76	755	13.26	739	13.04
HCC99	Cerebrovascular Disease, Unspecified	705	12.31	714	12.54	727	12.76	755	13.26	739	13.04
HCC100	Hemiplegia/Hemiparesis	2,439	20.46	2,436	21.16	2,414	21.10	2,283	20.94	2,320	21.47
HCC101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	1,091	4.81	1,365	6.17	1,373	6.20	1,371	6.80	1,451	7.34
HCC102	Speech, Language, Cognitive, Perceptual Deficits	510	5.52	600	6.68	561	6.27	328	3.69	357	4.07
HCC103	Cerebrovascular Disease Late Effects, Unspecified	510	5.52	600	6.68	561	6.27	328	3.69	357	4.07
HCC104	Vascular Disease with Complications	3,254	36.83	3,106	35.58	3,080	35.29	3,005	34.82	2,875	34.15
HCC105	Vascular Disease	1,246	30.26	1,278	31.31	1,277	31.30	1,209	29.75	1,141	28.31
HCC106	Other Circulatory Disease	0	.	0	.	0	.	0	.	0	.
HCC107	Cystic Fibrosis	1,826	43.46	1,779	42.48	1,780	42.50	1,761	42.32	1,721	41.43
HCC108	Chronic Obstructive Pulmonary Disease	1,826	43.46	1,779	42.48	1,780	42.50	1,761	42.32	1,721	41.43
HCC109	Fibrosis of Lung and Other Chronic Lung Disorders	886	9.46	828	8.87	830	8.89	710	7.62	716	7.72
HCC110	Asthma	437	5.34	462	5.67	463	5.69	419	5.12	428	5.26
HCC111	Aspiration and Specified Bacterial Pneumonias	4,204	30.56	4,067	29.87	4,008	29.54	3,724	27.92	3,761	28.37
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess	1,652	9.62	1,682	9.92	1,626	9.60	1,675	10.02	1,781	10.76
HCC113	Viral and Unspecified Pneumonia, Pleurisy	1,316	25.40	1,309	25.48	1,307	25.44	1,239	24.52	1,246	24.84
HCC114	Pleural Effusion/Pneumothorax	905	9.96	749	8.32	733	8.15	704	7.89	783	8.80
HCC115	Other Lung Disorders	0	.	0	.	0	.	0	.	0	.
HCC116	Legally Blind	0	.	0	.	0	.	0	.	0	.
HCC117	Major Eye Infections/Inflammations	0	.	0	.	0	.	0	.	0	.
HCC118	Retinal Detachment	0	.	0	.	0	.	0	.	0	.
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1,865	11.80	1,745	11.08	1,731	11.00	1,718	10.96	1,755	11.20
HCC120	Diabetic and Other Vascular Retinopathies	661	9.34	653	9.28	652	9.27	653	9.34	661	9.47
HCC121	Retinal Disorders, Except Detachment and Vascular Retinopathies	0	.	0	.	0	.	0	.	0	.
HCC122	Glaucoma	0	.	0	.	0	.	0	.	0	.
HCC123	Cataract	0	.	0	.	0	.	0	.	0	.
HCC124	Other Eye Disorders	0	.	0	.	0	.	0	.	0	.
HCC125	Significant Ear, Nose, and Throat Disorders	0	.	0	.	0	.	0	.	0	.
HCC126	Hearing Loss	0	.	0	.	0	.	0	.	0	.
HCC127	Other Ear, Nose, Throat, and Mouth Disorders	0	.	0	.	0	.	0	.	0	.
HCC128	Kidney Transplant Status	2,691	7.27	2,657	7.20	2,637	7.15	2,606	7.07	2,657	7.32
HCC129	End Stage Renal Disease	0	.	0	.	0	.	0	.	0	.
HCC130	Dialysis Status	13,955	21.26	13,658	20.97	13,698	21.12	13,213	20.95	11,687	19.98

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC131	Renal Failure	2,487	18.33	2,367	17.53	2,374	17.59	2,307	17.13	2,233	17.31
HCC132	Nephritis	1,892	8.26	1,797	7.92	1,777	7.85	1,745	7.77	1,492	6.98
HCC133	Urinary Obstruction and Retention	0	.	0	.	0	.	0	.	0	.
HCC134	Incontinence	0	.	0	.	0	.	0	.	0	.
HCC135	Urinary Tract Infection	0	.	0	.	0	.	0	.	0	.
HCC136	Other Urinary Tract Disorders	0	.	0	.	0	.	0	.	0	.
HCC137	Female Infertility	0	.	0	.	0	.	0	.	0	.
HCC138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	0	.	0	.	0	.	0	.	0	.
HCC139	Other Female Genital Disorders	0	.	0	.	0	.	0	.	0	.
HCC140	Male Genital Disorders	0	.	0	.	0	.	0	.	0	.
HCC141	Ectopic Pregnancy	0	.	0	.	0	.	0	.	0	.
HCC142	Miscarriage/Abortion	0	.	0	.	0	.	0	.	0	.
HCC143	Completed Pregnancy With Major Complications	0	.	0	.	0	.	0	.	0	.
HCC144	Completed Pregnancy With Complications	0	.	0	.	0	.	0	.	0	.
HCC145	Completed Pregnancy Without Complications (Normal Delivery)	0	.	0	.	0	.	0	.	0	.
HCC146	Uncompleted Pregnancy With Complications	3,242	2.10	3,416	2.26	3,425	2.26	3,815	2.61	3,216	2.37
HCC147	Uncompleted Pregnancy With No or Minor Complications	921	1.23	818	1.10	823	1.10	854	1.15	535	0.82
HCC148	Decubitus Ulcer of Skin	4,293	36.85	5,200	48.51	5,209	48.93	5,004	51.15	4,986	51.19
HCC149	Chronic Ulcer of Skin, Except Decubitus	2,416	27.67	2,338	26.88	2,331	26.81	2,304	26.55	2,307	26.74
HCC150	Extensive Third-Degree Burns	6,376	3.19	5,467	2.84	5,385	2.80	5,370	2.82	5,525	2.93
HCC151	Other Third-Degree and Extensive Burns	0	.	0	.	0	.	0	.	0	.
HCC152	Cellulitis, Local Skin Infection	0	.	0	.	0	.	0	.	0	.
HCC153	Other Dermatological Disorders	0	.	0	.	0	.	0	.	0	.
HCC154	Severe Head Injury	4,127	4.22	4,629	4.80	4,654	4.86	4,961	5.27	5,041	5.73
HCC155	Major Head Injury	1,062	9.15	926	8.04	902	7.85	867	7.96	858	8.05
HCC156	Concussion or Unspecified Head Injury	0	.	0	.	0	.	0	.	0	.
HCC157	Vertebral Fractures	2,362	20.67	2,439	21.84	2,407	21.58	2,376	21.67	2,366	21.63
HCC158	Hip Fracture/Dislocation	1,050	11.88	1,077	12.48	990	11.50	1,162	14.29	1,103	13.67
HCC159	Major Fracture, Except of Skull, Vertebrae, or Hip	0	.	0	.	0	.	0	.	0	.
HCC160	Internal Injuries	0	.	0	.	0	.	0	.	0	.
HCC161	Traumatic Amputation[1]	3,688	17.26	3,625	17.42	3,628	17.63	3,453	21.11	3,558	21.98
HCC162	Other Injuries	0	.	0	.	0	.	0	.	0	.
HCC163	Poisonings and Allegic Reactions	0	.	0	.	0	.	0	.	0	.

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC164	Major Complications of Medical Care and Trauma	1,062	14.14	887	11.89	887	11.92	850	11.55	905	12.39
HCC165	Other Complications of Medical Care	0	.	0	.	0	.	0	.	0	.
HCC166	Major Symptoms, Abnormalities	0	.	0	.	0	.	0	.	0	.
HCC167	Minor Symptoms, Signs, Findings	0	.	0	.	0	.	0	.	0	.
HCC168	Extremely Low Birthweight Neonates	0	.	0	.	0	.	0	.	0	.
HCC169	Very Low Birthweight Neonates	0	.	0	.	0	.	0	.	0	.
HCC170	Serious Perinatal Problem Affecting Newborn	0	.	0	.	0	.	0	.	0	.
HCC171	Other Perinatal Problems Affecting Newborn	0	.	0	.	0	.	0	.	0	.
HCC172	Normal, Single Birth	0	.	0	.	0	.	0	.	0	.
HCC173	Major Organ Transplant	0	.	0	.	0	.	0	.	0	.
HCC174	Major Organ Transplant Status	3,532	7.49	3,630	7.74	3,666	7.83	3,545	7.64	3,766	8.46
HCC175	Other Organ Transplant/Replacement	0	.	0	.	0	.	0	.	0	.
HCC176	Artificial Openings for Feeding or Elimination	2,271	14.02	2,543	16.43	2,472	16.24	1,843	15.74	1,821	15.60
HCC177	Amputation Status, Lower Limb/Amputation Complications[1]	3,688	17.26	3,625	17.42	3,628	17.63	3,453	21.11	3,558	21.98
HCC178	Amputation Status, Upper Limb	0	.	0	.	0	.	0	.	0	.
HCC179	Post-Surgical States/Aftercare/Elective	0	.	0	.	0	.	0	.	0	.
HCC180	Radiation Therapy	0	.	0	.	0	.	0	.	0	.
HCC181	Chemotherapy	0	.	0	.	0	.	0	.	0	.
HCC182	Rehabilitation	0	.	0	.	0	.	0	.	0	.
HCC183	Screening/Observation/Special Exams	0	.	0	.	0	.	0	.	0	.
HCC184	History of Disease	0	.	0	.	0	.	0	.	0	.
HCC185	Oxygen	0	.	0	.	0	.	0	.	0	.
HCC186	CPAP/IPPB/Nebulizers	0	.	0	.	0	.	0	.	0	.
HCC187	Patient Lifts, Power Operated Vehicles, Beds	0	.	0	.	0	.	0	.	0	.
HCC188	Wheelchairs, Commodes	0	.	0	.	0	.	0	.	0	.
HCC189	Walkers	0	.	0	.	0	.	0	.	0	.
D_HCC5	DISABLED*OPPORTUNISTIC INFECTIONS	3,892	5.67	3,861	5.71	3,881	5.75	3,687	5.50	3,675	5.62
D_HCC44	DISABLED*SEVERE HEMATOLOGICAL DISORDERS	4,760	9.53	4,691	9.49	4,683	9.48	5,365	10.92	5,400	11.74
D_HCC45	DISABLED*DISORDERS OF IMMUNITY	1,103	2.62	1,169	2.80	1,198	2.87	1,100	2.65	1,033	2.70
D_HCC46	DISABLED*COAGULATION DEFECTS	1,999	7.51	1,771	6.83	1,762	6.80	1,815	7.02	1,935	8.32
D_HCC51	DISABLED*DRUG/ALCOHOL PSYCHOSIS	4,010	11.29	4,112	11.69	4,111	11.71	4,160	11.92	3,973	11.51
D_HCC52	DISABLED*DRUG/ALCOHOL DEPENDENCE	2,173	8.58	2,225	8.89	2,242	8.99	2,280	9.19	2,184	8.96
D_HCC54	DISABLED* SCHIZOPHRENIA	893	6.95	887	6.95	892	6.99	974	7.65	970	7.69
D_HCC72	DISABLED* MULTIPLE SCLEROSIS	2,085	4.96	1,967	4.78	1,966	4.78	1,751	4.40	1,838	4.68
D_HCC107	DISABLED* CYSTIC FIBROSIS	6,188	4.60	6,144	4.58	6,172	4.60	5,864	4.49	5,775	4.55

Table 5-2 (continued)

HCC Prospective Risk Adjustment Models with Additional Sources of Diagnoses

		Base									
		2		3		4		5		6	
		Diagnoses Used for Estimation Added Cumulatively									
		Hosp, MD[1]		HHA[2]		SNF,ASC,HSP[3]		DME[4]		All Dxs[5]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
INT1	DM *CHF	1,036	11.97	1,067	12.49	1,067	12.50	1,053	12.47	991	12.14
INT2	DM *CVD	559	6.31	547	6.27	514	5.90	497	5.80	494	5.94
INT3	CHF *COPD	1,590	18.74	1,652	19.72	1,649	19.71	1,781	21.70	1,784	22.08
INT4	COPD*CVD *CAD	521	4.53	403	3.59	370	3.30	325	2.99	352	3.31
INT5	RF*CHF	1,435	6.27	1,343	5.95	1,317	5.84	1,216	5.46	1,235	5.73
INT6	RF*CHF*DM	1,680	5.88	1,875	6.70	1,633	5.60	1,823	6.66	1,776	6.76

NOTES:

[1]Source=1-5, Hosp=Hospital, MD=Physician. Also includes Clinically-Trained Non-Physicians.

[2]Source=1-5, 6B. HHA = Home Health Agency.

[3]Source=1-6. SNF = Skilled Nursing Facility; HSP = Hospice; ASC = Ambulatory Surgery Center.

[4]Source=1-6, 8. DME = Durable Medical Equipment.

[5]Source=1-9. Adds Laboratory, Radiology/Imaging Clinics, Miscellaneous.

DM= diabetes mellitus (HCCs 15-20)
CHF= congestive heart failure (HCC 80)
COPD= chronic obstructive pulmonary disease (HCC 108)
CVD= cerebrovascular disease (HCCs 95-103)
VD= vascular disease (HCCs 104-105)
CAD= coronary artery disease (HCCs 81-84)
RF=renal failure (HCC 131)

[1]Coefficients of HCCs 161 and 177 are constrained to be equal.

"|" means coefficients of HCCs are constrained to be equal.

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 5-3

Base HCC Model Estimated Excluding Diagnoses from RAPs and Clinically-Trained Non-Physicians

		Base 2		1	
		Hosp, MD[1]		Hosp,MD,no RAPs[2]	
Number of Observations:		1,394,701		1,394,701	
R-Square		0.1115		0.1103	
Adjusted R-Square		0.1114		0.1102	
Dependent Variable Mean:		5,314		5,314	
Root Mean Square Error:		13,030		13,039	
Model Parameters		127		127	
Computer Output:		D9pr03g.out		D9pr12a.out	
Variable	**Label**	**Parameter Estimate**	**t-ratio**	**Parameter Estimate**	**t-ratio**
	Demographics				
	Male, 0-34	$211	1.63	$166	1.28
	Male, 35-44	360	3.79	330	3.47
	Male, 45-54	676	8.01	668	7.92
	Male, 55-59	1,042	9.14	1,014	8.88
	Male, 60-64	1,468	14.25	1,465	14.21
	Male, 65-69	1,462	34.14	1,466	34.23
	Male, 70-74	1,932	50.69	1,948	51.10
	Male, 75-79	2,536	58.59	2,568	59.33
	Male, 80-84	3,080	56.53	3,136	57.55
	Male, 85-89	3,883	49.59	3,994	51.01
	Male, 90-94	4,557	33.64	4,708	34.74
	Male, 95+	3,919	14.21	4,104	14.87
	Female, 0-34	403	2.51	372	2.31
	Female, 35-44	648	5.53	638	5.45
	Female, 45-54	880	8.63	869	8.52
	Female, 55-59	1,134	8.84	1,133	8.82
	Female, 60-64	1,724	14.89	1,743	15.05
	Female, 65-69	1,212	31.57	1,238	32.24
	Female, 70-74	1,613	48.98	1,660	50.47
	Female, 75-79	2,165	61.00	2,242	63.26
	Female, 80-84	2,716	65.95	2,847	69.28
	Female, 85-89	3,305	63.13	3,509	67.18
	Female, 90-94	3,710	48.43	3,976	51.99
	Female, 95+	2,984	23.52	3,294	25.97
	Prior Year Medicaid	927	26.74	977	28.18
	Originally Disabled	1,392	29.41	1,413	29.84
HCC1	HIV/AIDS	2,676	7.99	2,801	8.30
HCC2	Septicemia/Shock	3,518	30.09	3,689	31.13
HCC4	Tuberculosis	693	2.96	830	3.15
HCC5	Opportunistic Infections	4,122	12.12	4,235	12.19
HCC6	Other Infectious Diseases	0	.	0	.
HCC7	Metastatic Cancer and Acute Leukemia	7,871	70.60	8,683	70.85
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	4,237	33.61	5,074	38.02
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	2,587	25.67	2,920	27.63
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	990	21.95	1,141	24.79
HCC11	Other Respiratory and Heart Neoplasms	0	.	0	.
HCC12	Other Digestive and Urinary Neoplasms	0	.	0	.
HCC13	Other Neoplasms	0	.	0	.
HCC14	Benign Neoplasms of Skin, Breast, Eye	0	.	0	.
HCC15	Diabetes with Renal Manifestation	4,098	19.84	4,195	20.08
HCC16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	2,650	27.91	2,947	24.06
HCC17	Diabetes with Acute Complications	2,167	15.12	2,481	17.19
HCC18	Diabetes with Ophthalmologic Manifestation	1,148	10.17	1,563	13.17
HCC19	Diabetes with No or Unspecified Complications	764	17.80	860	20.34
HCC20	Type I Diabetes Mellitus	1,982	29.59	2,043	30.02
HCC21	Protein-Calorie Malnutrition	3,185	24.50	3,359	25.62

Table 5-3 (continued)

Base HCC Model Estimated Excluding Diagnoses from RAPs and Clinically-Trained Non-Physicians

		Base 2 Hosp, MD[1]		1 Hosp,MD,no RAPs[2]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC22	Other Significant Endocrine and Metabolic Disorders	1,197	10.47	1,289	11.01
HCC23	Disorders of Fluid/Electrolyte/Acid-Base Balance	0	.	0	.
HCC24	Other Endocrine/Metabolic/Nutritional Disorders	0	.	0	.
HCC25	End-Stage Liver Disease	5,157	17.30	5,438	17.63
HCC26	Cirrhosis of Liver	2,041	11.31	2,187	11.95
HCC27	Chronic Hepatitis	2,041	11.31	2,187	11.95
HCC28	Acute Liver Failure/Disease	0	.	0	.
HCC29	Other Hepatitis and Liver Disease	0	.	0	.
HCC30	Gallbladder and Biliary Tract Disorders	0	.	0	.
HCC31	Intestinal Obstruction/Perforation	2,219	25.71	2,380	25.31
HCC32	Pancreatic Disease	1,543	11.38	1,591	11.27
HCC33	Inflammatory Bowel Disease	1,324	8.32	1,336	8.24
HCC34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	1,067	21.75	1,152	23.27
HCC35	Appendicitis	0	.	0	.
HCC36	Other Gastrointestinal Disorders	0	.	0	.
HCC37	Bone/Joint/Muscle Infections/Necrosis	2,705	21.29	3,071	20.80
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1,520	25.48	1,603	26.19
HCC39	Disorders of the Vertebrae and Spinal Discs	0	.	0	.
HCC40	Osteoarthritis of Hip or Knee	0	.	0	.
HCC41	Osteoporosis and Other Bone/Cartilage Disorders	0	.	0	.
HCC42	Congenital/Developmental Skeletal and Connective Tissue Disorders	0	.	0	.
HCC43	Other Musculoskeletal and Connective Tissue Disorders	0	.	0	.
HCC44	Severe Hematological Disorders	4,930	28.49	5,087	28.82
HCC45	Disorders of Immunity	3,603	20.36	3,673	20.32
HCC46	Coagulation Defects and Other Specified Hematological Disorders	763	9.52	764	9.43
HCC47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	0	.	0	.
HCC48	Delirium and Encephalopathy	1,501	14.00	1,779	15.99
HCC49	Dementia	602	10.51	683	11.25
HCC50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	0	.	0	.
HCC51	Drug/Alcohol Psychosis	1,183	7.39	1,346	8.33
HCC52	Drug/Alcohol Dependence	1,183	7.39	1,346	8.33
HCC53	Drug/Alcohol Abuse, Without Dependence	0	.	0	.
HCC54	Schizophrenia	2,239	33.91	2,394	35.56
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	2,239	33.91	2,394	35.56
HCC56	Reactive and Unspecified Psychosis	639	11.35	705	12.31
HCC57	Personality Disorders	639	11.35	705	12.31
HCC58	Depression	639	11.35	705	12.31
HCC59	Anxiety Disorders	441	2.98	491	3.21
HCC60	Other Psychiatric Disorders	0	.	0	.
HCC61	Profound Mental Retardation/Developmental Disability	0	.	0	.
HCC62	Severe Mental Retardation/Developmental Disability	0	.	0	.
HCC63	Moderate Mental Retardation/Developmental Disability	0	.	0	.
HCC64	Mild/Unspecified Mental Retardation/Developmental Disability	0	.	0	.
HCC65	Other Developmental Disability	0	.	0	.
HCC66	Attention Deficit Disorder	0	.	0	.
HCC67	Quadriplegia, Other Extensive Paralysis	6,902	33.64	7,165	34.33
HCC68	Paraplegia	6,902	33.64	7,165	34.33
HCC69	Spinal Cord Disorders/Injuries	2,464	19.55	2,761	19.93
HCC70	Muscular Dystrophy	2,148	3.79	2,069	3.58

Table 5-3 (continued)

Base HCC Model Estimated Excluding Diagnoses from RAPs and Clinically-Trained Non-Physicians

		Base 2 Hosp, MD[1]		1 Hosp,MD,no RAPs[2]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC71	Polyneuropathy	1,731	21.39	1,809	20.93
HCC72	Multiple Sclerosis	2,127	6.77	2,592	7.89
HCC73	Parkinson's and Huntington's Diseases	2,241	22.78	2,402	24.30
HCC74	Seizure Disorders and Convulsions	1,253	16.85	1,375	18.37
HCC75	Coma, Brain Compression/Anoxic Damage	3,168	9.82	2,943	8.40
HCC76	Mononeuropathy, Other Neurological Conditions/Injuries	0	.	0	.
HCC77	Respirator Dependence/Tracheostomy Status	7,713	33.16	7,940	31.49
HCC78	Respiratory Arrest	7,713	33.16	7,940	31.49
HCC79	Cardio-Respiratory Failure and Shock	3,390	39.87	3,951	44.23
HCC80	Congestive Heart Failure	1,824	34.81	1,928	36.53
HCC81	Acute Myocardial Infarction	1,389	32.94	1,478	34.89
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	1,389	32.94	1,478	34.89
HCC83	Angina Pectoris/Old Myocardial Infarction	1,389	32.94	1,478	34.89
HCC84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	929	25.18	972	26.26
HCC85	Heart Infection/Inflammation, Except Rheumatic	1,381	7.46	1,571	8.26
HCC86	Valvular and Rheumatic Heart Disease	1,059	22.34	1,121	23.49
HCC87	Major Congenital Cardiac/Circulatory Defect	749	1.10	422	0.59
HCC88	Other Congenital Heart/Circulatory Disease	0	.	0	.
HCC89	Hypertensive Heart and Renal Disease or Encephalopathy	488	2.94	481	2.83
HCC90	Hypertensive Heart Disease	217	3.44	222	3.51
HCC91	Hypertension	0	.	0	.
HCC92	Specified Heart Arrhythmias	880	19.93	937	21.18
HCC93	Other Heart Rhythm and Conduction Disorders	0	.	0	.
HCC94	Other and Unspecified Heart Disease	0	.	0	.
HCC95	Cerebral Hemorrhage	1,469	22.39	1,565	22.72
HCC96	Ischemic or Unspecified Stroke	1,469	22.39	1,565	22.72
HCC97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	705	12.31	738	12.36
HCC98	Cerebral Atherosclerosis and Aneurysm	705	12.31	738	12.36
HCC99	Cerebrovascular Disease, Unspecified	705	12.31	738	12.36
HCC100	Hemiplegia/Hemiparesis	2,439	20.46	2,638	21.77
HCC101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	1,091	4.81	1,287	5.55
HCC102	Speech, Language, Cognitive, Perceptual Deficits	510	5.52	530	5.63
HCC103	Cerebrovascular Disease Late Effects, Unspecified	510	5.52	530	5.63
HCC104	Vascular Disease with Complications	3,254	36.83	3,464	35.95
HCC105	Vascular Disease	1,246	30.26	1,587	31.58
HCC106	Other Circulatory Disease	0	.	0	.
HCC107	Cystic Fibrosis	1,826	43.46	1,921	44.74
HCC108	Chronic Obstructive Pulmonary Disease	1,826	43.46	1,921	44.74
HCC109	Fibrosis of Lung and Other Chronic Lung Disorders	886	9.46	983	7.62
HCC110	Asthma	437	5.34	482	5.95
HCC111	Aspiration and Specified Bacterial Pneumonias	4,204	30.56	4,185	29.86
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess	1,652	9.62	1,464	7.85
HCC113	Viral and Unspecified Pneumonia, Pleurisy	1,316	25.40	1,348	23.12
HCC114	Pleural Effusion/Pneumothorax	905	9.96	697	6.10
HCC115	Other Lung Disorders	0	.	0	.
HCC116	Legally Blind	0	.	0	.
HCC117	Major Eye Infections/Inflammations	0	.	0	.
HCC118	Retinal Detachment	0	.	0	.
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1,865	11.80	1,894	11.46
HCC120	Diabetic and Other Vascular Retinopathies	661	9.34	790	10.30
HCC121	Retinal Disorders, Except Detachment and Vascular Retinopathies	0	.	0	.
HCC122	Glaucoma	0	.	0	.
HCC123	Cataract	0	.	0	.

Table 5-3 (continued)

Base HCC Model Estimated Excluding Diagnoses from RAPs and Clinically-Trained Non-Physicians

		Base 2 Hosp, MD[1]		1 Hosp,MD,no RAPs[2]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC124	Other Eye Disorders	0	.	0	.
HCC125	Significant Ear, Nose, and Throat Disorders	0	.	0	.
HCC126	Hearing Loss	0	.	0	.
HCC127	Other Ear, Nose, Throat, and Mouth Disorders	0	.	0	.
HCC128	Kidney Transplant Status	2,691	7.27	2,760	7.40
HCC129	End Stage Renal Disease	0	.	0	.
HCC130	Dialysis Status	13,955	21.26	14,065	20.24
HCC131	Renal Failure	2,487	18.33	2,718	19.93
HCC132	Nephritis	1,892	8.26	1,926	8.22
HCC133	Urinary Obstruction and Retention	0	.	0	.
HCC134	Incontinence	0	.	0	.
HCC135	Urinary Tract Infection	0	.	0	.
HCC136	Other Urinary Tract Disorders	0	.	0	.
HCC137	Female Infertility	0	.	0	.
HCC138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	0	.	0	.
HCC139	Other Female Genital Disorders	0	.	0	.
HCC140	Male Genital Disorders	0	.	0	.
HCC141	Ectopic Pregnancy	0	.	0	.
HCC142	Miscarriage/Abortion	0	.	0	.
HCC143	Completed Pregnancy With Major Complications	0	.	0	.
HCC144	Completed Pregnancy With Complications	0	.	0	.
HCC145	Completed Pregnancy Without Complications (Normal Delivery)	0	.	0	.
HCC146	Uncompleted Pregnancy With Complications	3,242	2.10	1,375	0.90
HCC147	Uncompleted Pregnancy With No or Minor Complications	921	1.23	1,016	1.35
HCC148	Decubitus Ulcer of Skin	4,293	36.85	5,129	37.86
HCC149	Chronic Ulcer of Skin, Except Decubitus	2,416	27.67	3,034	25.02
HCC150	Extensive Third-Degree Burns	6,376	3.19	6,607	2.99
HCC151	Other Third-Degree and Extensive Burns	0	.	0	.
HCC152	Cellulitis, Local Skin Infection	0	.	0	.
HCC153	Other Dermatological Disorders	0	.	0	.
HCC154	Severe Head Injury	4,127	4.22	5,129	4.97
HCC155	Major Head Injury	1,062	9.15	1,181	8.63
HCC156	Concussion or Unspecified Head Injury	0	.	0	.
HCC157	Vertebral Fractures	2,362	20.67	2,660	21.86
HCC158	Hip Fracture/Dislocation	1,050	11.88	1,137	12.31
HCC159	Major Fracture, Except of Skull, Vertebrae, or Hip	0	.	0	.
HCC160	Internal Injuries	0	.	0	.
HCC161	Traumatic Amputation[3]	3,688	17.26	3,641	16.30
HCC162	Other Injuries	0	.	0	.
HCC163	Poisonings and Allegic Reactions	0	.	0	.
HCC164	Major Complications of Medical Care and Trauma	1,062	14.14	1,150	14.92
HCC165	Other Complications of Medical Care	0	.	0	.
HCC166	Major Symptoms, Abnormalities	0	.	0	.
HCC167	Minor Symptoms, Signs, Findings	0	.	0	.
HCC168	Extremely Low Birthweight Neonates	0	.	0	.
HCC169	Very Low Birthweight Neonates	0	.	0	.
HCC170	Serious Perinatal Problem Affecting Newborn	0	.	0	.
HCC171	Other Perinatal Problems Affecting Newborn	0	.	0	.
HCC172	Normal, Single Birth	0	.	0	.
HCC173	Major Organ Transplant	0	.	0	.
HCC174	Major Organ Transplant Status	3,532	7.49	4,056	8.41
HCC175	Other Organ Transplant/Replacement	0	.	0	.
HCC176	Artificial Openings for Feeding or Elimination	2,271	14.02	2,387	14.07

Table 5-3 (continued)

Base HCC Model Estimated Excluding Diagnoses from RAPs and Clinically-Trained Non-Physicians

		Base 2 Hosp, MD[1]		1 Hosp,MD,no RAPs[2]	
Variable	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC177	Amputation Status, Lower Limb/Amputation Complications[3]	3,688	17.26	3,641	16.30
HCC178	Amputation Status, Upper Limb	0	.	0	.
HCC179	Post-Surgical States/Aftercare/Elective	0	.	0	.
HCC180	Radiation Therapy	0	.	0	.
HCC181	Chemotherapy	0	.	0	.
HCC182	Rehabilitation	0	.	0	.
HCC183	Screening/Observation/Special Exams	0	.	0	.
HCC184	History of Disease	0	.	0	.
HCC185	Oxygen	0	.	0	.
HCC186	CPAP/IPPB/Nebulizers	0	.	0	.
HCC187	Patient Lifts, Power Operated Vehicles, Beds	0	.	0	.
HCC188	Wheelchairs, Commodes	0	.	0	.
HCC189	Walkers	0	.	0	.
D_HCC5	DISABLED*OPPORTUNISTIC INFECTIONS	3,892	5.67	3,916	5.63
D_HCC44	DISABLED*SEVERE HEMATOLOGICAL DISORDERS	4,760	9.53	4,805	9.53
D_HCC45	DISABLED*DISORDERS OF IMMUNITY	1,103	2.62	895	2.10
D_HCC46	DISABLED*COAGULATION DEFECTS	1,999	7.51	2,126	7.93
D_HCC51	DISABLED*DRUG/ALCOHOL PSYCHOSIS	4,010	11.29	3,828	10.69
D_HCC52	DISABLED*DRUG/ALCOHOL DEPENDENCE	2,173	8.58	2,072	8.10
D_HCC54	DISABLED* SCHIZOPHRENIA	893	6.95	783	6.03
D_HCC72	DISABLED* MULTIPLE SCLEROSIS	2,085	4.96	1,662	3.84
D_HCC107	DISABLED* CYSTIC FIBROSIS	6,188	4.60	5,953	4.20
INT1	DM *CHF	1,036	11.97	1,095	12.43
INT2	DM *CVD	559	6.31	623	6.74
INT3	CHF *COPD	1,590	18.74	1,565	18.00
INT4	COPD*CVD *CAD	521	4.53	442	3.59
INT5	RF*CHF	1,435	6.27	1,235	5.32
INT6	RF*CHF*DM	1,680	5.88	1,633	5.60

NOTES:

[1]Source=1-5, Hosp=Hospital, MD=Physician. Also includes clinically-trained non-physicians.

[2]Source=1-4a, Hosp=Hospital, MD=Physician, excluding diagnoses from RAPs and clinically-trained non-physicians.

DM= diabetes mellitus (HCCs 15-20)
CHF= congestive heart failure (HCC 80)
COPD= chronic obstructive pulmonary disease (HCC 108)
CVD= cerebrovascular disease (HCCs 95-103)
VD= vascular disease (HCCs 104-105)
CAD= coronary artery disease (HCCs 81-84)
RF=renal failure (HCC 131)

[3]Coefficients of HCCs 161 and 177 are constrained to be equal.
"|" means Coefficients of HCCs are constrained to be equal.

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 5-4

Predictive Power of Base Model Estimated with Alternative Diagnosis Sources

Diagnoses Used to Fit Model	R-Squared
1. Hospital, physician, excluding RAPs and clinically-trained non-physicians	11.03%
2. Hospital, physician (Base)	**11.15%**
3. Model 2 + Home Health Agency	11.65%
4. Model 3 + SNF, ASC, hospice	11.65%
5. Model 4 + DME	11.85%
6. Model 5 + lab, radiology/imaging clinics, misc. (ALL)	11.82%

NOTE:
RAPs=Radiologists, Anesthesiologists, pathologists; SNF=Skilled Nursing Facility; ASC=Ambulatory Surgery Center; DME=Durable Medical Equipment.
From Tables 5-2 and 5-3.
Hospital/physician includes clinically trained non-physicians.

SOURCE: Health Economics Research, Inc.

Table 5-5

Predictive Ratios for Base HCC Model Estimated Using Alternative Sources of Diagnoses

	1	2	3	4	5	6
		Diagnoses Used for Estimation Added Cumulatively				
Label	Hosp,MD,no RAPs[1]	Hosp, MD[2]	HHA[3]	SNF,ASC,HSP[4]	DME[5]	All Dxs[6]
ALL ENROLLEES	1.00	1.00	1.00	1.00	1.00	1.00
Demographics						
AGED	1.00	1.00	1.00	1.00	1.00	1.00
DISABLED	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, <=34	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 35-44	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 45-54	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 55-59	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 60-64	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 65-69	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 70-74	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 75-79	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 80-84	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 85-89	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE,90-94	1.00	1.00	1.00	1.00	1.00	1.00
FEMALE, 95 OR OLDER	1.00	1.00	1.00	1.00	1.00	1.00
MALE, <=34	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 35-44	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 45-54	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 55-59	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 60-64	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 65-69	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 70-74	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 75-79	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 80-84	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 85-89	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 90-94	1.00	1.00	1.00	1.00	1.00	1.00
MALE, 95 OR OLDER	1.00	1.00	1.00	1.00	1.00	1.00
RACE = BLACK	1.05	1.04	1.04	1.04	1.04	1.04
RACE = OTHER	1.00	1.00	1.00	1.00	1.00	1.00
ORIGINALLY DISABLED	1.00	1.00	1.00	1.00	1.00	1.00
MEDICAID	1.00	1.00	1.00	1.00	1.00	1.00

Table 5-5 (continued)

Predictive Ratios for Base HCC Model Estimated Using Alternative Sources of Diagnoses

	1	2	3	4	5	6
		Diagnoses Used for Estimation Added Cumulatively				
Label	Hosp,MD,no RAPs[1]	Hosp, MD[2]	HHA[3]	SNF,ASC,HSP[4]	DME[5]	All Dxs[6]
Diagnoses[7]						
ANY 1996 CHRONIC CONDITION	0.98	0.98	0.99	0.99	0.99	0.99
DEPRESSION	0.92	0.92	0.95	0.95	0.95	0.94
ALCOHOL / DRUG DEPENDENCE	0.97	0.97	0.98	0.98	0.98	0.97
HYPERTENSIVE HEART/RENAL DISEASE	0.95	0.95	0.96	0.96	0.97	0.96
BENIGN/UNSPECIFIED HYPERTENSION	0.96	0.96	0.97	0.97	0.97	0.97
DIABETES WITH COMPLICATIONS	0.93	0.96	0.97	0.97	0.97	0.97
DIABETES WITHOUT COMPLICATIONS	0.99	0.99	1.00	1.00	1.00	0.99
HEART FAILURE / CARDIOMYOPATHY	0.97	0.97	0.99	0.99	0.99	0.98
ACUTE MYOCARDIAL INFARCTION	0.97	0.98	1.00	1.00	1.00	1.00
OTHER HEART DISEASE	0.98	0.98	0.99	0.99	0.99	0.99
CHRONIC OBSTRUCTIVE PULMONARY DISEASE	0.98	0.99	0.99	0.99	1.00	0.99
COLORECTAL CANCER	0.98	0.98	0.99	0.99	0.99	0.98
BREAST CANCER	1.07	1.08	1.08	1.08	1.08	1.08
LUNG/PANCREAS CANCER	0.90	0.90	0.91	0.91	0.91	0.90
OTHER STROKE	0.95	0.96	0.99	0.99	1.00	1.00
INTRACEREBRAL HEMORRHAGE	1.01	1.04	1.06	1.06	1.06	1.06
HIP FRACTURE	0.97	0.99	1.02	1.02	1.04	1.03
ARTHRITIS	0.90	0.91	0.91	0.91	0.91	0.91
Multiple Diagnoses[7]						
DIABETES, CORONARY ARTERY DISEASE	0.97	0.98	0.99	0.99	0.99	0.98
DIABETES, CEREBROVASCULAR DISEASE	0.97	0.98	1.00	1.00	1.00	1.00
HEART FAILURE, COPD	0.97	0.98	1.00	1.00	1.00	1.00
CORONARY ARTERY DISEASE, VASCULAR DISEASE	0.95	0.97	0.99	0.99	0.99	0.99
COPD, CORONARY ARTERY DISEASE	0.98	0.99	1.00	1.00	1.00	1.00
HEART FAILURE, RENAL FAILURE	0.98	0.98	1.00	1.00	0.99	0.99
DIABETES, HEART FAILURE, RENAL FAILURE	0.97	0.98	1.00	1.00	1.00	0.98
COPD, CEREBROVASCULAR DISEASE, CORONARY ARTERY DISEASE	0.97	0.99	1.00	1.00	1.00	1.00
DIABETES, CEREBROVASCULAR DISEASE, VASCULAR DISEASE	0.97	0.99	1.01	1.01	1.01	1.01
Expenditures						
FIRST (LOWEST) QUINTILE, 1996 EXPEND	1.26	1.23	1.19	1.19	1.17	1.16
SECOND QUINTILE, 1996 EXPEND	1.26	1.23	1.21	1.21	1.19	1.19
MIDDLE QUINTILE, 1996 EXPEND	1.14	1.14	1.13	1.13	1.12	1.13
FOURTH QUINTILE, 1996 EXPEND	1.01	1.02	1.02	1.02	1.02	1.03
FIFTH (HIGHEST) QUINTILE,1996 EXPEND	0.85	0.86	0.88	0.88	0.88	0.88
Top 5 percent 1996	0.76	0.77	0.79	0.80	0.80	0.80
Top 1 percent 1996	0.68	0.69	0.70	0.71	0.71	0.71
FIRST (LOWEST) QUINTILE, 1997 EXPEND	105.87	104.22	102.01	102.07	100.92	100.15

Table 5-5 (continued)

Predictive Ratios for Base HCC Model Estimated Using Alternative Sources of Diagnoses

	1	2	3	4	5	6
		Diagnoses Used for Estimation Added Cumulatively				
Label	Hosp,MD,no RAPs[1]	Hosp, MD[2]	HHA[3]	SNF,ASC,HSP[4]	DME[5]	All Dxs[6]
SECOND QUINTILE, 1997 EXPEND	13.85	13.73	13.54	13.54	13.42	13.41
MIDDLE QUINTILE, 1997 EXPEND	5.69	5.71	5.67	5.67	5.65	5.67
FOURTH QUINTILE, 1997 EXPEND	1.96	1.97	1.97	1.97	1.98	1.98
FIFTH (HIGHEST) QUINTILE,1997 EXPEND	0.37	0.37	0.38	0.38	0.38	0.38
No home health spending 1996	1.10	1.10	1.08	1.08	1.08	1.08
Home health spending > 0 1996	0.74	0.75	0.79	0.79	0.80	0.79
HHA spending>0:FIRST (LOWEST) QUINTILE, 1996	0.98	0.99	1.03	1.03	1.03	1.02
HHA spending>0:SECOND QUINTILE, 1996	0.98	0.98	1.02	1.02	1.03	1.02
HHA spending>0:MIDDLE QUINTILE, 1996	0.88	0.88	0.93	0.93	0.93	0.93
HHA spending>0:FOURTH QUINTILE, 1996	0.75	0.75	0.80	0.80	0.81	0.81
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.46	0.46	0.51	0.51	0.53	0.52
HHA spending>0: top 10% of HHA spending 1996	0.39	0.39	0.43	0.43	0.45	0.45
HHA spending>0: top 5% of HHA spending 1996	0.33	0.33	0.37	0.37	0.39	0.39
No home health spending 1997	1.54	1.54	1.53	1.53	1.53	1.53
Home health spending > 0 1997	0.40	0.41	0.42	0.42	0.43	0.42
HHA spending>0:FIRST (LOWEST) QUINTILE, 1997	0.53	0.53	0.54	0.54	0.54	0.53
HHA spending>0:SECOND QUINTILE, 1997	0.47	0.47	0.48	0.48	0.48	0.48
HHA spending>0:MIDDLE QUINTILE, 1997	0.43	0.43	0.44	0.44	0.44	0.44
HHA spending>0:FOURTH QUINTILE, 1997	0.39	0.39	0.41	0.41	0.41	0.41
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1997	0.32	0.32	0.35	0.35	0.35	0.35
HHA spending>0: top 10% of HHA spending 1997	0.29	0.29	0.32	0.32	0.33	0.33
HHA spending>0: top 5% of HHA spending 1997	0.26	0.26	0.29	0.29	0.30	0.30
No DME spending 1996	1.09	1.09	1.08	1.08	1.06	1.06
DME spending > 0 1996	0.81	0.82	0.84	0.84	0.87	0.87
DME spending>0:FIRST (LOWEST) QUINTILE, 1996	0.93	0.94	0.95	0.95	0.97	0.97
DME spending>0:SECOND QUINTILE, 1996	0.89	0.89	0.91	0.91	0.93	0.93
DME spending>0:MIDDLE QUINTILE, 1996	0.88	0.89	0.91	0.91	0.94	0.94
DME spending>0:FOURTH QUINTILE, 1996	0.81	0.82	0.84	0.84	0.88	0.88
DME spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.66	0.65	0.68	0.68	0.72	0.72
DME spending>0: top 10% of DME spending 1996	0.60	0.59	0.61	0.61	0.66	0.66
DME spending>0: top 5% of DME spending 1996	0.58	0.57	0.59	0.59	0.64	0.64
No DME spending 1997	1.41	1.41	1.40	1.40	1.39	1.39
DME spending > 0 1997	0.57	0.57	0.58	0.58	0.60	0.60
DME spending>0:FIRST (LOWEST) QUINTILE, 1997	0.76	0.76	0.77	0.77	0.77	0.77
DME spending>0:SECOND QUINTILE, 1997	0.58	0.58	0.59	0.59	0.59	0.59
DME spending>0:MIDDLE QUINTILE, 1997	0.65	0.65	0.66	0.66	0.68	0.68
DME spending>0:FOURTH QUINTILE, 1997	0.54	0.54	0.55	0.55	0.57	0.57

Table 5-5 (continued)

Predictive Ratios for Base HCC Model Estimated Using Alternative Sources of Diagnoses

	1	2	3	4	5	6
		Diagnoses Used for Estimation Added Cumulatively				
Label	Hosp,MD,no RAPs[1]	Hosp, MD[2]	HHA[3]	SNF,ASC,HSP[4]	DME[5]	All Dxs[6]
DME spending>0:FIFTH (HIGHEST) QUINTILE,1997	0.48	0.47	0.49	0.49	0.51	0.51
DME spending>0: top 10% of DME spending 1997	0.51	0.50	0.52	0.52	0.54	0.54
DME spending>0: top 5% of DME spending 1997	0.44	0.44	0.45	0.45	0.48	0.48
DME						
oxygen supplies/equipment (DME)	0.66	0.65	0.67	0.67	0.70	0.70
wheelchairs (DME)	0.68	0.68	0.71	0.72	0.77	0.76
walkers (DME)	0.83	0.84	0.86	0.86	0.88	0.87
HOSPITAL ADMISSIONS						
0 1996 HOSP ADMISSIONS	1.03	1.03	1.02	1.02	1.02	1.02
1 1996 HOSP ADMISSIONS	1.01	1.02	1.03	1.03	1.03	1.02
2 1996 HOSP ADMISSIONS	0.97	0.98	0.99	0.99	1.00	0.99
3+ 1996 HOSP ADMISSIONS	0.82	0.82	0.83	0.83	0.83	0.83
0 1997 HOSP ADMISSIONS	3.54	3.53	3.52	3.52	3.51	3.51
1 1997 HOSP ADMISSIONS	0.56	0.56	0.57	0.57	0.57	0.57
2 1997 HOSP ADMISSIONS	0.34	0.34	0.34	0.34	0.34	0.34
3+ 1997 HOSP ADMISSIONS	0.24	0.24	0.25	0.25	0.25	0.25

NOTES:

[1]Source=1-4a, Hosp=Hospital, MD=Physician, excluding diagnoses from RAPs and Clinically-Trained Non-Physicians.

[2]Source=1-5, Hosp=Hospital, MD=Physician. Also includes Clinically-Trained Non-Physicians.

[3]Source=1-5, 6B. HHA = Home Health Agency.

[4]Source=1-6. SNF = Skilled Nursing Facility; HSP = Hospice; ASC = Ambulatory Surgery Center.

[5]Source=1-6, 8. DME = Durable Medical Equipment.

[6]Source=1-9. Adds Laboratory, Radiology/Imaging Clinics, Miscellaneous.

[7]Validation group diagnoses assigned using Source=1-6.

OUTPUT: D9pr07ca.out, D9pr07aa.out, D9pr02vc.out, and D9pr12ab.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 5-6

Twenty Five Highest Frequency Home Health Diagnoses

DXG	Label	Frequency
91.01	essential hypertension	48,722
80.05	heart failure	24,322
43.05	osteoarthritis, not specified to be of spine, hip, or knee	18,051
84.01	coronary atherosclerosis and other chronic ischemic heart disease	16,823
108.01	emphysema/chronic bronchitis	16,493
19.01	type II diabetes without complications	15,199
43.04	arthropathy/joint disorders, derangements, joint pain/stiffness, excluding gout	13,422
96.02	cerebrovascular accident, unspecified	13,288
135.01	cystitis, other urinary tract infections	10,409
19.02	type I diabetes without complications	10,241
92.02	atrial arrhythmia	9,755
36.03	stomach/intestinal disorders/symptoms, except obstruction, ulcer, and hemorrhage	9,613
134.02	incontinence/urethral discharge	9,579
47.01	iron deficiency and other/unspecified anemias	7,824
162.13	open wound, except eye and lower arm	7,755
113.02	other and unspecified pneumonia	7,599
167.02	other general symptoms	7,559
58.01	depression, excluding major depressive and bipolar disorders	6,879
23.01	disorders of fluid/electrolyte/acid-base balance, e.g., dehydration	6,793
83.02	angina pectoris	6,756
158.03	femoral (hip) fracture	6,663
105.05	unspecified peripheral vascular disease	5,873
24.04	thyroid disorders, except goiter and thyrotoxicosis	5,843
93.01	other conduction disorders/cardiac dysrhythmias	5,760
41.03	osteoporosis	5,526

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 5-7

Twenty Five Highest Frequency DME Diagnoses

DXG	Label	Frequency
108.01	emphysema/chronic bronchitis	32,229
43.05	osteoarthritis, not specified to be of spine, hip, or knee	18,172
43.04	arthropathy/joint disorders, derangements, joint pain/stiffness, excluding gou	16,548
19.02	type I diabetes without complications	15,324
80.05	heart failure	14,722
96.02	cerebrovascular accident, unspecified	13,896
19.01	type II diabetes without complications	12,984
43.08	disorders of soft tissue (e.g., tendonitis, bursitis, muscle disorders)	8,133
176.01	artificial opening of gastrointestinal tract status/complications	7,353
148.01	decubitus ulcer of skin	7,132
134.02	incontinence/urethral discharge	6,964
167.02	other general symptoms	6,931
158.03	femoral (hip) fracture	6,909
91.01	essential hypertension	6,434
110.01	asthma, except chronic obstructive	6,365
10.05	breast cancer, age 45+	6,191
43.07	nonspecific backache and other back/neck pain/disorders	5,946
162.06	fracture of hand/wrist/lower arm	5,133
179.03	joint replacement	4,909
162.12	sprains	4,513
161.01	traumatic amputation of leg/arm/hand/foot/toe, compl reattached body part	4,213
84.01	coronary atherosclerosis and other chronic ischemic heart disease	4,200
100.01	hemiplegia and hemiparesis	3,345
39.02	intervertebral disc disorders (herniated, prolapsed, degenerated disc)	3,202
40.02	osteoarthritis of lower leg (knee)	3,196

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 5-8

Aggregate Effect of Including and Omitting Various Sources of Diagnoses on Predicted Payments
Prospective Payment Medicare Model (N = 1,394,701)

Simulation Run	Source Values Used	Description	Predicted Payments	Ratio of Current Run Prediction to Base Prediction
1	**1, 2, 3, 4, 5**	**Base Model**	**$5,314**	**1.00**
Predictions While Including Diagnoses from Further Sources				
2	1, 2, 3, 4, 5, 6b	Run 1 plus Home Health Agency	5,386	1.01
3	1, 2, 3, 4, 5, 6	Run 2 plus Skilled Nursing Facilities/and Ambulatory Surgery Centers	5,397	1.02
4	1, 2, 3, 4, 5, 6, 8	Run 3 plus Medical Supplies/DME	5,519	1.04
5	All Sources, 1-9	All diagnoses	5,660	1.07
Predictions While Omitting Diagnoses from Various Sources				
6	1, 2, 3, 4	Run 1 minus clinically trained non-MDs	5,198	0.98
7	1, 2, 3	Run 6 minus all MDs	3,682	0.69
8	1, 2	Run 7 minus hospital OPD	3,133	0.59
9	1	Run 8 minus inpatient secondary	2,560	0.48
10	None	No diagnoses used	2,288	0.43

Computer Output: "D9pr13aa.out.

SOURCE: Healthy Economics Research, Inc. analysis of 1996/1997 Medicare data.

Table 5-9

Detailed Effects of Including and Omitting Sources of Diagnoses on Predicted Payments by Validation Group
Prospective Payment Medicare Model (N = 1,394,701)

				Ratio of Simulation Run Prediction to Base Model Prediction:									
				Including Diagnoses from Further Sources					Omitting Diagnoses from Various Sources				
		Average Actual	Base Model	Base	2	3	4	5	6	7	8	9	10
			SOURCE 1-5	1-5	1-5,6b***	1-6	1-6, 8***	1-9	1-4	1-3	1-2	1	none
OBS	Validation Group name	Payment		Base	+HHA	+SNF+ASC	+DME	ALL	-non MD	-MD	IP only	PIP only	No Diags
1	ALL ENROLLEES	$5,314	$5,314	1.00	1.01	1.02	1.04	1.07	0.98	0.69	0.59	0.48	0.43
2	AGED	5,413	5,413	1.00	1.01	1.02	1.04	1.06	0.98	0.70	0.60	0.49	0.45
3	DISABLED	4,559	4,559	1.00	1.01	1.01	1.05	1.08	0.98	0.66	0.50	0.36	0.28
4	FEMALE, <=34	3,650	3,650	1.00	1.01	1.01	1.05	1.08	0.99	0.70	0.53	0.41	0.30
5	FEMALE, 35-44	4,236	4,236	1.00	1.01	1.01	1.04	1.07	0.98	0.67	0.50	0.38	0.28
6	FEMALE, 45-54	4,812	4,812	1.00	1.01	1.01	1.05	1.08	0.98	0.64	0.48	0.35	0.28
7	FEMALE, 55-59	5,339	5,339	1.00	1.01	1.02	1.05	1.08	0.98	0.64	0.49	0.36	0.29
8	FEMALE, 60-64	6,252	6,252	1.00	1.02	1.02	1.04	1.07	0.98	0.67	0.53	0.40	0.34
9	FEMALE, 65-69	3,582	3,582	1.00	1.01	1.01	1.03	1.06	0.98	0.67	0.56	0.46	0.41
10	FEMALE, 70-74	4,240	4,240	1.00	1.01	1.01	1.03	1.06	0.98	0.67	0.57	0.47	0.43
11	FEMALE, 75-79	5,279	5,278	1.00	1.01	1.02	1.04	1.06	0.98	0.69	0.59	0.49	0.45
12	FEMALE, 80-84	6,374	6,374	1.00	1.02	1.02	1.04	1.07	0.97	0.70	0.61	0.50	0.46
13	FEMALE, 85-89	7,445	7,445	1.00	1.02	1.02	1.05	1.08	0.96	0.71	0.62	0.52	0.47
14	FEMALE, 90-94	8,095	8,095	1.00	1.02	1.03	1.07	1.10	0.96	0.72	0.63	0.53	0.48
15	FEMALE, 95 OR OLDER	7,434	7,434	1.00	1.03	1.03	1.08	1.12	0.95	0.69	0.59	0.49	0.45
16	MALE, <=34	3,305	3,305	1.00	1.01	1.01	1.06	1.09	0.99	0.69	0.51	0.39	0.26
17	MALE, 35-44	3,839	3,838	1.00	1.01	1.01	1.05	1.08	0.99	0.66	0.48	0.34	0.23
18	MALE, 45-54	4,068	4,068	1.00	1.01	1.01	1.05	1.08	0.98	0.66	0.49	0.33	0.24
19	MALE, 55-59	4,699	4,699	1.00	1.01	1.01	1.05	1.07	0.98	0.66	0.51	0.35	0.27
20	MALE, 60-64	5,377	5,377	1.00	1.01	1.01	1.04	1.07	0.98	0.67	0.54	0.38	0.32
21	MALE, 65-69	4,078	4,078	1.00	1.01	1.01	1.03	1.05	0.99	0.70	0.59	0.49	0.44
22	MALE, 70-74	4,839	4,839	1.00	1.01	1.01	1.03	1.05	0.99	0.70	0.59	0.49	0.44
23	MALE, 75-79	6,021	6,021	1.00	1.01	1.01	1.03	1.05	0.98	0.70	0.60	0.50	0.45
24	MALE, 80-84	7,189	7,188	1.00	1.01	1.02	1.04	1.06	0.98	0.71	0.61	0.50	0.45
25	MALE, 85-89	8,380	8,380	1.00	1.02	1.02	1.04	1.07	0.98	0.72	0.64	0.53	0.48
26	MALE, 90-94	9,203	9,203	1.00	1.02	1.02	1.05	1.08	0.98	0.74	0.66	0.55	0.50
27	MALE, 95 OR OLDER	8,551	8,550	1.00	1.03	1.03	1.07	1.09	0.97	0.73	0.65	0.54	0.48
28	RACE = BLACK	5,118	5,319	1.00	1.01	1.01	1.04	1.07	0.98	0.67	0.58	0.50	0.45
29	RACE = OTHER	5,323	5,314	1.00	1.01	1.02	1.04	1.06	0.98	0.69	0.59	0.48	0.43
30	EVER DISABLED	8,148	8,148	1.00	1.02	1.02	1.05	1.07	0.98	0.72	0.62	0.49	0.44
31	MEDICAID	7,277	7,277	1.00	1.02	1.02	1.06	1.09	0.97	0.71	0.59	0.46	0.39
32	ANY 1996 CHRONIC CONDITION	6,569	6,453	1.00	1.02	1.02	1.04	1.07	0.98	0.67	0.56	0.42	0.37
33	DEPRESSION	9,976	9,184	1.00	1.02	1.03	1.06	1.08	0.97	0.66	0.54	0.33	0.24
34	ALCOHOL / DRUG DEPENDENCE	11,970	11,576	1.00	1.02	1.02	1.04	1.06	0.99	0.73	0.61	0.31	0.15
35	HYPERTENSIVE HEART/RENAL DISEASE	9,031	8,601	1.00	1.02	1.02	1.04	1.07	0.98	0.64	0.55	0.35	0.28
36	BENIGN/UNSPECIFIED HYPERTENSION	6,769	6,529	1.00	1.02	1.02	1.04	1.07	0.98	0.68	0.57	0.42	0.36
37	DIABETES WITH COMPLICATIONS	12,800	12,225	1.00	1.02	1.03	1.06	1.08	0.94	0.61	0.48	0.26	0.19
39	HEART FAILURE / CARDIOMYOPATHY	12,797	12,452	1.00	1.02	1.03	1.05	1.07	0.98	0.65	0.53	0.31	0.22
40	ACUTE MYOCARDIAL INFARCTION	12,538	12,294	1.00	1.02	1.02	1.05	1.06	0.99	0.70	0.62	0.32	0.20
41	OTHER HEART DISEASE	8,950	8,769	1.00	1.02	1.02	1.04	1.07	0.98	0.65	0.54	0.36	0.29
42	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	9,145	9,018	1.00	1.02	1.02	1.04	1.07	0.98	0.64	0.53	0.34	0.27

Table 5-9 (continued)

Detailed Effects of Including and Omitting Sources of Diagnoses on Predicted Payments by Validation Group
Prospective Payment Medicare Model (N = 1,394,701)

				Ratio of Simulation Run Prediction to Base Model Prediction:										
				Including Diagnoses from Further Sources					Omitting Diagnoses from Various Sources					
		Average	Base Model	Base	2	3	4	5	6	7	8	9	10	
		Actual	SOURCE 1-5	1-5	1-5,6b***	1-6	1-6, 8***	1-9	1-4	1-3	1-2	1	none	
OBS	Validation Group name	Payment		Base	+HHA	+SNF+ASC	+DME	ALL	-non MD	-MD	IP only	PIP only	No Diags	
43	COLORECTAL CANCER	9,556	9,353	1.00	1.02	1.02	1.05	1.07	0.99	0.67	0.56	0.35	0.26	
44	BREAST CANCER	6,619	7,131	1.00	1.01	1.02	1.04	1.06	0.98	0.64	0.49	0.40	0.34	
45	LUNG/PANCREAS CANCER	15,437	13,969	1.00	1.01	1.02	1.03	1.05	0.99	0.64	0.47	0.26	0.15	
46	OTHER STROKE	12,084	11,625	1.00	1.03	1.04	1.07	1.10	0.98	0.65	0.53	0.31	0.23	
47	INTRACEREBRAL HEMORRHAGE	13,148	13,652	1.00	1.02	1.02	1.06	1.08	0.98	0.65	0.56	0.31	0.20	
48	HIP FRACTURE	11,484	11,350	1.00	1.03	1.04	1.08	1.10	0.97	0.68	0.59	0.37	0.27	
49	ARTHRITIS	7,393	6,691	1.00	1.02	1.02	1.05	1.07	0.97	0.67	0.57	0.40	0.34	
50	DM*CAD	12,550	12,287	1.00	1.02	1.02	1.05	1.07	0.97	0.62	0.51	0.28	0.20	
51	DM*CVD	14,445	14,112	1.00	1.03	1.03	1.07	1.09	0.97	0.63	0.51	0.26	0.18	
52	CHF*COPD	16,382	16,080	1.00	1.02	1.03	1.05	1.07	0.99	0.64	0.54	0.27	0.17	
53	CAD*VD	13,590	13,250	1.00	1.02	1.02	1.05	1.07	0.96	0.63	0.52	0.29	0.20	
54	COPD*CAD	13,608	13,455	1.00	1.02	1.02	1.04	1.06	0.99	0.64	0.54	0.29	0.20	
55	CHF*RF	21,902	21,558	1.00	1.02	1.03	1.05	1.07	0.99	0.66	0.57	0.24	0.13	
56	DM*CHF*RF	26,003	25,430	1.00	1.03	1.03	1.05	1.06	0.98	0.66	0.57	0.21	0.11	
57	COPD*CVD*CAD	17,514	17,255	1.00	1.02	1.03	1.05	1.07	0.99	0.64	0.54	0.26	0.16	
58	DM*CVD*VD	17,898	17,673	1.00	1.03	1.03	1.06	1.08	0.96	0.62	0.51	0.24	0.15	
59	FIRST (LOWEST) QUINTILE, 1996 EXPEND	1,885	2,322	1.00	1.00	1.00	1.00	1.01	1.00	0.90	0.88	1.08	1.08	
60	SECOND QUINTILE, 1996 EXPEND	2,688	3,319	1.00	1.00	1.00	1.01	1.04	0.98	0.73	0.66	0.81	0.81	
61	MIDDLE QUINTILE, 1996 EXPEND	3,886	4,440	1.00	1.00	1.00	1.02	1.06	0.97	0.64	0.52	0.59	0.59	
62	FOURTH QUINTILE, 1996 EXPEND	5,686	5,801	1.00	1.01	1.01	1.04	1.07	0.97	0.61	0.45	0.43	0.42	
63	FIFTH (HIGHEST) QUINTILE,1996 EXPEND	12,807	10,980	1.00	1.03	1.03	1.06	1.09	0.98	0.70	0.61	0.30	0.20	
64	Top 5 percent 1996	20,610	15,931	1.00	1.03	1.04	1.07	1.10	0.98	0.71	0.64	0.24	0.13	
65	Top 1 percent 1996	32,578	22,328	1.00	1.03	1.04	1.08	1.09	0.99	0.71	0.65	0.19	0.08	
66	FIRST (LOWEST) QUINTILE, 1997 EXPEND	27	2,768	1.00	1.01	1.01	1.01	1.03	0.99	0.84	0.79	78.21	76.02	
67	SECOND QUINTILE, 1997 EXPEND	284	3,904	1.00	1.01	1.01	1.02	1.04	0.98	0.72	0.63	8.00	7.62	
68	MIDDLE QUINTILE, 1997 EXPEND	891	5,088	1.00	1.01	1.01	1.03	1.06	0.97	0.67	0.56	2.76	2.56	
69	FOURTH QUINTILE, 1997 EXPEND	3,155	6,218	1.00	1.01	1.01	1.04	1.07	0.97	0.66	0.54	0.85	0.76	
70	FIFTH (HIGHEST) QUINTILE,1997 EXPEND	23,534	8,809	1.00	1.03	1.03	1.06	1.09	0.98	0.67	0.56	0.14	0.11	
71	No home health spending 1996	4,260	4,670	1.00	1.00	1.00	1.02	1.05	0.98	0.69	0.59	0.56	0.52	
72	Home health spending > 0 1996	15,359	11,447	1.00	1.07	1.07	1.11	1.13	0.98	0.70	0.60	0.26	0.18	
73	HHA spending>0:FIRST (LOWEST) QUINTILE, 1996	10,029	9,886	1.00	1.05	1.05	1.08	1.10	0.98	0.70	0.61	0.37	0.27	
74	HHA spending>0:SECOND QUINTILE, 1996	10,626	10,445	1.00	1.05	1.05	1.08	1.10	0.98	0.70	0.61	0.36	0.26	
75	HHA spending>0:MIDDLE QUINTILE, 1996	13,049	11,517	1.00	1.06	1.06	1.09	1.11	0.98	0.70	0.61	0.31	0.22	
76	HHA spending>0:FOURTH QUINTILE, 1996	16,803	12,652	1.00	1.07	1.08	1.12	1.14	0.98	0.70	0.60	0.26	0.17	
77	HHA spending>0:FIFTH (HIGHEST) QUINTILE,1996	28,483	13,169	1.00	1.11	1.11	1.17	1.20	0.98	0.71	0.59	0.15	0.11	
78	HHA spending>0: top 10% of HHA spending 1996	34,924	13,453	1.00	1.12	1.13	1.20	1.22	0.97	0.70	0.58	0.13	0.09	
79	HHA spending>0: top 5% of HHA spending 1996	41,981	13,799	1.00	1.13	1.14	1.22	1.24	0.97	0.70	0.58	0.10	0.07	
80	No home health spending 1997	3,122	4,817	1.00	1.01	1.01	1.03	1.05	0.98	0.70	0.59	0.78	0.71	
81	Home health spending > 0 1997	22,949	9,308	1.00	1.05	1.05	1.09	1.11	0.98	0.68	0.58	0.16	0.12	
82	HHA spending>0:FIRST (LOWEST) QUINTILE, 1997	14,737	7,797	1.00	1.03	1.03	1.05	1.08	0.98	0.68	0.58	0.22	0.18	
83	HHA spending>0:SECOND QUINTILE, 1997	17,196	8,084	1.00	1.03	1.03	1.06	1.08	0.98	0.68	0.57	0.19	0.16	

Table 5-9 (continued)

Detailed Effects of Including and Omitting Sources of Diagnoses on Predicted Payments by Validation Group
Prospective Payment Medicare Model (N = 1,394,701)

				Ratio of Simulation Run Prediction to Base Model Prediction:										
				Including Diagnoses from Further Sources					Omitting Diagnoses from Various Sources					
		Average	Base Model	Base	2	3	4	5	6	7	8	9	10
		Actual	SOURCE 1-5	1-5	1-5,6b***	1-6	1-6, 8***	1-9	1-4	1-3	1-2	1	none
OBS	Validation Group name	Payment		Base	+HHA	+SNF+ASC	+DME	ALL	-non MD	-MD	IP only	PIP only	No Diags
84	HHA spending>0:MIDDLE QUINTILE, 1997	20,778	8,874	1.00	1.03	1.04	1.07	1.09	0.98	0.68	0.57	0.17	0.13
85	HHA spending>0:FOURTH QUINTILE, 1997	25,865	10,090	1.00	1.05	1.05	1.09	1.11	0.98	0.68	0.58	0.15	0.11
86	HHA spending>0:FIFTH (HIGHEST) QUINTILE,1997	37,205	11,896	1.00	1.09	1.09	1.15	1.17	0.98	0.69	0.58	0.11	0.08
87	HHA spending>0: top 10% of HHA spending 1997	43,641	12,670	1.00	1.10	1.10	1.17	1.19	0.98	0.70	0.58	0.10	0.07
88	HHA spending>0: top 5% of HHA spending 1997	51,024	13,290	1.00	1.11	1.11	1.19	1.21	0.97	0.70	0.59	0.08	0.06
89	No DME spending 1996	4,213	4,591	1.00	1.01	1.01	1.01	1.04	0.98	0.70	0.60	0.58	0.53
90	DME spending > 0 1996	11,356	9,279	1.00	1.03	1.03	1.10	1.13	0.98	0.66	0.55	0.29	0.22
91	DME spending>0:FIRST (LOWEST) QUINTILE, 1996	7,663	7,215	1.00	1.02	1.02	1.07	1.09	0.97	0.67	0.56	0.38	0.32
92	DME spending>0:SECOND QUINTILE, 1996	9,527	8,520	1.00	1.03	1.03	1.08	1.11	0.97	0.66	0.56	0.34	0.27
93	DME spending>0:MIDDLE QUINTILE, 1996	9,730	8,647	1.00	1.03	1.03	1.10	1.13	0.97	0.65	0.54	0.32	0.26
94	DME spending>0:FOURTH QUINTILE, 1996	12,711	10,419	1.00	1.03	1.04	1.12	1.14	0.97	0.66	0.54	0.27	0.20
95	DME spending>0:FIFTH (HIGHEST) QUINTILE,1996	19,087	12,483	1.00	1.04	1.04	1.14	1.16	0.98	0.68	0.56	0.21	0.14
96	DME spending>0: top 10% of DME spending 1996	20,944	12,429	1.00	1.04	1.04	1.15	1.17	0.98	0.68	0.56	0.19	0.12
97	DME spending>0: top 5% of DME spending 1996	24,313	13,835	1.00	1.05	1.05	1.16	1.19	0.98	0.69	0.57	0.18	0.11
98	No DME spending 1997	3,291	4,644	1.00	1.01	1.01	1.02	1.05	0.98	0.71	0.61	0.74	0.68
99	DME spending > 0 1997	14,729	8,432	1.00	1.03	1.03	1.08	1.11	0.97	0.66	0.55	0.21	0.17
100	DME spending>0:FIRST (LOWEST) QUINTILE, 1997	8,504	6,495	1.00	1.02	1.02	1.05	1.08	0.97	0.67	0.55	0.33	0.29
101	DME spending>0:SECOND QUINTILE, 1997	12,486	7,239	1.00	1.02	1.02	1.06	1.09	0.97	0.66	0.54	0.24	0.20
102	DME spending>0:MIDDLE QUINTILE, 1997	12,054	7,885	1.00	1.02	1.03	1.08	1.11	0.97	0.65	0.54	0.25	0.21
103	DME spending>0:FOURTH QUINTILE, 1997	17,085	9,262	1.00	1.03	1.03	1.10	1.12	0.97	0.65	0.53	0.19	0.15
104	DME spending>0:FIFTH (HIGHEST) QUINTILE,1997	24,451	11,588	1.00	1.03	1.04	1.11	1.13	0.98	0.68	0.56	0.16	0.11
105	DME spending>0: top 10% of DME spending 1997	24,551	12,335	1.00	1.04	1.04	1.12	1.14	0.98	0.68	0.57	0.16	0.11
106	DME spending>0: top 5% of DME spending 1997	30,535	13,394	1.00	1.04	1.04	1.12	1.15	0.98	0.69	0.57	0.14	0.08
107	oxygen supplies/equipment (DME)	18,910	12,357	1.00	1.03	1.04	1.11	1.13	0.99	0.69	0.58	0.21	0.14
108	wheelchairs (DME)	17,258	11,713	1.00	1.06	1.06	1.17	1.19	0.97	0.69	0.58	0.23	0.16
109	walkers (DME)	13,327	11,169	1.00	1.03	1.04	1.08	1.10	0.98	0.69	0.61	0.30	0.21
110	0 1996 HOSP ADMISSIONS	3,960	4,066	1.00	1.01	1.01	1.03	1.06	0.97	0.67	0.55	0.56	0.56
111	1 1996 HOSP ADMISSIONS	8,887	9,032	1.00	1.02	1.02	1.05	1.07	0.98	0.71	0.64	0.39	0.28
112	2 1996 HOSP ADMISSIONS	12,826	12,550	1.00	1.02	1.02	1.05	1.07	0.98	0.73	0.67	0.34	0.20
113	3+ 1996 HOSP ADMISSIONS	21,536	17,668	1.00	1.02	1.02	1.05	1.07	0.99	0.74	0.69	0.27	0.12
114	0 1997 HOSP ADMISSIONS	1,300	4,594	1.00	1.01	1.01	1.03	1.06	0.98	0.70	0.60	1.84	1.71
115	1 1997 HOSP ADMISSIONS	12,619	7,118	1.00	1.02	1.02	1.05	1.07	0.98	0.67	0.56	0.24	0.20
116	2 1997 HOSP ADMISSIONS	25,258	8,527	1.00	1.02	1.02	1.05	1.08	0.98	0.68	0.57	0.13	0.10
117	3+ 1997 HOSP ADMISSIONS	45,258	11,061	1.00	1.02	1.02	1.05	1.08	0.98	0.69	0.59	0.09	0.06

NOTES:
Source 1 from the computer output "D9pr13aa.prt"
Source 0 from the computer output "D9pr13ca.prt"

SOURCE: Health Economics Research, Inc. analysis of 1996/1997 Medicare data.

6 Evaluation of Durable Medical Equipment as a Risk Adjuster

Durable medical equipment (DME) is a Medicare-covered benefit. Medicare-covered DME is heterogeneous, but several types of DME may be useful in identifying beneficiaries whose high expenditures are not fully captured by diagnoses. For example, some types of DME are mobility aids (e.g., wheelchairs, walkers), and are utilized by beneficiaries who are functionally impaired. Expenditures associated with functional impairment are not fully captured by diagnoses. This was shown in Chapter 4 by the underprediction by the base prospective risk adjustment model of total expenditures of beneficiaries utilizing DME. It was also shown in Pope *et al*., 1998 that diagnosis-based models underpredict for groups with multiple limitations in activities of daily living as measured using survey responses. In this chapter we examine whether DME utilization can be used to better predict the costs of functionally impaired beneficiaries, supplementing the predictive power of diagnosis-based risk adjustment models.

A potential advantage of using DME instead of survey based measures to identify functionally-impaired beneficiaries is that DME use may be available in the information systems of most Medicare+Choice plans. Thus, the need for expensive and burdensome surveys to assess the functional status of Medicare+Choice enrollees would be avoided. Moreover, survey functional status measures are only available for a small sample of each plan's enrollees, whereas automated DME records are potentially available for all

utilizing enrollees. Finally, the incremental total expenditures associated with DME use can be accurately calibrated with large samples of Medicare fee-for-service enrollees, such as the 5 percent sample used in this report.

Balancing these advantages are disadvantages of DME as a risk adjuster. The largest concern is that incentives would be established for M+C plans to inappropriately increase DME utilization to generate additional risk-adjusted payments.[1] For example, suppose a wheelchair can be supplied to a M+C enrollee at a cost of $1,500, and that wheelchair use triggers an additional $4,500 Medicare payment to a health plan per beneficiary. Then the health plan makes a "profit" of $3,000 on each beneficiary supplied with a wheelchair. HCFA could establish and audit strict guidelines for appropriateness of DME utilization, but this would be expensive and burdensome on HCFA and on plans. Disputes might arise over "borderline" cases.

A second concern is the cost of collecting data on DME utilization. Aside from concerns about inappropriate DME use, M+C plans and HCFA would have to establish DME data collection and verification systems such as are currently used in FFS Medicare. This would increase costs to HCFA and M+C plans. Another problem is that Medicare claims or encounter data may not provide a complete profile of DME use. For example, some DME used by Medicare beneficiaries may be paid for by other insurers or government programs such as Medicaid or the Veteran Administration, or may be paid

[1] Of course, under diagnosis-based payments, plans have incentives to inappropriately record reimbursable diagnoses. This may be less costly than providing inappropriate DME.

for out-of-pocket by beneficiaries.[2] Similarly, one base year may not capture all DME utilization. Most “big ticket” DME items are "durable", and usage may not appear in the claims record every year. Associated supplies may appear more frequently in claims, but they may be easier for HMOs to “game” by overproviding than the expensive big-ticket items (wheelchairs, oxygen machines, etc.) In many instances it is difficult to distinguish short-term from long-term use of DME. For example, a beneficiary may use a wheelchair after leaving the hospital for an operation. But when recovered, the beneficiary would no longer need the wheelchair. Thus, wheelchair use may confound those who are temporarily disabled with those who are long-term disabled. Finally, managed care use of DME may differ from FFS usage, because M+C plans do not have the same DME reimbursement criteria as the FFS sector.

In the remainder of this chapter we evaluate how much the predictive accuracy of our base risk adjustment model can be augmented by incorporating DME. We also briefly consider the contribution to expenditure prediction in the 1996/97 dataset of the "life sustaining procedures" (e.g., organ transplants) that we developed in previous projects (Ellis *et al*., 1996; Pope *et al*., 1998). We begin by providing basic descriptive statistics on DME and procedure groups. Then we discuss the integration of selected DME and procedures into our clinical classification system. Estimates of alternative risk adjustment models adding DME and procedures to our base model follow. Finally, we

[2] To the extent that DME use predicts only DME costs, the loss of information due to use of other insurers/providers is not of consequence. To the extent that DME use predicts non-DME costs, the loss is problematic. The same problem can exist for diagnoses if there is high use of the VA or Department of Defense systems, although diagnoses are more likely to be replicated across sites of care.

evaluate the gains in predictive accuracy for individuals and groups when DME and procedures are additional risk adjusters.

6.1 Durable Medical Equipment and Procedure Groups

HCFA staff provided us with 56 DME "policy groups". Frequencies of these DME policy groups for our 1996 base year, and mean and levels of dispersion for 1997 annualized spending are shown in Table 6-1. These policy groups were developed by HCFA's SADMERC (Statistical Analysis Durable Medical Equipment Regional Carrier) for analysis of coverage of related equipment and supplies. The SADMERC receives claims from the insurance carriers that process and pay Medicare DME claims, and use the groups as an aid to help refine coverage policy. The policy groups are the basic "building blocks" for all our DME analyses.

Descriptive statistics for the DME policy groups are shown in Table 6-1. The most frequent DME item utilized[3] is "wheelchairs", which was utilized by 37,573 beneficiaries, or 2.7 percent of our prospective sample, in 1996. Other frequently utilized types of DME include walkers, oxygen supplies and equipment, nebulizers and related drug administration devices, glucose monitors, hospital beds and accessories, and commodes/bedpans/urinals. Although not as common, the types of DME associated with the highest following year expenditures include parenteral and enteral nutrition, ventilators, patient lifts, suction pumps, support surfaces, and tracheostomy supplies.

[3] "Utilized" includes "purchased" and "rented" or "leased". Medicare will pay for no more than 15 months rental according to the HCFA website.

Descriptive statistics for our 14 life sustaining procedure groups are shown in Table 6-2 (see Ellis *et al*., 1996 and Pope *et al*., 1998 for further discussion of our procedure groups). Six of the 14 groups are organ transplants. These procedure groups are defined by CPT-4 procedure codes, and are identified in the Medicare Part B physician/supplier Standard Analytic File. Many of these procedures, especially the transplants, are quite rare in the Medicare population. For example, only 2 beneficiaries receiving lung transplants are identified in our 5 percent Medicare sample. The more common procedure groups are chemo- and radiotherapy, and gastrotomy/enterostomy. While rare, the life-sustaining procedures identify beneficiaries with high Medicare expenditures in the following year. For example, the mean 1997 expenditures of the 875 beneficiaries with a tracheostomy procedure code in 1996 are $48,600.

6.2 Integrating DME and Procedures into Diagnostic Classification

With guidance from our clinician coauthors, we selected DME types to add to our diagnostic classification (see Chapter 2). The criteria for selecting DME types to add were:

- DME types that identify high-expenditure beneficiaries, especially beneficiaries whose high expenditures are not predicted well by diagnostic-based models. This was determined by empirical regression analysis as reported later in this chapter.
- DME types that identify functionally impaired or limited beneficiaries. This was determined by clinical judgment.
- DME types that are utilized by a sufficiently large number of Medicare beneficiaries that incremental next year total expenditures associated with them can be accurately estimated. This was determined by empirical analysis.

- DME types that are less subject to incentive problems such as inappropriate oversupply. For this reason, we avoided inexpensive types of DME, such as inexpensive supplies or disposable items.

Application of these criteria to the 56 original DME policy groups resulted in 16 new "DME-DxGroups" being selected for consideration in our DCG/HCC model. For example, these DME-DxGroup include "185.01 oxygen supplies/equipment," "187.01 hospital beds," and "188.01 wheelchairs." Beneficiaries were assigned to each of the DME-DxGroups based on DME claims utilization in the base year (1996). All 16 DME-DxGroups are based directly on a corresponding HCFA SADMERC DME policy group, with no changes in included HCPCs codes.[4]

Of these 16 new DME-DxGroups, twelve were aggregated into five DME-based HCCs. Six were classified into HCCs that had already been defined using diagnostic information. Altogether 11 HCCs are affected by the inclusion of DME information.

The five clusters of DME-DxGroups assigned to DME-based HCCs are shown in Table 6-3. These new HCCs are grouped into two "hierarchies". The first is "respiratory therapy", which includes the two HCCs "Oxygen" and "CPAP/IPPB/Nebulizers". The first HCC, "Oxygen", is ranked above the second, and HCC 77 "Respiratory Dependence/Tracheostomy Status" (not shown in Table 6-3) is ranked above both these HCCs.[5] The second hierarchy is "mobility", and includes the three HCCs (in a strict

[4] Further refinement of the HCFA DME policy groups to exclude inexpensive equipment and supplies, and focus on "big ticket" items, would be desirable, but was not possible with the resources available to this project.

[5] HCC 77 includes diagnosis codes (V-codes), procedure codes, and DME codes (ventilator). See discussion later in this section.

hierarchy) shown in Table 6-3. The respiratory therapy and mobility hierarchies are additive to each other.

The six DME-DxGroups that are closely related to HCCs already defined based on ICD-9-CM "V codes" were simply grouped into existing HCCs. The DME-DxGroups that were incorporated into existing diagnosis-code-based HCCs are shown in Table 6-4. These HCCs reflect both diagnostic and DME information, and no changes in the base model hierarchies or HCC labels were made for these HCCs.

Table 6-5 shows the HCC assignments of the 14 procedure-based DxGroups. Five of the six transplant procedure groups are assigned to the only HCC based strictly on procedures, HCC 173 Major Organ Transplant. (The kidney transplant DxGroup 128.02 is assigned to HCC 128 Kidney Transplant, which also includes the V code for kidney transplant status.) All other procedure-based DxGroups were assigned to existing diagnosis-code-based HCCs.

6.3 Analysis of Predictive Power

Our multiple regression analysis of DME predictive power is presented in Tables 6-6, 6-7, and 6-8. Table 6-6 shows the detailed regression coefficient estimates. Table 6-7 abstracts from Table 6-6 the predictive power (R-square) of alternative models. Table 6-8 abstracts from Table 6-6 estimated incremental DME payments (coefficients) with comparisons to other estimated coefficients. Table 6-9 shows the predictive accuracy of alternative models for subgroups of Medicare beneficiaries. The models we compare in this analysis are:

- the base, diagnoses-only model (Model 5 of Table 4-2);
- the base model plus all HCFA DME policy groups;
- the base model plus our selected DME groups as described in Section 6.2; and
- the base model plus our selected DME groups and our selected procedure groups.

Table 6-7 shows that DME adds considerably to base model explanatory power. The R-square rises from 11.15 percent to 12.46 percent when all HCFA DME policy groups are added to the model. When DME is limited to the 16 of 56 categories that we selected for incorporation into our diagnostic classification (see the preceding section), the R-square falls only slightly, from 12.46 percent to 12.23 percent. Most of DME's explanatory power is contained in a relatively small number of DME types. Adding our procedure groups raises predictive power only very slightly, from 12.23 percent to 12.28 percent.[6] Although they identify high cost beneficiaries, the procedures are too infrequent to significantly raise predictive power.

In Table 6-6 (Model 2), many of the HCFA DME policy groups have large, statistically significant coefficients. But only a relatively small proportion—primarily the 16 chosen for incorporation into our classification system—appear to have really substantial impacts on predictive power (as judged by their coefficient magnitudes and t-statistics). Comparing Models 1 and 2, it is interesting that adding DME reduces the

[6] Note that the procedure groups with the greatest frequency, chemo- and radiotherapy, are not included in the payment version of our model, which limits the gain in explanatory power from adding the procedure groups. These procedures are not included in the payment version because the HCCs that contain them are excluded from the payment version of the model (see Chapter 2).

coefficients of certain diagnoses quite a lot: for example chronic obstructive pulmonary disease (COPD), hip fracture, neurological problems, lower limb amputation status, and diabetes. For example, the coefficient of HCC 158 "Hip Fracture/Dislocation" is reduced from $1,050 to $250 when DME is added. Beneficiaries with these diagnoses are clearly the heaviest users of DME, and when DME is added to the model, some of the predicted payments associated with these diagnoses are shifted to the DME categories. Since there is an overall gain in explanatory power, shifting predicted payments from one risk adjuster to another is not all that is occurring—DME is adding explanatory power by identifying more severely impaired/ill beneficiaries, or beneficiaries without appropriate diagnosis codes.

Table 6-8 shows incremental payments (coefficients) associated with selected DME-HCCs as estimated in Model 3. The DME coefficients are quite large.[7] Utilization of patient lifts in the base year is associated with about the same incremental expenditures as a base year diagnosis of metastatic cancer. Use of a walker is associated with larger incremental expenditures than COPD, and much larger expenditures than hip fracture. The DME coefficients are so large absolutely, relative to the cost of the DME itself, and relative to the diagnosis coefficients, that we have substantial concern about including DME in a payment model. The large incremental payments associated with DME would give M+C plans strong incentives to inappropriately increase DME utilization.

[7] Note from Table 6-1 that since the person years for 1997 are similar to the number of people, these high predicted expenses do not seem to be explained by high rates of mortality among DME users.

Not surprisingly, Table 6-9 shows that incorporating DME (compare columns 1 and 2) substantially improves predictive accuracy for groups defined by DME spending or utilization. For example, 96 percent versus 82 percent of the mean total expenditures of prior year DME utilizers are predicted when DME is included versus not. Predictive accuracy is also improved moderately for home health utilizers, as there plausibly is a correlation between DME and home health use. Eighty two percent of mean total expenditures are predicted for beneficiaries with any prior year home health use with DME included versus 75 percent without DME. Adding our procedure groups to the base plus DME model (compare columns 2 and 3 in Table 6-9) results in no detectable improvement in predictive accuracy.

Gains in predictive accuracy for other groups are detectable, but are not large. For example, the predictive ratio for those with 3 or more prior year hospital admissions rises from 82 percent to 84 percent. The predictive ratio for the 5th quintile of prior year total spending increases from 86 percent to 89 percent. These are not inconsequential improvements, but still fall far short of perfect prediction. Surprisingly, predictive accuracy for the diagnosis of arthritis is hardly improved at all.

Overall, adding DME as a risk adjuster does significantly improve predictive accuracy, especially for those utilizing Medicare DME and home health services, who may proxy to some extent for the functionally impaired. But the large incremental payments associated with DME utilization raise serious concerns about incentives to inappropriately provide DME to enrollees and thereby "game" the payment system.

Table 6-1

Descriptive Statistics by HCFA DME Policy Group

DME Group	1996 Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. Mean	Std. Dev.	Coefficient of Variation
Breast Prostheses	7,766	7,535	$5,244	$140	$12,140	231%
Continuous Positive Airway Pressure System (CPAP)	3,683	3,515	10,471	372	22,057	211
CPM Device	1,058	1,041	5,322	283	9,142	172
Canes/Crutches	13,694	12,980	11,771	184	20,962	178
Commodes/Bed Pans/Urinals	18,608	16,831	16,017	191	24,723	154
Diabetic Shoes	2,649	2,495	16,450	559	27,935	170
Dialysis Supplies & Equipment	354	331	19,362	1,775	32,285	167
Dynamic Splint	193	176	13,317	2,064	27,376	206
Enteral Nutrition	2,986	2,408	24,225	589	28,877	119
Epoetin	2	1	73,504	51,694	57,796	79
Eye Prostheses	727	699	7,520	730	19,297	257
Facial Prostheses	4	4	13,392	5,413	10,247	77
Glucose Monitor	25,160	23,696	12,902	148	22,793	177
Heat/Cold Application	1,350	1,311	10,827	531	19,211	177
Hospital Beds/Accessories	21,571	18,858	19,895	191	26,279	132
Intermittent Positive Pressure Breathing System (IPPB)	171	159	22,319	2,302	29,026	130
Immunosuppressive Drugs	19	14	18,880	18,222	67,773	359
Impotence Aid	2,862	2,777	5,674	236	12,458	220
Infusion Pumps & Related Drugs	1,057	910	22,269	962	29,001	130
Lenses	883	845	5,774	559	16,266	282
Lower Limb Orthoses	13,928	13,150	10,484	167	19,111	182
Lower Limb Prostheses	2,906	2,689	15,451	493	25,541	165
Nebulizers & Related Drugs	22,402	20,325	16,530	180	25,624	155
Oral Anti-Cancer Drugs	0	0	--	--	--	--
Oral Anti-Emetric Drugs	0	0	--	--	--	--
Orthopedic Footwear	1,478	1,422	10,270	465	17,539	171
Orthosis/Prosthesis Repair	1,330	1,262	10,841	588	20,870	193
Osteogenesis Stimulator	153	146	12,734	1,933	23,312	183
Ostomy Supplies	9,329	8,640	11,229	221	20,535	183
Other Neuromuscular Stimulators	593	571	10,689	828	19,801	185
Oxygen Supplies/Equipment	26,569	23,241	18,914	177	26,948	142
Power Operated Vehicle (POV)	505	472	17,215	1,294	28,107	163
Parenteral Nutrition	82	68	37,550	4,948	40,752	109
Patient Lift	2,370	2,052	26,501	606	27,453	104
Pneumatic Compression Device	468	437	15,781	1,155	24,143	153
Repairs/DME	1,660	1,592	12,829	510	20,335	159
Respiratory Assist Device	0	0	--	--	--	--
Seat Lift Mechanism	1,266	1,155	15,009	555	18,862	126
Spinal Orthoses	7,974	7,636	10,013	216	18,908	189
Suction Pump	1,434	1,175	26,860	1,001	34,308	128
Support Surfaces	5,477	4,638	24,469	410	27,903	114
Surgical Dressings	7,532	6,623	15,878	302	24,595	155
Transcutaneous Electrical Nerve Stimulators (TENS)	2,337	2,234	11,390	449	21,231	186
Tracheostomy Supplies	511	447	24,595	1,515	32,026	130
Traction Equipment	569	555	9,470	752	17,711	187
Upper Limb Orthoses	8,328	7,891	8,332	189	16,814	202
Upper Limb Prostheses	115	110	6,889	1,212	12,702	184
Urological Supplies	8,338	7,261	14,950	274	23,369	156
Ventilators	628	562	26,033	1,424	33,748	130
Voice Prostheses	246	223	11,848	1,220	18,220	154
Walkers	28,579	26,352	13,327	140	22,759	171
Wheelchairs	37,573	33,734	17,258	137	25,160	146
Misc DMEPOS	8,954	8,385	11,980	251	22,998	192
Misc Drugs	341	313	12,786	1,276	22,583	177
Routinely Denied Items	5,248	4,960	10,210	284	20,027	196
{N/A}	77	70	17,173	3,558	29,771	173

NOTE: DME categories assigned from DME Standard Analytic File only.

OUTPUT: D9pr06a.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 6-2

Descriptive Statistics by Procedure Group (DXGs)

DXG	Label	1996 Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. Mean	Std. Dev.	Coefficient of Variation
77.03	tracheostomy (procedure)	875	662	$48,600	$3,814	$98,164	202%
128.02	kidney transplant (procedure)	8	8	31,980	19,318	54,640	171
130.02	dialysis (procedure)	643	488	42,921	3,799	83,950	196
173.01	lung transplant (procedure)	2	2	14,248	14,212	20,099	141
173.02	heart transplant (procedure)	24	24	26,334	8,125	39,386	150
173.03	bone marrow transplant (procedure)	11	9	31,604	11,501	34,822	110
173.04	liver transplant (procedure)	16	14	17,379	9,413	35,532	204
173.05	pancreas transplant (procedure)	.	.	.	.	.	.
176.04	gastrostomy (procedure)	3,040	2,417	24,034	793	38,974	162
176.05	enterostomy (procedure)	645	557	20,096	1,585	37,398	186
177.02	amputation, lower limb (procedure)	1,553	1,315	24,782	904	32,762	132
178.02	amputation, upper limb (procedure)	12	10	11,153	4,938	15,419	138
180.02	radiation therapy (procedure)	10,729	9,073	12,668	234	22,273	176
181.02	chemotherapy (procedure)	12,129	10,509	16,237	223	22,907	141

OUTPUT: D9pr04aa.out and D9pr04aa.ou2

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 6-3

Durable Medical Equipment HCCs

HCC	Dx Group	This HCC Excludes	Hierarchy
185	**Oxygen**[1] 185.01 oxygen supplies/equipment	186	Respiratory Therapy 1
186	**CPAP/IPPB/Nebulizers**[1] 186.01 nebulizers and related drugs 186.02 continuous positive airway pressure system 186.03 intermittent positive pressure breathing system		Respiratory Therapy 2
187	**Patient Lifts, Power-Operated Vehicles, Beds** 187.01 hospital beds/accessories 187.02 patient lifts 187.03 power operated vehicles	188, 189	Mobility 1
188	**Wheelchairs, Commodes** 188.01 wheelchairs 188.02 commodes/bed pans/urinals	189	Mobility 2
189	**Walkers** 189.01 walkers		Mobility 3

[1] This HCC is excluded by HCC 77 Respiratory Dependence/Tracheotomy Status, which includes DME ventilators.

SOURCE: Health Economics Research, Inc.

Table 6-4

DME Groups Mapped Into Diagnosis-Based HCCs

DME Group		HCC	
77.04	Ventilators	77	Respirator Dependence
130.03	Dialysis supplies and equipment	130	Dialysis Status
176.06	Enteral nutrition	176	Artificial Openings for Feeding and Elimination
176.07	Parenteral nutrition	176	Artificial Openings for Feeding and Elimination
177.03	Lower limb prostheses	177	Amputation Status, Lower Limb
178.03	Upper limb prostheses	178	Amputation Status, Upper Limb

SOURCE: Health Economics Research, Inc.

Table 6-5

Procedure Groups Mapped into HCCs

Procedure Group	HCC
77.03 tracheostomy	77 Respirator Dependence/Tracheostomy
128.02 kidney transplant	128 Kidney Transplant
130.02 dialysis	130 Dialysis
173.01 lung transplant	173 Major Organ Transplant
173.02 heart transplant	173 Major Organ Transplant
173.03 bone marrow transplant	173 Major Organ Transplant
173.04 liver transplant	173 Major Organ Transplant
173.05 pancreas transplant	173 Major Organ Transplant
176.04 gastrostomy	176 Artificial Openings
176.05 enterostomy	176 Artificial Openings
177.02 amputation, lower limb	177 Amputation Status, Lower Limb
178.02 amputation, upper limb	177 Amputation Status, Upper Limb
180.02 radiation therapy	180 Radiation Therapy
181.02 chemotherapy	181 Chemotherapy

SOURCE: Health Economics Research, Inc.

Table 6-6

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
	Number of Observations:	1,394,701		1,394,701		1,394,701		1,394,701	
	R-Square	0.1115		0.1246		0.1223		0.1228	
	Adjusted R-Square	0.1114		0.1245		0.1222		0.1227	
	Dependent Variable Mean:	5,314		5,314		5,314		5,314	
	Root Mean Square Error:	13,030		12,934		12,950		12,947	
	Model Parameters	127		180		132		133	
	Computer Output:	D9pr03g.out		D9pr03f.ou2		D9pr05za.prt		D9pr05a.prt	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
	Male, 0-34	$211	1.63	$191	1.49	$183	1.43	$184	1.44
	Male, 35-44	360	3.79	300	3.17	307	3.24	307	3.25
	Male, 45-54	676	8.01	629	7.50	632	7.54	628	7.49
	Male, 55-59	1,042	9.14	942	8.32	955	8.43	949	8.37
	Male, 60-64	1,468	14.25	1,417	13.85	1,416	13.83	1,413	13.80
	Male, 65-69	1,462	34.14	1,512	35.54	1,510	35.48	1,509	35.47
	Male, 70-74	1,932	50.69	1,951	51.49	1,959	51.70	1,958	51.70
	Male, 75-79	2,536	58.59	2,537	59.00	2,538	59.01	2,542	59.12
	Male, 80-84	3,080	56.53	3,044	56.26	3,039	56.12	3,045	56.23
	Male, 85-89	3,883	49.59	3,771	48.50	3,765	48.38	3,775	48.52
	Male, 89-94	4,557	33.64	4,370	32.49	4,345	32.26	4,352	32.33
	Male, 95+	3,919	14.21	3,619	13.21	3,530	12.87	3,528	12.87
	Female, 0-34	403	2.51	387	2.42	401	2.51	402	2.52
	Female, 35-44	648	5.53	597	5.13	626	5.38	627	5.39
	Female, 45-54	880	8.63	750	7.41	789	7.79	786	7.76
	Female, 55-59	1,134	8.84	916	7.18	969	7.60	971	7.61
	Female, 60-64	1,724	14.89	1,446	12.57	1,501	13.04	1,502	13.05
	Female, 65-69	1,212	31.57	1,205	31.59	1,209	31.67	1,209	31.68
	Female, 70-74	1,613	48.98	1,568	47.89	1,576	48.16	1,577	48.21
	Female, 75-79	2,165	61.00	2,096	59.39	2,090	59.24	2,092	59.31
	Female, 80-84	2,716	65.95	2,604	63.60	2,587	63.16	2,590	63.25
	Female, 85-89	3,305	63.13	3,152	60.57	3,110	59.71	3,114	59.79
	Female, 89-94	3,710	48.43	3,453	45.37	3,404	44.66	3,407	44.71
	Female, 95+	2,984	23.52	2,636	20.91	2,602	20.62	2,610	20.69
	Prior Year Medicaid	927	26.74	739	21.43	767	22.22	762	22.09
	Originally Disabled	1,392	29.41	1,150	24.46	1,165	24.74	1,163	24.72
HCC1	HIV/AIDS	2,676	7.99	2,794	8.41	2,801	8.42	2,823	8.49
HCC2	Septicemia/Shock	3,518	30.09	3,175	27.27	3,324	28.57	3,254	27.97
HCC3	Central Nervous System Infection	1,075	5.51	610	3.15	718	3.70	718	3.71
HCC4	Tuberculosis	693	2.96	739	3.17	712	3.06	708	3.04
HCC5	Opportunistic Infections	4,122	12.12	3,526	10.44	3,554	10.51	3,538	10.47
HCC6	Other Infectious Diseases	0	.	0	.	0	.	0	.

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC7	Metastatic Cancer and Acute Leukemia	7,871	70.60	7,747	69.72	7,730	69.76	7,667	69.20
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	4,237	33.61	4,104	32.79	4,095	32.68	4,077	32.55
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	2,587	25.67	2,582	25.77	2,575	25.71	2,540	25.37
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	990	21.95	1,058	23.34	1,031	23.00	1,029	22.96
HCC11	Other Respiratory and Heart Neoplasms	0	.	0	.	0	.	0	.
HCC12	Other Digestive and Urinary Neoplasms	0	.	0	.	0	.	0	.
HCC13	Other Neoplasms	0	.	0	.	0	.	0	.
HCC14	Benign Neoplasms of Skin, Breast, Eye	0	.	0	.	0	.	0	.
HCC15	Diabetes with Renal Manifestation	4,098	19.84	3,729	18.15	3,990	19.45	4,115	20.08
HCC16	Diabetes with Neurologic or Peripheral Circulatory Manifestation	2,650	27.91	2,344	24.70	2,536	26.87	2,530	26.81
HCC17	Diabetes with Acute Complications	2,167	15.12	1,887	13.23	2,045	14.35	2,045	14.36
HCC18	Diabetes with Ophthalmologic Manifestation	1,148	10.17	1,040	9.26	1,147	10.23	1,148	10.24
HCC19	Diabetes with No or Unspecified Complications	764	17.80	667	15.61	712	16.69	710	16.65
HCC20	Type I Diabetes Mellitus	1,982	29.59	1,499	21.74	1,818	27.30	1,810	27.19
HCC21	Protein-Calorie Malnutrition	3,185	24.50	2,688	20.72	2,788	21.52	2,598	19.99
HCC22	Other Significant Endocrine and Metabolic Disorders	1,197	10.47	1,109	9.77	1,124	9.89	1,129	9.93
HCC23	Disorders of Fluid/Electrolyte/Acid-Base Balance	0	.	0	.	0	.	0	.
HCC24	Other Endocrine/Metabolic/Nutritional Disorders	0	.	0	.	0	.	0	.
HCC25	End-Stage Liver Disease	5,157	17.30	5,091	17.20	5,072	17.12	5,067	17.09
HCC26	Cirrhosis of Liver	2,041	11.31	2,093	11.68	2,071	11.54	2,078	11.58
HCC27	Chronic Hepatitis	2,041	11.31	2,093	11.68	2,071	11.54	2,078	11.58
HCC28	Acute Liver Failure/Disease	0	.	0	.	0	.	0	.
HCC29	Other Hepatitis and Liver Disease	0	.	0	.	0	.	0	.
HCC30	Gallbladder and Biliary Tract Disorders	0	.	0	.	0	.	0	.
HCC31	Intestinal Obstruction/Perforation	2,219	25.71	2,049	23.89	2,041	23.80	1,994	23.23
HCC32	Pancreatic Disease	1,543	11.38	1,458	10.82	1,517	11.25	1,516	11.25
HCC33	Inflammatory Bowel Disease	1,324	8.32	1,266	8.00	1,330	8.41	1,318	8.34
HCC34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	1,067	21.75	$1,019	20.91	1,014	20.79	1,007	20.64
HCC35	Appendicitis	0	.	0	.	0	.	0	.
HCC36	Other Gastrointestinal Disorders	0	.	0	.	0	.	0	.
HCC37	Bone/Joint/Muscle Infections/Necrosis	2,705	21.29	2,214	17.49	2,337	18.51	2,319	18.36
HCC38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1,520	25.48	1,372	23.14	1,379	23.26	1,383	23.33
HCC39	Disorders of the Vertebrae and Spinal Discs	0	.	0	.	0	.	0	.
HCC40	Osteoarthritis of Hip or Knee	0	.	0	.	0	.	0	.
HCC41	Osteoporosis and Other Bone/Cartilage Disorders	0	.	0	.	0	.	0	.
HCC42	Congenital/Developmental Skeletal and Connective Tissue Disorders	0	.	0	.	0	.	0	.
HCC43	Other Musculoskeletal and Connective Tissue Disorders	0	.	0	.	0	.	0	.
HCC44	Severe Hematological Disorders	4,930	28.49	4,798	27.92	4,807	27.95	4,825	28.06
HCC45	Disorders of Immunity	3,603	20.36	3,552	20.22	3,562	20.25	3,552	20.20
HCC46	Coagulation Defects and Other Specified Hematological Disorders	763	9.52	670	8.43	641	8.05	645	8.10
HCC47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease	0	.	0	.	0	.	0	.

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC48	Delirium and Encephalopathy	1,501	14.00	1,413	13.27	1,369	12.85	1,374	12.89
HCC49	Dementia	602	10.51	615	10.80	622	10.91	617	10.84
HCC50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions	0	.	0	.	0	.	0	.
HCC51	Drug/Alcohol Psychosis	1,183	7.39	1,228	7.73	1,180	7.42	1,169	7.35
HCC52	Drug/Alcohol Dependence	1,183	7.39	1,228	7.73	1,180	7.42	1,169	7.35
HCC53	Drug/Alcohol Abuse, Without Dependence	0	.	0	.	0	.	0	.
HCC54	Schizophrenia	2,239	33.91	2,307	35.18	2,291	34.90	2,293	34.94
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	2,239	33.91	2,307	35.18	2,291	34.90	2,293	34.94
HCC56	Reactive and Unspecified Psychosis	639	11.35	599	10.71	590	10.54	589	10.53
HCC57	Personality Disorders	639	11.35	599	10.71	590	10.54	589	10.53
HCC58	Depression	639	11.35	599	10.71	590	10.54	589	10.53
HCC59	Anxiety Disorders	441	2.98	441	3.00	449	3.05	448	3.05
HCC60	Other Psychiatric Disorders	0	.	0	.	0	.	0	.
HCC61	Profound Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.
HCC62	Severe Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.
HCC63	Moderate Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.
HCC64	Mild/Unspecified Mental Retardation/Developmental Disability	0	.	0	.	0	.	0	.
HCC65	Other Developmental Disability	0	.	0	.	0	.	0	.
HCC66	Attention Deficit Disorder	0	.	0	.	0	.	0	.
HCC67	Quadriplegia, Other Extensive Paralysis	6,902	33.64	4,328	20.71	4,947	24.15	4,886	23.87
HCC68	Paraplegia	6,902	33.64	4,328	20.71	4,947	24.15	4,886	23.87
HCC69	Spinal Cord Disorders/Injuries	2,464	19.55	2,023	16.14	2,074	16.55	2,084	16.64
HCC70	Muscular Dystrophy	2,148	3.79	578	1.03	999	1.77	948	1.68
HCC71	Polyneuropathy	1,731	21.39	1,432	17.80	1,531	19.04	1,533	19.06
HCC72	Multiple Sclerosis	2,127	6.77	1,334	4.27	1,499	4.80	1,502	4.81
HCC73	Parkinson's and Huntington's Diseases	2,241	22.78	1,824	18.65	1,843	18.83	1,839	18.79
HCC74	Seizure Disorders and Convulsions	1,253	16.85	1,154	15.63	1,160	15.69	1,145	15.49
HCC75	Coma, Brain Compression/Anoxic Damage	3,168	9.82	3,181	9.92	3,149	9.82	2,917	9.09
HCC76	Mononeuropathy, Other Neurological Conditions/Injuries	0	.	0	.	0	.	0	.
HCC77	Respirator Dependence/Tracheostomy Status	7,713	33.16	5,844	24.68	7,750	35.86	9,312	44.54
HCC78	Respiratory Arrest	7,713	33.16	5,844	24.68	7,750	35.86	9,312	44.54
HCC79	Cardio-Respiratory Failure and Shock	3,390	39.87	2,183	25.54	2,153	25.12	1,896	22.07
HCC80	Congestive Heart Failure	1,824	34.81	1,630	31.31	1,608	30.87	1,623	31.16
HCC81	Acute Myocardial Infarction	1,389	32.94	1,429	34.13	1,417	33.80	1,420	33.89
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	1,389	32.94	1,429	34.13	1,417	33.80	1,420	33.89
HCC83	Angina Pectoris/Old Myocardial Infarction	1,389	32.94	1,429	34.13	1,417	33.80	1,420	33.89
HCC84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	929	25.18	950	25.91	949	25.86	949	25.86
HCC85	Heart Infection/Inflammation, Except Rheumatic	1,381	7.46	1,478	8.04	1,424	7.74	1,427	7.76
HCC86	Valvular and Rheumatic Heart Disease	1,059	22.34	1,112	23.63	1,097	23.30	1,102	23.41
HCC87	Major Congenital Cardiac/Circulatory Defect	749	1.10	27	0.04	137	0.20	172	0.25

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC88	Other Congenital Heart/Circulatory Disease	0	.	0	.	0	.	0	.
HCC89	Hypertensive Heart and Renal Disease or Encephalopathy	488	2.94	519	3.15	515	3.12	552	3.35
HCC90	Hypertensive Heart Disease	217	3.44	202	3.23	196	3.13	198	3.16
HCC91	Hypertension	0	.	0	.	0	.	0	.
HCC92	Specified Heart Arrhythmias	880	19.93	922	21.05	895	20.39	897	20.46
HCC93	Other Heart Rhythm and Conduction Disorders	0	.	0	.	0	.	0	.
HCC94	Other and Unspecified Heart Disease	0	.	0	.	0	.	0	.
HCC95	Cerebral Hemorrhage	1,469	22.39	1,174	17.99	1,202	18.41	1,187	18.19
HCC96	Ischemic or Unspecified Stroke	1,469	22.39	1,174	17.99	1,202	18.41	1,187	18.19
HCC97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia	705	12.31	715	12.58	710	12.48	716	12.58
HCC98	Cerebral Atherosclerosis and Aneurysm	705	12.31	715	12.58	710	12.48	716	12.58
HCC99	Cerebrovascular Disease, Unspecified	705	12.31	715	12.58	710	12.48	716	12.58
HCC100	Hemiplegia/Hemiparesis	2,439	20.46	1,432	12.02	1,607	13.52	1,575	13.25
HCC101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	1,091	4.81	408	1.81	441	1.96	429	1.91
HCC102	Speech, Language, Cognitive, Perceptual Deficits	510	5.52	223	2.43	276	3.01	256	2.79
HCC103	Cerebrovascular Disease Late Effects, Unspecified	510	5.52	223	2.43	276	3.01	256	2.79
HCC104	Vascular Disease with Complications	3,254	36.83	3,005	34.20	3,048	34.72	3,020	34.33
HCC105	Vascular Disease	1,246	30.26	1,226	29.99	1,220	29.80	1,221	29.83
HCC106	Other Circulatory Disease	0	.	0	.	0	.	0	.
HCC107	Cystic Fibrosis	1,826	43.46	1,149	27.04	1,198	28.15	1,191	28.01
HCC108	Chronic Obstructive Pulmonary Disease	1,826	43.46	1,149	27.04	1,198	28.15	1,191	28.01
HCC109	Fibrosis of Lung and Other Chronic Lung Disorders	886	9.46	811	8.73	789	8.48	776	8.35
HCC110	Asthma	437	5.34	231	2.85	270	3.32	264	3.25
HCC111	Aspiration and Specified Bacterial Pneumonias	4,204	30.56	3,396	24.78	3,585	26.19	3,436	25.09
HCC112	Pneumococcal Pneumonia, Empyema, Lung Abscess	1,652	9.62	1,258	7.37	1,249	7.31	1,260	7.38
HCC113	Viral and Unspecified Pneumonia, Pleurisy	1,316	25.40	1,154	22.42	1,169	22.68	1,168	22.66
HCC114	Pleural Effusion/Pneumothorax	905	9.96	883	9.79	801	8.88	778	8.62
HCC115	Other Lung Disorders	0	.	0	.	0	.	0	.
HCC116	Legally Blind	0	.	0	.	0	.	0	.
HCC117	Major Eye Infections/Inflammations	0	.	0	.	0	.	0	.
HCC118	Retinal Detachment	0	.	0	.	0	.	0	.
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1,865	11.80	1,814	11.54	1,930	12.28	1,944	12.37
HCC120	Diabetic and Other Vascular Retinopathies	661	9.34	684	9.74	719	10.22	721	10.25
HCC121	Retinal Disorders, Except Detachment and Vascular Retinopathies	0	.	0	.	0	.	0	.
HCC122	Glaucoma	0	.	0	.	0	.	0	.
HCC123	Cataract	0	.	0	.	0	.	0	.
HCC124	Other Eye Disorders	0	.	0	.	0	.	0	.
HCC125	Significant Ear, Nose, and Throat Disorders	0	.	0	.	0	.	0	.
HCC126	Hearing Loss	0	.	0	.	0	.	0	.
HCC127	Other Ear, Nose, Throat, and Mouth Disorders	0	.	0	.	0	.	0	.

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC128	Kidney Transplant Status	2,691	7.27	2,682	7.29	2,745	7.46	2,717	7.39
HCC129	End Stage Renal Disease	0	.	0	.	0	.	0	.
HCC130	Dialysis Status	13,955	21.26	14,055	21.57	9,707	20.04	8,807	26.71
HCC131	Renal Failure	2,487	18.33	2,389	17.74	2,370	17.57	2,249	16.59
HCC132	Nephritis	1,892	8.26	1,773	7.80	1,785	7.83	1,734	7.60
HCC133	Urinary Obstruction and Retention	0	.	0	.	0	.	0	.
HCC134	Incontinence	0	.	0	.	0	.	0	.
HCC135	Urinary Tract Infection	0	.	0	.	0	.	0	.
HCC136	Other Urinary Tract Disorders	0	.	0	.	0	.	0	.
HCC137	Female Infertility	0	.	0	.	0	.	0	.
HCC138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	0	.	0	.	0	.	0	.
HCC139	Other Female Genital Disorders	0	.	0	.	0	.	0	.
HCC140	Male Genital Disorders	0	.	0	.	0	.	0	.
HCC141	Ectopic Pregnancy	0	.	0	.	0	.	0	.
HCC142	Miscarriage/Abortion	0	.	0	.	0	.	0	.
HCC143	Completed Pregnancy With Major Complications	0	.	0	.	0	.	0	.
HCC144	Completed Pregnancy With Complications	0	.	0	.	0	.	0	.
HCC145	Completed Pregnancy Without Complications (Normal Delivery)	0	.	0	.	0	.	0	.
HCC146	Uncompleted Pregnancy With Complications	3,242	2.10	3,472	2.26	3,383	2.20	3,403	2.21
HCC147	Uncompleted Pregnancy With No or Minor Complications	921	1.23	948	1.27	940	1.26	956	1.28
HCC148	Decubitus Ulcer of Skin	4,293	36.85	3,158	26.87	3,706	31.95	3,666	31.60
HCC149	Chronic Ulcer of Skin, Except Decubitus	2,416	27.67	2,143	24.66	2,238	25.79	2,243	25.85
HCC150	Extensive Third-Degree Burns	6,376	3.19	5,929	2.99	6,219	3.13	5,908	2.97
HCC151	Other Third-Degree and Extensive Burns	0	.	0	.	0	.	0	.
HCC152	Cellulitis, Local Skin Infection	0	.	0	.	0	.	0	.
HCC153	Other Dermatological Disorders	0	.	0	.	0	.	0	.
HCC154	Severe Head Injury	4,127	4.22	4,926	5.08	4,508	4.64	4,223	4.35
HCC155	Major Head Injury	1,062	9.15	1,034	8.96	978	8.47	967	8.37
HCC156	Concussion or Unspecified Head Injury	0	.	0	.	0	.	0	.
HCC157	Vertebral Fractures	2,362	20.67	1,749	15.31	1,785	15.70	1,788	15.73
HCC158	Hip Fracture/Dislocation	1,050	11.88	250	2.81	184	2.07	191	2.15
HCC159	Major Fracture, Except of Skull, Vertebrae, or Hip	0	.	0	.	0	.	0	.
HCC160	Internal Injuries	0	.	0	.	0	.	0	.
HCC161	Traumatic Amputation[1]	3,688	17.26	2,021	8.82	2,622	14.36	2,825	15.78
HCC162	Other Injuries	0	.	0	.	0	.	0	.
HCC163	Poisonings and Allegic Reactions	0	.	0	.	0	.	0	.
HCC164	Major Complications of Medical Care and Trauma	1,062	14.14	801	10.71	865	11.57	800	10.69
HCC165	Other Complications of Medical Care	0	.	0	.	0	.	0	.
HCC166	Major Symptoms, Abnormalities	0	.	0	.	0	.	0	.
HCC167	Minor Symptoms, Signs, Findings	0	.	0	.	0	.	0	.

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
HCC168	Extremely Low Birthweight Neonates	0	.	0	.	0	.	0	.
HCC169	Very Low Birthweight Neonates	0	.	0	.	0	.	0	.
HCC170	Serious Perinatal Problem Affecting Newborn	0	.	0	.	0	.	0	.
HCC171	Other Perinatal Problems Affecting Newborn	0	.	0	.	0	.	0	.
HCC172	Normal, Single Birth	0	.	0	.	0	.	0	.
HCC173	Major Organ Transplant	0	.	0	.	0	.	4,111	2.21
HCC174	Major Organ Transplant Status	3,532	7.49	3,624	7.74	3,662	7.81	3,611	7.51
HCC175	Other Organ Transplant/Replacement	0	.	0	.	0	.	0	.
HCC176	Artificial Openings for Feeding or Elimination	2,271	14.02	1,129	6.56	2,724	18.51	3,027	21.66
HCC177	Amputation Status, Lower Limb/Amputation Complications[1]	3,688	17.26	2,021	8.82	2,622	14.36	2,825	15.78
HCC178	Amputation Status, Upper Limb	0	.	0	.	0	.	0	.
HCC179	Post-Surgical States/Aftercare/Elective	0	.	0	.	0	.	0	.
HCC180	Radiation Therapy	0	.	0	.	0	.	0	.
HCC181	Chemotherapy	0	.	0	.	0	.	0	.
HCC182	Rehabilitation	0	.	0	.	0	.	0	.
HCC183	Screening/Observation/Special Exams	0	.	0	.	0	.	0	.
HCC184	History of Disease	0	.	0	.	0	.	0	.
HCC185	Oxygen	0	.	0	.	6,907	73.99	6,904	73.92
HCC186	CPAP/IPPB/Nebulizers	0	.	0	.	2,285	20.75	2,414	22.40
HCC187	Patient Lifts, Power Operated Vehicles, Beds	0	.	0	.	7,688	80.02	7,650	79.65
HCC188	Wheelchairs, Commodes	0	.	0	.	4,382	59.13	4,374	59.05
HCC189	Walkers	0	.	0	.	1,995	19.05	1,994	19.05
D_HCC5	DISABLED*OPPORTUNISTIC INFECTIONS	3,892	5.67	3,600	5.28	4,000	5.86	3,955	5.79
D_HCC44	DISABLED*SEVERE HEMATOLOGICAL DISORDERS	4,760	9.53	4,796	9.67	4,838	9.74	4,820	9.71
D_HCC45	DISABLED*DISORDERS OF IMMUNITY	1,103	2.62	1,109	2.65	1,180	2.82	1,178	2.82
D_HCC46	DISABLED*COAGULATION DEFECTS	1,999	7.51	1,892	7.16	1,927	7.28	1,902	7.19
D_HCC51	DISABLED*DRUG/ALCOHOL PSYCHOSIS	4,010	11.29	4,285	12.15	4,289	12.15	4,275	12.11
D_HCC52	DISABLED*DRUG/ALCOHOL DEPENDENCE	2,173	8.58	2,278	9.06	2,338	9.28	2,348	9.33
D_HCC54	DISABLED* SCHIZOPHRENIA	893	6.95	1,106	8.67	1,068	8.37	1,071	8.40
D_HCC72	DISABLED* MULTIPLE SCLEROSIS	2,085	4.96	1,534	3.68	1,594	3.82	1,588	3.80
D_HCC107	DISABLED* CYSTIC FIBROSIS	6,188	4.60	5,720	4.28	5,849	4.37	5,884	4.40
INT1	DM *CHF	1,036	11.97	944	10.99	960	11.16	1,005	11.70
INT2	DM *CVD	559	6.31	462	5.25	475	5.39	475	5.39
INT3	CHF *COPD	1,590	18.74	720	8.50	760	8.97	754	8.90
INT4	COPD*CVD *CAD	521	4.53	811	7.10	806	7.04	811	7.10
INT5	RF*CHF	1,435	6.27	1,350	5.94	1,277	5.61	1,053	4.58
INT6	RF*CHF*DM	1,680	5.88	1,634	5.76	1,720	6.05	1,257	4.37
GRP110	Breast Prostheses	--	--	-908	-5.98	--	--	--	--
GRP120	Continuous Positive Airway Pressure System (CPAP)	--	--	635	2.87	--	--	--	--
GRP130	CPM Device	--	--	-2,094	-5.17	--	--	--	--

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
GRP140	Canes/Crutches	--	--	1,043	8.94	--	--	--	--
GRP150	Commodes/Bed Pans/Urinals	--	--	1,338	12.19	--	--	--	--
GRP160	Diabetic Shoes	--	--	2,805	10.61	--	--	--	--
GRP170	Dialysis Supplies & Equipment	--	--	1,022	1.41	--	--	--	--
GRP180	Dynamic Splint	--	--	2,845	2.91	--	--	--	--
GRP190	Enteral Nutrition	--	--	2,788	9.55	--	--	--	--
GRP200	Epoetin	--	--	47,880	4.14	--	--	--	--
GRP210	Eye Prostheses	--	--	1,082	2.21	--	--	--	--
GRP220	Facial Prostheses	--	--	-248	-0.04	--	--	--	--
GRP230	Glucose Monitor	--	--	1,525	16.03	--	--	--	--
GRP240	Heat/Cold Application	--	--	1,224	3.40	--	--	--	--
GRP250	Hospital Beds/Accessories	--	--	3,780	34.91	--	--	--	--
GRP260	Intermittent Positive Pressure Breathing System (IPPB)	--	--	3,790	3.68	--	--	--	--
GRP270	Immunosuppressive Drugs	--	--	1,890	0.54	--	--	--	--
GRP280	Impotence Aid	--	--	-74	-0.30	--	--	--	--
GRP290	Infusion Pumps & Related Drugs	--	--	3,253	7.18	--	--	--	--
GRP300	Lenses	--	--	-507	-1.07	--	--	--	--
GRP310	Lower Limb Orthoses	--	--	732	6.21	--	--	--	--
GRP320	Lower Limb Prostheses	--	--	848	3.06	--	--	--	--
GRP330	Nebulizers & Related Drugs	--	--	3,117	30.96	--	--	--	--
GRP340	Oral Anti-Cancer Drugs	--	--	--	--	--	--	--	--
GRP342	Oral Anti-Emetic Drugs	--	--	--	--	--	--	--	--
GRP350	Orthopedic Footwear	--	--	-194	-0.55	--	--	--	--
GRP360	Orthosis/Prosthesis Repair	--	--	621	1.66	--	--	--	--
GRP370	Osteogenesis Stimulator	--	--	1,017	0.95	--	--	--	--
GRP380	Ostomy Supplies	--	--	1,034	6.64	--	--	--	--
GRP390	Other Neuromuscular Stimulators	--	--	530	0.98	--	--	--	--
GRP400	Oxygen Supplies/Equipment	--	--	5,893	61.01	--	--	--	--
GRP410	Power Operated Vehicle (POV)	--	--	4,064	6.81	--	--	--	--
GRP420	Parenteral Nutrition	--	--	13,086	8.23	--	--	--	--
GRP430	Patient Lift	--	--	5,679	18.77	--	--	--	--
GRP440	Pneumatic Compression Device	--	--	2,862	4.62	--	--	--	--
GRP450	Repairs/DME	--	--	-1,165	-3.46	--	--	--	--
GRP455	Respiratory Assist Device	--	--	--	--	--	--	--	--
GRP460	Seat Lift Mechanism	--	--	3,177	8.32	--	--	--	--
GRP470	Spinal Orthoses	--	--	1,113	7.39	--	--	--	--
GRP480	Suction Pump	--	--	3,896	9.32	--	--	--	--
GRP490	Support Surfaces	--	--	4,845	23.14	--	--	--	--
GRP500	Surgical Dressings	--	--	1,310	7.62	--	--	--	--
GRP510	Transcutaneous Electrical Nerve Stimulators (TENS)	--	--	2,218	8.04	--	--	--	--
GRP520	Tracheostomy Supplies	--	--	-1,371	-2.01	--	--	--	--

Table 6-6 (Continued)

HCC Prospective Risk Adjustment Models with DME and Procedure Groups

		1		2		3		4	
		Base Model		All DME Groups		Selected DME groups		Selected DME,Procs	
HCC	Label	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio	Parameter Estimate	t-ratio
GRP530	Traction Equipment	--	--	1,442	2.62	--	--	--	--
GRP540	Upper Limb Orthoses	--	--	338	2.30	--	--	--	--
GRP550	Upper Limb Prostheses	--	--	-560	-0.45	--	--	--	--
GRP560	Urological Supplies	--	--	243	1.49	--	--	--	--
GRP570	Ventilators	--	--	6,305	11.26	--	--	--	--
GRP580	Voice Prostheses	--	--	-3,060	-3.42	--	--	--	--
GRP590	Walkers	--	--	1,108	12.75	--	--	--	--
GRP600	Wheelchairs	--	--	3,940	48.64	--	--	--	--
GRP610	_Misc DMEPOS_	--	--	920	6.31	--	--	--	--
GRP612	_Misc Drugs_	--	--	-882	-1.18	--	--	--	--
GRP620	_Routinely Denied Items_	--	--	-79	-0.40	--	--	--	--
GRP630	{N/A}	--	--	5,685	3.67	--	--	--	--

NOTES:

DM= diabetes mellitus (HCCs 15-20)
CHF= congestive heart failure (HCC 80)
COPD= chronic obstructive pulmonary disease (HCC 108)
CVD= cerebrovascular disease (HCCs 95-103)
VD= vascular disease (HCCs 104-105)
CAD= coronary artery disease (HCCs 81-84)
RF=renal failure (HCC 131)
[1] Coefficients of HCCs 161 and 177 are constrained to be equal.
"|" means Coefficients of HCCs are constrained to be equal.

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table 6-7

Predictive Power of Base HCC Model Adding DME and Procedure Groups

HCC Model	R-squared
diagnoses only (Base)	11.15%
diagnoses + all HCFA DME policy groups	12.46%
diagnoses + HCC DME groups	12.23%
diagnoses + HCC DME groups + HCC procedure groups	12.28%

NOTES:
From Table 6-6.

SOURCE: Health Economics Research, Inc.

Table 6-8

Incremental Payments Associated with DME Utilization

Base Year DME HCC	Incremental Payments
185 Oxygen	$6,907
186 CPAP/IPPB/Nebulizers	$2,285
187 Patient Lifts, POVs, Beds	$7,688
188 Wheelchairs, Commodes	$4,382
189 Walkers	$1,995
Comparisons:	
7 Metastatic Cancer and Acute Leukemia	$7,730
67 Quadriplegia	$4,947
72 Multiple Sclerosis	$1,499
80 Congestive Heart Failure	$1,608
108 COPD	$1,198
158 Hip Fracture/Dislocation	$184

NOTES:
From Table 6-6.

SOURCE: Health Economics Research, Inc.

Table 6-9

Predictive Ratios for Base Model, and Models Adding DME and Procedures

	1	2	3
		Model	
Validation Group	Base HCC	Base + DME[1]	Base + DME, Procs[2]
ALL ENROLLEES	1.00	1.00	1.00
Demographics			
AGED	1.00	1.00	1.00
DISABLED	1.00	1.00	1.00
FEMALE, <=34	1.00	1.00	1.00
FEMALE, 35-44	1.00	1.00	1.00
FEMALE, 45-54	1.00	1.00	1.00
FEMALE, 55-59	1.00	1.00	1.00
FEMALE, 60-64	1.00	1.00	1.00
FEMALE, 65-69	1.00	1.00	1.00
FEMALE, 70-74	1.00	1.00	1.00
FEMALE, 75-79	1.00	1.00	1.00
FEMALE, 80-84	1.00	1.00	1.00
FEMALE, 85-89	1.00	1.00	1.00
FEMALE, 89-94	1.00	1.00	1.00
FEMALE, 95 OR OLDER	1.00	1.00	1.00
MALE, <=34	1.00	1.00	1.00
MALE, 35-44	1.00	1.00	1.00
MALE, 45-54	1.00	1.00	1.00
MALE, 55-59	1.00	1.00	1.00
MALE, 60-64	1.00	1.00	1.00
MALE, 65-69	1.00	1.00	1.00
MALE, 70-74	1.00	1.00	1.00
MALE, 75-79	1.00	1.00	1.00
MALE, 80-84	1.00	1.00	1.00
MALE, 85-89	1.00	1.00	1.00
MALE, 89-94	1.00	1.00	1.00
MALE, 95 OR OLDER	1.00	1.00	1.00
RACE = BLACK	1.04	1.07	1.07
RACE = OTHER	1.00	1.00	1.00
ORIGINALLY DISABLED	1.00	1.00	1.00
MEDICAID	1.00	1.00	1.00
Diagnoses[3]			
ANY 1996 CHRONIC CONDITION	0.98	0.98	0.98
DEPRESSION	0.92	0.93	0.93
ALCOHOL / DRUG DEPENDENCE	0.97	0.96	0.96
HYPERTENSIVE HEART/RENAL DISEASE	0.95	0.96	0.95
BENIGN/UNSPECIFIED HYPERTENSION	0.96	0.97	0.97
DIABETES WITH COMPLICATIONS	0.96	0.96	0.96
DIABETES WITHOUT COMPLICATIONS	0.99	0.99	0.99
HEART FAILURE / CARDIOMYOPATHY	0.97	0.98	0.98
ACUTE MYOCARDIAL INFARCTION	0.98	0.98	0.98
OTHER HEART DISEASE	0.98	0.98	0.98
CHRONIC OBSTRUCTIVE PULMONARY DISEASE	0.99	0.99	0.99
COLORECTAL CANCER	0.98	0.98	0.98
BREAST CANCER	1.08	1.08	1.08
LUNG/PANCREAS CANCER	0.90	0.91	0.91
OTHER STROKE	0.96	0.97	0.97
INTRACEREBRAL HEMORRHAGE	1.04	1.04	1.04
HIP FRACTURE	0.99	1.00	1.00
ARTHRITIS	0.91	0.92	0.92

Table 6-9 (Continued)

Predictive Ratios for Base Model, and Models Adding DME and Procedures

	1	2	3
		Model	
Validation Group	Base HCC	Base + DME[1]	Base + DME, Procs[2]
Multiple Diagnoses[3]			
DIABETES, CORONARY ARTERY DISEASE	0.98	0.98	0.98
DIABETES, CEREBROVASCULAR DISEASE	0.98	0.98	0.98
HEART FAILURE, COPD	0.98	0.99	0.99
CORONARY ARTERY DISEASE, VASCULAR DISEASE	0.97	0.98	0.98
COPD, CORONARY ARTERY DISEASE	0.99	0.99	0.99
HEART FAILURE, RENAL FAILURE	0.98	0.99	0.97
DIABETES, HEART FAILURE, RENAL FAILURE	0.98	0.98	0.96
COPD, CEREBROVASCULAR DISEASE, CORONARY ARTERY DISEASE	0.99	0.99	0.99
DIABETES, CEREBROVASCULAR DISEASE, VASCULAR DISEASE	0.99	0.99	0.99
Expenditures			
FIRST (LOWEST) QUINTILE, 1996 EXPEND	1.23	1.19	1.19
SECOND QUINTILE, 1996 EXPEND	1.23	1.19	1.18
MIDDLE QUINTILE, 1996 EXPEND	1.14	1.10	1.10
FOURTH QUINTILE, 1996 EXPEND	1.02	1.02	1.02
FIFTH (HIGHEST) QUINTILE,1996 EXPEND	0.86	0.89	0.89
Top 5 percent 1996 EXPENDITURES	0.77	0.81	0.81
Top 1 percent 1996 EXPENDITURES	0.69	0.72	0.72
FIRST (LOWEST) QUINTILE, 1997 EXPEND	104.22	100.76	100.73
SECOND QUINTILE, 1997 EXPEND	13.73	13.29	13.29
MIDDLE QUINTILE, 1997 EXPEND	5.71	5.56	5.56
FOURTH QUINTILE, 1997 EXPEND	1.97	1.98	1.98
FIFTH (HIGHEST) QUINTILE,1997 EXPEND	0.37	0.39	0.39
No home health spending 1996	1.10	1.07	1.07
Home health spending > 0 1996	0.75	0.82	0.82
HHA spending>0:FIRST (LOWEST) QUINTILE, 1996	0.99	1.02	1.02
HHA spending>0:SECOND QUINTILE, 1996	0.98	1.04	1.04
HHA spending>0:MIDDLE QUINTILE, 1996	0.88	0.96	0.96
HHA spending>0:FOURTH QUINTILE, 1996	0.75	0.84	0.84
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.46	0.55	0.55
HHA spending>0: top 10% of HHA spending 1996	0.39	0.47	0.47
HHA spending>0: top 5% of HHA spending 1996	0.33	0.40	0.40
No home health spending 1997	1.54	1.51	1.51
Home health spending > 0 1997	0.41	0.44	0.44
HHA spending>0:FIRST (LOWEST) QUINTILE, 1997	0.53	0.55	0.55
HHA spending>0:SECOND QUINTILE, 1997	0.47	0.49	0.49
HHA spending>0:MIDDLE QUINTILE, 1997	0.43	0.45	0.45
HHA spending>0:FOURTH QUINTILE, 1997	0.39	0.42	0.42
HHA spending>0:FIFTH (HIGHEST) QUINTILE,1997	0.32	0.37	0.37
HHA spending>0: top 10% of HHA spending 1997	0.29	0.34	0.34
HHA spending>0: top 5% of HHA spending 1997	0.26	0.31	0.31
No DME spending 1996	1.09	1.02	1.02
DME spending > 0 1996	0.82	0.96	0.96
DME spending>0:FIRST (LOWEST) QUINTILE, 1996	0.94	0.96	0.96
DME spending>0:SECOND QUINTILE, 1996	0.89	1.00	1.00
DME spending>0:MIDDLE QUINTILE, 1996	0.89	1.00	1.00
DME spending>0:FOURTH QUINTILE, 1996	0.82	0.97	0.97
DME spending>0:FIFTH (HIGHEST) QUINTILE,1996	0.65	0.91	0.91
DME spending>0: top 10% of DME spending 1996	0.59	0.87	0.87
DME spending>0: top 5% of DME spending 1996	0.57	0.81	0.81

Table 6-9 (Continued)

Predictive Ratios for Base Model, and Models Adding DME and Procedures

	1	2	3
		Model	
Validation Group	Base HCC	Base + DME[1]	Base + DME, Procs[2]
No DME spending 1997	1.41	1.35	1.35
DME spending > 0 1997	0.57	0.64	0.64
DME spending>0:FIRST (LOWEST) QUINTILE, 1997	0.76	0.77	0.77
DME spending>0:SECOND QUINTILE, 1997	0.58	0.60	0.60
DME spending>0:MIDDLE QUINTILE, 1997	0.65	0.69	0.69
DME spending>0:FOURTH QUINTILE, 1997	0.54	0.59	0.59
DME spending>0:FIFTH (HIGHEST) QUINTILE,1997	0.47	0.61	0.61
DME spending>0: top 10% of DME spending 1997	0.50	0.69	0.69
DME spending>0: top 5% of DME spending 1997	0.44	0.58	0.58
DME			
oxygen supplies/equipment (DME)	0.65	0.99	0.99
wheelchairs (DME)	0.68	0.95	0.95
walkers (DME)	0.84	1.03	1.03
HOSPITAL ADMISSIONS			
0 1996 HOSP ADMISSIONS	1.03	1.02	1.02
1 1996 HOSP ADMISSIONS	1.02	1.03	1.03
2 1996 HOSP ADMISSIONS	0.98	1.00	1.00
3+ 1996 HOSP ADMISSIONS	0.82	0.84	0.84
0 1997 HOSP ADMISSIONS	3.53	3.50	3.50
1 1997 HOSP ADMISSIONS	0.56	0.57	0.57
2 1997 HOSP ADMISSIONS	0.34	0.34	0.34
3+ 1997 HOSP ADMISSIONS	0.24	0.25	0.25

OUTPUT: D9pr07ba.out and D9pr07aa.out

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

[1]Model 3 of Table 6-6

[2] Model 4 of Table 6-6

[3]Validation groupd diagnoses assigned using Source=1- 6

7 Concurrent DCG Modeling

7.1 Overview

In the preceding six chapters we have described prospective DCG/HCC models, which estimate expected year-2 costs from year-1 information. In Chapter 7, we use the same population and modeling framework to develop concurrent models, that is, models which estimate expected costs in the same year that the diagnostic information is generated.[1] Specifically, we estimate our models using year-2 diagnoses to predict year-2 spending. Our strategy for concurrent modeling is somewhat different than previously. First, we see concurrent models as useful primarily for provider profiling and monitoring rather than plan payment. Concurrent models may create inappropriate incentives for treatment and diagnosis, and are thus less attractive for establishing payments. If concurrent models will not be used for payment, there is no need to exclude condition categories because of concerns about incentives. Second, acute and common but minor conditions (e.g., infectious diseases, ear, nose, and throat disorders, and injuries) generate significant expenditures in the year in which they occur. But, due to greater variation in coding minor conditions as opposed to more serious chronic conditions, and their greater sensitivity to deductibles, a concurrent model may use diagnoses that are somewhat less consistently coded. Concurrent modeling is more useful, rather, in making comparison

[1] The description of the concurrent DCG/HCC model draws upon Ash *et al* 1998 extensively.

within a population or among populations with similar features. Third, concurrent models predict much better than do prospective models, and it is easy to see why. For example, when we see no diagnoses listed for a woman this year, it is nearly certain that she has incurred minimal or zero costs; however, there is still a non-negligible chance that she will have a costly medical problem next year. We regard it as a sign of the success of our concurrent models that once diagnoses are taken into account, there is little additional explanatory power added by considering age and sex groups. In our preferred specifications, we omit age and sex categories altogether from the concurrent models. To avoid negative predicted payments, we also constrain intercept terms.

The first two stages in creating concurrent models were exactly the same as with prospective DCG models. ICD-9-CM diagnoses from 1997 were first aggregated into 804 DxGroups using the same classification system as for the prospective model. Although the primary focus in designing the DxGroups was on prospective modeling, in some cases separate DxGroups were created to differentiate clusters of diagnoses that predict concurrent, rather than future, costs. As can be seen in Table A-3 of DxGroup means in the appendix, the DxGroups identify many meaningful categories of concurrent resource use, for example, 106.06 varicose veins, 106.10 hemorrhage nos, 14.01 benign neoplasm of skin, and 91.01 essential hypertension.

Next we aggregate the DxGroups into 184 of the 189 Condition Categories (CCs). We chose *a priori* not to include the five HCCs defined solely by DME claims. In our initial development of DCG models (Ellis *et al*., 1996), we used one set of CCs and

hierarchies for our concurrent models and a generally similar set of CCs for our prospective models. Here we follow Ash *et al*., 1998 and Pope *et al*, 1998 in using exactly the same classification system and hierarchies for both concurrent and prospective models. Differences between concurrent and prospective frameworks derive from differences in coefficients, not from different groupings of diagnoses into condition categories.

One small difference in the concurrent modeling is that we use end-of-year age instead of beginning-of-year age (as was used for prospective modeling). This accommodates newborns, who would otherwise be assigned negative concurrent ages. It also permits both prospective and concurrent models to be estimated from the same set of explanatory variables.

We first used only age and sex to predict costs in 1997. Then we estimated four types of models, similar to those examined prospectively, only this time using diagnostic and demographic information from 1997 to predict costs in the same year. For our concurrent model, following the sample selection criteria described in Chapter 2, we included anyone eligible for coverage in at least one month in 1997. This resulted in an estimation sample of 1,581,370. The sample includes all people included in the prospective modeling subset of our Prospective sample, and additionally those people who became eligible for Medicare during 1996 or 1997. See Table 3-4 in Chapter 3 for descriptive statistics on the overall concurrent sample, and by concurrent HCC.

7.2 Process of Selection

The first two columns of numbers in Table 7-1 show the coefficients and t-ratios from the first model, an Age/Sex Only model. At the top of the two columns, the model's R^2 value is shown as 1.08 percent. As seen in the prospective modelling, coefficients on the age cohorts are monotonic except that the 65-69 year old age groups for both sexes cost less than the age 55-64 group, and the two oldest groups (ages 95 and over) cost less than the 90 to 94-year olds. Starting on the second page of the table, the first column shows the number of person years falling in each HCC in the concurrent sample. Although this column repeats information that is also presented in Table 3-4, it is useful here for interpreting coefficients. In particular, it reminds us that some sample cell sizes are small.

The second model adds binary dummy variables for each of the 184 HCCs to the 24 age-sex dummies without imposing any exclusions. This model has much higher explanatory power than any prospective model: its R^2 is 52.44 percent versus 11.15 percent for the base prospective model. There are 22 negative coefficients, notably in the Mental Retardation/Developmental Disability HCCs, and various low cost HCCs. In several cases, monotonicity of the HCCs in a hierarchy is not satisfied, such that lower ranked HCCs have larger cost weights than higher ranked HCCs. Most coefficients are substantially larger than those of the prospective model. The age-sex coefficients are all negative and show a pattern that is the opposite of the simple Age/Sex Only model. Medicaid status (eligibility in 1997) is small and slightly positive ($73, t = 3.01), while

the coefficient on originally disabled is negative. Taken together, the coefficients indicate that the observed demographic cost pattern is largely explained in a concurrent model by diagnostic information, with little variation explained by the demographic variables once the diagnoses are accounted for.

The next step in model development was to impose constraints to eliminate negative coefficients. We find it undesirable to have negative coefficients for any age/sex cells, which wrongly assign negative expected costs to the many individuals in these cells who have no 1997 diagnoses (HCCs). Therefore we constrain all the age-sex coefficients to be zero, and instead capture the expected costs for people with no diagnoses in a single constant term (the intercept). We also dropped the Medicaid status and originally disabled variables (that is, we set their coefficients to zero) because they add little information in the concurrent setting. Also, it is undesirable for any risk adjustment model (whether intended for payment, monitoring or profiling) to reduce its predicted cost when either any new medical condition is added to a person's profile, or when a more serious condition is coded rather than one that indicates lesser severity. Hence, for reasons similar to those stated for the prospective model, we constrain coefficients to remove negatives and non-monotonic coefficients in the same hierarchy. For example, although the unconstrained coefficient of HCC 67 Quadriplegia, Other Extensive Paralysis is somewhat smaller than that for HCC 68 Paraplegia, our constrained model contains only a single coefficient for all people with diagnoses in either category.

These changes have little effect on the remaining coefficients or the R^2, which is now 52.31 percent, down from 52.45 percent. One new problem, however, arises; instead of numerous negative age/sex constants, we now have a single, highly significant, negative intercept. We address this problem by omitting the intercept, but including a new variable (NOHCC) to ensure that all predictions are positive.

For the fourth model shown in Table 7-1, we replace the intercept with the dummy NOHCC, which equals one if the beneficiary does not have any HCC used in calculating predictions. Note that NOHCC indicates more than people with no valid diagnoses recorded – some of these people had HCCs for lower cost conditions which were excluded from the model because they were negative. NOHCC is a marker for people with "no HCC that leads to increased predicted expenditures."[2]

Preliminary versions of Model 4, (not shown in Table 7-1) using the NOHCC variable, had many HCCs with coefficients smaller than the one for NOHCC. This violates monotonicity, since a person with no HCCs then receives a higher prediction than someone with a single, low-cost HCC. Therefore, in our final preferred specification we constrain any HCCs with coefficients that are less than the NOHCC coefficient to be zero. This requires recalculating the NOHCC variable. The final preferred specification has a NOHCC coefficient of $353, and only 117 parameters. This implies that only 116 HCC parameters are estimated for the 184 HCCs. An additional 6 HCCs are assigned weight in the prediction while constrained to be equal to other HCC coefficients. A total

of 62 HCCs, mostly lower cost ones, have a zero coefficient, and their costs are picked up in the single NOHCC ("not in any prediction-increasing HCC") variable.

The final concurrent model, shown as Model 4 of Table 7-1, has generally plausible coefficients on each of the non-zero HCCs. The R^2 is an impressive 52.15 percent, down only slightly from the 52.45 percent when no constraints or exclusions are imposed. The 3 highest cost groups are "77 Respirator Dependence/Tracheostomy Status (incremental cost = $42,450)", "150 Extensive Third Degree Burns ($33,801)", and "78 Respiratory Arrest ($17,606)." These high cost groups have good face validity.

Using results from Model 4, Figure 7-1 presents a comparison of predicted and actual levels of spending for people in each of 22 predicted-cost categories, known as DCGs. The lowest-cost group has DCG-predicted costs of $300-399, the second lowest encompasses predicted costs of $400-499, ranging up to a top group with model-predicted costs of $70,000 or more. Points are located along the X-axis corresponding to the DCG category dollar labels. The Y-axis values are (weighted) average actual expenditures for the groups of people. Both actual and predicted costs are plotted. Clearly, the concurrent model successfully discriminates costs, identifying substantial subgroups of Medicare enrollees with very high and very low costs.

7.3 Alternative Concurrent Models

[2] See Table 3-4 of Chapter 3 for descriptive statistics on NOHCC for the base concurrent model (Model 4 in Table 7-1).

In addition to our base concurrent model shown as Model 4 of Table 7-1, we explored two alternative concurrent models. The two alternative models are discussed in turn in Sections 7.3.1 and 7.3.2, and shown in Table 7-2 as Models 5 and 6 along with our base concurrent Model 4 repeated from Table 7-1. The first additional concurrent model is a profiling model that could be used as an alternative to the base concurrent model. The second additional concurrent model is a payment version of the concurrent model. The additional models may be useful for different purposes than the base concurrent model.

7.3.1 Alternative Profiling Model

The first alternative begins by a priori constraining certain HCC coefficients equal to zero, then using the same model selection process as described in Section 7.2. This process differs from the base model, in which no HCCs (other than the DME-based HCCs) were excluded from the model a priori. The HCCs constrained a priori to be zero included:

1) Selected HCCs that represent the process or outcome of medical care as opposed to clinical diagnoses (HCCs 175, 179-189).

These HCCs are based on ICD-9-CM "V" codes, or on DME HCPCS procedure codes. Examples of these HCCs are HCC 179 "Post-Surgical States/Aftercare/Elective", HCC 181 "Chemotherapy", HCC 182 "Rehabilitation", and HCC 183

"Screening/Observation/Special Exams". All DME groups (HCCs 185-189, e.g., "wheelchair") are also excluded as part of this group (the DME HCCs are not included in our base concurrent Model 4 either).

Note that we do not exclude all V-code-based HCCs from this alternative concurrent model. For example, we continue to include HCC 174 "Major Organ Transplant Status" and HCC 177 "Amputation Status, Lower Limb/Amputation Complications". Our clinical panel considered these categories to be better defined and less subject to practice style and coding variations than the excluded HCCs.

2) Diagnoses representing complications of medical care (HCCs 164-165).

3) HCCs that represent symptoms (HCCs 166-167).

4) Neonatal diagnoses (HCCs 168-172).

5) Diagnostic categories that may be vague, gameable, imperfectly coded, or not necessarily indicative of serious illness (HCCs 23, 47, 133-136).

The diagnoses in category 5 are strongly correlated with costs, but the diagnoses themselves are often acting as proxies for other, underlying serious conditions. These diagnoses themselves are not necessarily serious or even directly indicative of an underlying serious condition. They are more likely to be erratically coded. Examples include HCC 23 "Disorders of Fluid/Electrolyte/Acid-Base Balance", HCC 47 "Iron Deficiency and Other/Unspecified Anemias and Blood Disease", and HCC 134 "Incontinence".

By excluding these five categories of diagnoses, the costs they capture are reassigned to other diagnostic categories, which better measure underlying, serious disease (e.g., cancer, heart disease, stroke, etc.). A concurrent profiling model excluding these HCCs may be preferred by some because it emphasizes underlying, serious clinical diagnoses, and is less confounded by the process and complications of care, symptoms, and discretionary diagnoses. On the other hand, because we conceptualize this model as a concurrent profiling model, we retain in this variant more HCCs than are allowed in the prospective HCC payment model (see Section 4.6). For example, we do not exclude diagnoses that are expected to generate significant current year, but not necessarily subsequent year, expenditures, such as HCC 35 "Appendicitis" and HCC 30 "Gallbladder and Biliary Tract Disorders".

We estimated a concurrent model with the coefficients of the HCCs identified above set to zero. Then we went through the same process of model selection as described above in Section 7.2 for the base concurrent model. That is, we set negative coefficients equal to zero, constrained coefficients where hierarchies were violated, excluded all age/sex and other demographic variables[3], dropped the regression intercept (constant) term[4], introduced a "No HCC" variable, and excluded all HCCs with coefficients less than the NOHCC coefficient, incorporating them into the NOHCC variable.

[3] These variables were excluded because their coefficients were negative or close to zero.

[4] The intercept was excluded because it was negative.

The final alternative concurrent profiling model is shown as Model 5 in Table 7-2. Table 7-2 has the same format as Table 7-1. Model 4 from Table 7-1 (our base concurrent model) is repeated in Table 7-2 for comparison with these two alternative concurrent models (Models 5 and 6). The alternative profiling model (Model 5) contains

10 fewer parameters than the base model (Model 4). Mostly, these are accounted for by the explicit exclusions of HCCs from the alternative model. On the other hand, the alternative model retains some HCCs that are excluded from the base model: for example, HCC 39 "Disorders of the Vertebrae and Spinal Discs", HCCs 56, 57, and 58, "Reactive/Unspecified Psychosis", "Personality Disorders", and "Depression", respectively, and HCC 118 "Retinal Detachment". Reflecting the greater exclusions from the alternative model, its NOHCC coefficient is $412, slightly greater than in the base model ($353). As expected, the coefficients of serious illnesses such as cancer, heart disease, and stroke are higher in the alternative model than in the base model. These diagnoses carry more of the predictive "load" in the alternative model, because HCCs representing symptoms, medical care or its complications, and less fundamental ancillary diagnoses are excluded. Excluding these diagnoses does come at a cost in predictive power: the R-square of the alternative model declines to 49.44% from 52.15% for the base model.

7.3.2 Payment Model

The second alternative concurrent model we estimated excluded a priori the same HCC categories as were excluded from the base prospective payment model (see Section 4.6 for a discussion of the base prospective payment model). The criteria for including diagnoses in a payment model are more stringent than for including them in a profiling model (see Section 3.1 for a discussion of criteria for excluding diagnoses from a

payment model). Hence, the second alternative concurrent model includes fewer HCCs than the other two concurrent models. Although we generally prefer the use of prospective risk adjustment models for payment purposes, there may be some circumstances in which use of a concurrent model is necessary (e.g., only one year of data are available) or desirable (e.g., a "casemix" adjuster is desired). We estimated a "payment" version of the concurrent model for use in these cases.

After making the a priori exclusions of HCCs, we used the same model selection process as was used for the other two concurrent models. That is, we set negative coefficients equal to zero, constrained coefficients where hierarchies were violated, excluded all age/sex and other demographic variables[5], dropped the regression intercept (constant) term[6], introduced a "No HCC" variable, and excluded all HCCs with coefficients less than the NOHCC coefficient, incorporating them into the NOHCC variable. The final payment concurrent model is shown as Model 6 of Table 7-2.

The number of parameters in the payment concurrent model is 89, 28 fewer than in the base concurrent model (Model 4), and 10 fewer than in the alternative concurrent profiling model (Model 5). This reflects the more stringent criteria for including diagnoses in a payment model. Note that the HCCs included in the concurrent payment model are not identical to those included in the prospective payment model. For example, although not excluded a priori, HCC 118 "Retinal Detachment" was excluded

[5] These variables were excluded because their coefficients were negative or close to zero.

[6] The intercept was excluded because it was negative.

from the final prospective model because it had a coefficient insignificantly different from zero (see Table 4-2).[7] But in the concurrent estimation, HCC 118 has a statistically significant positive coefficient greater than NOHCC's coefficient, so it is included in the concurrent payment model (Model 6 of Table 7-2). Conversely, HCC 19 "Diabetes with No or Unspecified Complications" is included in the base prospective model (Table 4-2), but not in the concurrent payment model because its coefficient is less than NOHCC's coefficient in the concurrent estimation and thus it is incorporated into the NOHCC variable. Despite these exceptions and a few others, the HCCs included in the prospective and concurrent payment models are quite similar overall (compare Model 5 of Table 4-2 to Model 6 of Table 7-2).

Because of the greater number of exclusions from the payment model, NOHCC's coefficient rises to $613, considerably larger than in either of the two concurrent profiling models (Models 4 and 5 in Table 7-2). NOHCC's coefficient is the predicted payment assigned to all beneficiaries not assigned to an HCC included in the final model. The overall predictive power of the payment model, an R-square of 49.05%, is only slightly lower than the alternative profiling model (Model 5), but several percentage points less than the base concurrent model (Model 4). Again, this reflects the a priori exclusion of certain HCCs that, while they contribute to predictive power, may create undesirable incentives in a payment model.

[7] An insignificant coefficient in the prospective model indicates that retinal detachment is not associated with elevated future medical expenditures, holding constant other diagnoses and demographic factors.

Table 7-1

Concurrent Medicare Models Using 1997 Data

	Model 1		Model 2		Model 3		Model 4	
	Age Sex Only		No Exclusions		Exclusions		Exclusions, Constraints, NOHCC	
Model Name	CON0		CON1		CON3		CON6	
Number of Obs	1,581,370		1,581,370		1,581,370		1,581,370	
Dependent Variable Mean	5,156.98		5,156.98		5,156.98		5,156.98	
Model Parameters	23		207		153		117	
Standard error	13,462		9,334		9,347		9,362	
CV	261		181		181		182	
R-Square	0.0108		0.5245		0.5231		0.5215	
Adj. R-Square	0.0108		0.5244		0.5231		0.5215	
Computer Output	d9con01a		d9cn03b		d9cn03n		d9cn03r	
Variable	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**
INTERCEPT[1]	3,281	101.75	-	-	-816	-60.09	-	-
NOHCC	.	.	-	-	-	-	353	24.56
Male, age 0 to 34	35	0.29	-357	-4.31	-	-	-	-
Male, age 35 to 44	640	6.99	-585	-9.27	-	-	-	-
Male, age 45 to 54	797	9.42	-801	-14.22	-	-	-	-
Male, age 55 to 59	1,362	12.32	-918	-12.31	-	-	-	-
Male, age 60 to 64	2,065	20.45	-794	-11.73	-	-	-	-
Male, age 65 to 69	480	9.93	-47	-1.65	-	-	-	-
Male, age 70 to 74	1,580	32.20	-274	-9.10	-	-	-	-
Male, age 75 to 79	2,769	52.20	-446	-13.23	-	-	-	-
Male, age 80 to 84	3,960	63.26	-830	-20.11	-	-	-	-
Male, age 85 to 89	5,183	61.05	-1,105	-19.19	-	-	-	-
Male, age 90 to 94	5,991	42.28	-1,241	-12.71	-	-	-	-
Male, age 95 and over	5,293	18.61	-1,405	-7.14	-	-	-	-
Female, age 0 to 34	431	2.95	-263	-2.52	-	-	-	-
Female, age 35 to 44	979	8.84	-548	-7.11	-	-	-	-
Female, age 45 to 54	1,466	15.05	-712	-10.60	-	-	-	-
Female, age 55 to 59	1,884	15.54	-699	-8.39	-	-	-	-
Female, age 60 to 64	2,961	26.36	-506	-6.59	-	-	-	-
Female, age 65 to 69[1]	-	-	-147	-5.41	-	-	-	-
Female, age 70 to 74	970	21.04	-334	-12.11	-	-	-	-
Female, age 75 to 79	2,015	42.87	-484	-16.57	-	-	-	-
Female, age 80 to 84	3,122	61.00	-721	-22.04	-	-	-	-
Female, age 85 to 89	4,222	70.12	-1,011	-25.31	-	-	-	-
Female, age 90 to 94	4,894	59.37	-1,202	-21.33	-	-	-	-
Female, age 95 and over	4,144	31.35	-1,707	-18.70	-	-	-	-
Medicaid Status, 1997	-	-	73	3.10	-	-	-	-
Originally Disabled	-	-	-268	-8.06	-	-	-	-

Table 7-1 (continued)

Concurrent Medicare Models Using 1997 Data

		Model 2		Model 3		Model 4	
		No Exclusions		Exclusions		Exclusions, Constraints, NOHCC	
Variable	Number of Person Years	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
1 HIV/AIDS	2,419	1,894	9.73	1,816	9.40	1,533	7.93
2 Septicemia/Shock	22,864	10,293	149.37	10,329	149.74	10,382	151.94
3 Central Nervous System Infection	5,257	2,783	21.43	2,741	21.08	2,679	20.59
4 Tuberculosis	2,939	1,220	7.05	1,157	6.68	1,033	5.96
5 Opportunistic Infections	3,094	9,359	54.66	9,309	54.30	9,341	54.44
6 Other Infectious Diseases	240,084	326	14.31	192	8.57	0	.
7 Metastatic Cancer and Acute Leukemia	24,334	7,553	114.22	7,609	115.23	7,563	115.04
8 Lung, Upper Digestive Tract, and Other Severe Cancers	15,254	1,999	25.72	2,008	25.84	1,904	24.55
9 Lymphatic, Head and Neck, Brain, and Other Major Cancers	19,821	1,187	17.47	1,125	16.59	949	14.03
10 Breast, Prostate, Colorectal and Other Cancers and Tumors	103,618	640	19.78	566	17.82	343	11.16
11 Other Respiratory and Heart Neoplasms	3,545	989	6.27	978	6.19	343	11.16
12 Other Digestive and Urinary Neoplasms	42,447	40	0.83	44	0.93	0	.
13 Other Neoplasms	87,488	105	3.07	-1	-0.04	0	.
14 Benign Neoplasms of Skin, Breast, Eye	120,614	-258	-8.64	0	.	0	.
15 Diabetes with Renal Manifestation	7,666	1,483	12.51	1,599	13.56	1,614	13.85
16 Diabetes with Neurologic or Peripheral Circulatory Manifestation	34,289	921	15.41	966	16.29	942	16.39
17 Diabetes with Acute Complications	10,377	832	8.68	898	9.37	826	8.71
18 Diabetes with Ophthalmologic Manifestation	22,287	-127	-1.71	97	3.73	0	.
19 Diabetes with No or Unspecified Complications	164,379	113	4.22	97	3.73	0	.
20 Type I Diabetes Mellitus	76,083	1,657	37.77	1,681	38.60	1,611	40.56
21 Protein-Calorie Malnutrition	19,571	8,575	118.37	8,625	118.93	8,726	120.27
22 Other Significant Endocrine and Metabolic Disorders	17,219	1,267	17.48	1,248	17.21	1,224	16.90
23 Disorders of Fluid/Electrolyte/Acid-Base Balance	119,712	3,226	96.54	3,219	96.35	3,333	102.13
24 Other Endocrine/Metabolic/Nutritional Disorders	400,519	-12	-0.63	-86	-4.69	0	.
25 End-Stage Liver Disease	3,321	4,815	29.28	4,873	29.60	4,881	29.64
26 Cirrhosis of Liver	4,765	109	0.79	166	1.21	342	2.95
27 Chronic Hepatitis	1,962	1,086	5.13	1,072	5.06	342	2.95
28 Acute Liver Failure/Disease	1,539	1,747	7.26	1,785	7.41	1,739	7.21
29 Other Hepatitis and Liver Disease	15,833	167	2.21	198	2.62	0	.
30 Gallbladder and Biliary Tract Disorders	23,689	2,705	42.66	2,746	43.26	2,761	43.74
31 Intestinal Obstruction/Perforation	32,569	4,936	87.62	4,895	86.81	4,972	89.33
32 Pancreatic Disease	12,003	1,806	20.53	1,780	20.21	1,806	20.54
33 Inflammatory Bowel Disease	8,136	980	9.37	925	8.84	796	7.63
34 Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	91,796	1,339	38.89	1,270	36.89	1,222	36.97
35 Appendicitis	1,668	2,863	12.47	2,941	12.80	2,942	12.79
36 Other Gastrointestinal Disorders	294,112	116	5.52	0	-0.01	0	.
37 Bone/Joint/Muscle Infections/Necrosis	13,057	4,149	48.94	4,230	49.95	4,311	50.93

Table 7-1 (continued)

Concurrent Medicare Models Using 1997 Data

Variable	Number of Person Years	Model 2 No Exclusions Parameters	Model 2 No Exclusions t-ratios	Model 3 Exclusions Parameters	Model 3 Exclusions t-ratios	Model 4 Exclusions, Constraints, NOHCC Parameters	Model 4 Exclusions, Constraints, NOHCC t-ratios
38 Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	57,194	416	10.05	362	8.88	668	25.02
39 Disorders of the Vertebrae and Spinal Discs	120,453	166	5.54	105	3.62	0	.
40 Osteoarthritis of Hip or Knee	81,387	1,236	35.14	1,216	35.11	668	25.02
41 Osteoporosis and Other Bone/Cartilage Disorders	121,628	297	9.79	216	7.35	0	.
42 Congenital/Developmental Skeletal and Connective Tissue Disorders	1,228	1,381	5.18	1,355	5.07	1,312	4.91
43 Other Musculoskeletal and Connective Tissue Disorders	390,108	-79	-4.05	0	.	0	.
44 Severe Hematological Disorders	10,921	4,834	52.02	4,801	51.60	4,776	51.27
45 Disorders of Immunity	9,800	4,177	42.14	4,165	41.96	4,134	41.61
46 Coagulation Defects and Other Specified Hematological Disorders	42,410	1,885	39.42	1,857	38.81	1,822	38.06
47 Iron Deficiency and Other/Unspecified Anemias and Blood Disease	150,098	1,836	66.39	1,766	63.93	1,680	61.16
48 Delirium and Encephalopathy	21,563	4,649	69.02	4,665	69.39	4,795	71.55
49 Dementia	92,347	681	18.77	567	16.00	614	18.57
50 Senility, Nonpsychotic Organic Brain Syndromes/Conditions	11,015	1,361	15.12	1,240	13.77	614	18.57
51 Drug/Alcohol Psychosis	6,020	3,808	30.99	3,952	32.15	4,024	32.71
52 Drug/Alcohol Dependence	9,464	2,906	29.42	3,042	30.91	2,948	29.98
53 Drug/Alcohol Abuse, Without Dependence	25,763	1,372	22.85	1,488	24.86	1,419	23.73
54 Schizophrenia	23,024	3,633	55.64	3,615	57.35	3,210	51.24
55 Major Depressive, Bipolar, and Paranoid Disorders	45,002	2,739	58.95	2,700	58.77	2,491	54.68
56 Reactive and Unspecified Psychosis	19,629	225	3.22	324	8.77	0	.
57 Personality Disorders	1,711	761	3.36	324	8.77	0	.
58 Depression	51,608	446	10.44	324	8.77	0	.
59 Anxiety Disorders	9,262	181	1.85	283	6.78	0	.
60 Other Psychiatric Disorders	43,929	400	8.74	283	6.78	0	.
61 Profound Mental Retardation/Developmental Disability	1,239	-2,682	-10.02	0	.	0	.
62 Severe Mental Retardation/Developmental Disability	1,036	-2,008	-6.88	0	.	0	.
63 Moderate Mental Retardation/Developmental Disability	1,135	-791	-2.84	0	.	0	.
64 Mild/Unspecified Mental Retardation/Developmental Disability	7,518	-517	-4.67	0	.	0	.
65 Other Developmental Disability	923	1,339	4.35	0	.	0	.
66 Attention Deficit Disorder	557	2,020	5.10	0	.	0	.
67 Quadriplegia, Other Extensive Paralysis	3,162	5,373	31.85	5,305	31.54	5,530	42.11
68 Paraplegia	2,102	6,160	29.92	6,194	30.11	5,530	42.11
69 Spinal Cord Disorders/Injuries	12,006	2,306	26.47	2,263	26.01	2,265	26.08
70 Muscular Dystrophy	608	844	2.22	821	2.16	579	1.52
71 Polyneuropathy	36,195	1,300	24.75	1,273	24.22	1,257	23.98
72 Multiple Sclerosis	4,774	2,152	15.73	2,121	15.56	1,881	13.79
73 Parkinson's and Huntington's Diseases	22,407	780	12.19	737	11.52	627	9.81
74 Seizure Disorders and Convulsions	40,736	1,097	22.26	1,027	21.13	888	18.32

Table 7-1 (continued)

Concurrent Medicare Models Using 1997 Data

		Model 2		Model 3		Model 4	
		No Exclusions		Exclusions		Exclusions, Constraints, NOHCC	
Variable	Number of Person Years	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
75 Coma, Brain Compression/Anoxic Damage	4,004	9,909	65.51	9,973	65.86	9,994	65.92
76 Mononeuropathy, Other Neurological Conditions/Injuries	64,947	202	5.29	102	2.69	0	.
77 Respirator Dependence/Tracheostomy Status	2,434	42,251	217.83	42,370	218.18	42,450	218.52
78 Respiratory Arrest	3,517	17,365	108.06	17,507	108.81	17,606	109.27
79 Cardio-Respiratory Failure and Shock	46,880	7,123	146.39	7,215	148.16	7,299	149.82
80 Congestive Heart Failure	193,089	1,447	49.14	1,284	44.15	1,257	46.53
81 Acute Myocardial Infarction	19,736	9,255	130.62	9,384	132.45	9,468	134.88
82 Unstable Angina and Other Acute Ischemic Heart Disease	54,428	4,171	94.96	4,255	97.01	4,302	100.39
83 Angina Pectoris/Old Myocardial Infarction	77,100	613	16.76	607	16.63	533	14.98
84 Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	183,788	-28	-1.12	3	0.13	0	.
85 Heart Infection/Inflammation, Except Rheumatic	6,681	5,951	51.19	5,977	51.35	6,019	51.64
86 Valvular and Rheumatic Heart Disease	119,787	1,157	37.58	1,119	36.36	1,085	35.39
87 Major Congenital Cardiac/Circulatory Defect	326	4,762	9.21	4,765	9.20	4,761	9.18
88 Other Congenital Heart/Circulatory Disease	5,061	871	6.61	844	6.40	788	5.96
89 Hypertensive Heart and Renal Disease or Encephalopathy	7,814	766	7.13	713	6.63	651	6.06
90 Hypertensive Heart Disease	51,034	110	2.52	-19	-0.44	0	.
91 Hypertension	485,207	129	6.96	7	0.40	0	.
92 Specified Heart Arrhythmias	146,126	1,681	57.38	1,582	54.22	1,485	51.17
93 Other Heart Rhythm and Conduction Disorders	82,179	797	22.93	704	20.29	576	16.71
94 Other and Unspecified Heart Disease	19,096	755	10.99	3	0.13	0	.
95 Cerebral Hemorrhage	8,980	5,231	50.65	5,245	50.74	5,267	50.91
96 Ischemic or Unspecified Stroke	70,399	1,800	43.25	1,780	42.75	1,735	41.85
97 Precerebral Arterial Occlusion and Transient Cerebral Ischemia	65,112	531	13.72	458	11.84	355	9.23
98 Cerebral Atherosclerosis and Aneurysm	7,788	334	3.13	253	2.37	0	.
99 Cerebrovascular Disease, Unspecified	5,198	115	0.88	8	0.06	0	.
100 Hemiplegia/Hemiparesis	18,995	5,846	76.89	5,945	78.13	6,017	79.00
101 Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	3,914	1,267	8.41	1,134	7.55	982	6.53
102 Speech, Language, Cognitive, Perceptual Deficits	10,614	1,659	17.16	1,698	17.54	1,736	17.91
103 Cerebrovascular Disease Late Effects, Unspecified	19,970	430	6.19	435	6.26	427	6.14
104 Vascular Disease with Complications	31,094	6,182	107.70	6,210	108.34	6,134	107.63
105 Vascular Disease	148,272	583	20.78	501	17.95	368	13.61
106 Other Circulatory Disease	105,770	497	15.98	416	13.39	0	.
107 Cystic Fibrosis	457	1,550	3.55	1,392	3.18	1,088	2.49
108 Chronic Obstructive Pulmonary Disease	196,374	1,183	46.74	1,131	44.99	986	42.13
109 Fibrosis of Lung and Other Chronic Lung Disorders	26,407	1,276	21.43	1,213	20.35	986	42.13
110 Asthma	29,579	45	0.81	-87	-1.57	0	.
111 Aspiration and Specified Bacterial Pneumonias	17,690	9,934	128.86	9,887	128.18	9,935	128.75

Table 7-1 (continued)

Concurrent Medicare Models Using 1997 Data

		Model 2		Model 3		Model 4	
		No Exclusions		Exclusions		Exclusions, Constraints, NOHCC	
Variable	Number of Person Years	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
112 Pneumococcal Pneumonia, Empyema, Lung Abscess	7,984	2,408	22.60	2,360	22.11	2,375	22.24
113 Viral and Unspecified Pneumonia, Pleurisy	95,436	1,399	41.02	1,325	38.85	1,300	38.32
114 Pleural Effusion/Pneumothorax	38,004	7,399	138.07	7,452	138.92	7,586	141.62
115 Other Lung Disorders	119,102	274	9.39	136	4.70	0	.
116 Legally Blind	4,268	1,822	12.67	1,600	11.13	1,560	10.85
117 Major Eye Infections/Inflammations	3,627	148	0.95	59	0.38	0	.
118 Retinal Detachment	6,630	541	4.67	513	4.44	0	.
119 Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	9,273	101	0.97	87	0.87	0	.
120 Diabetic and Other Vascular Retinopathies	50,729	-127	-2.66	0	.	0	.
121 Retinal Disorders, Except Detachment and Vascular Retinopathies	100,513	-395	-12.53	0	.	0	.
122 Glaucoma	145,034	-44	-1.68	0	.	0	.
123 Cataract	396,817	-230	-12.28	0	.	0	.
124 Other Eye Disorders	105,430	-430	-13.97	0	.	0	.
125 Significant Ear, Nose, and Throat Disorders	13,486	45	0.55	109	1.34	0	.
126 Hearing Loss	46,842	-149	-3.35	0	.	0	.
127 Other Ear, Nose, Throat, and Mouth Disorders	358,968	-411	-21.68	0	.	0	.
128 Kidney Transplant Status	1,421	750	2.98	694	2.76	464	1.85
129 End Stage Renal Disease	.	0	.	0	.	0	.
130 Dialysis Status	1,184	4,516	16.39	4,600	16.67	4,622	16.73
131 Renal Failure	31,497	4,254	73.72	4,266	73.90	4,257	74.08
132 Nephritis	3,996	1,149	7.56	1,143	7.51	1,083	7.11
133 Urinary Obstruction and Retention	68,233	1,133	28.51	1,092	27.94	1,068	27.84
134 Incontinence	33,871	853	16.15	752	14.24	767	14.60
135 Urinary Tract Infection	185,024	850	33.07	771	30.26	687	27.60
136 Other Urinary Tract Disorders	87,088	191	5.49	148	4.26	0	.
137 Female Infertility	113	1,885	2.15	1,883	2.14	1,616	1.84
138 Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	32,100	449	8.28	432	8.09	0	.
139 Other Female Genital Disorders	119,438	-180	-5.93	0	.	0	.
140 Male Genital Disorders	156,472	-174	-6.04	0	.	0	.
141 Ectopic Pregnancy	37	-1,089	-0.71	775	1.37	619	1.10
142 Miscarriage/Abortion	134	562	0.69	775	1.37	619	1.10
143 Completed Pregnancy With Major Complications	108	5,880	6.50	5,971	6.62	5,729	6.34
144 Completed Pregnancy With Complications	292	2,141	3.87	2,184	3.97	1,933	3.52
145 Completed Pregnancy Without Complications (Normal Delivery)	98	1,229	1.30	1,365	1.45	906	0.96
146 Uncompleted Pregnancy With Complications	104	1,741	1.90	775	1.37	619	1.10
147 Uncompleted Pregnancy With No or Minor Complications	302	120	0.22	94	0.17	0	.
148 Decubitus Ulcer of Skin	20,733	5,899	84.93	5,893	84.95	5,901	85.18

Table 7-1 (continued)

Concurrent Medicare Models Using 1997 Data

	Variable	Number of Person Years	Model 2 No Exclusions Parameters	Model 2 No Exclusions t-ratios	Model 3 Exclusions Parameters	Model 3 Exclusions t-ratios	Model 4 Exclusions, Constraints, NOHCC Parameters	Model 4 Exclusions, Constraints, NOHCC t-ratios
149	Chronic Ulcer of Skin, Except Decubitus	27,324	365	6.20	315	5.36	0	.
150	Extensive Third-Degree Burns	59	33,909	27.93	33,903	27.89	33,801	27.76
151	Other Third-Degree and Extensive Burns	502	4,156	9.97	4,226	10.12	4,135	9.89
152	Cellulitis, Local Skin Infection	109,235	776	24.52	712	22.91	617	20.33
153	Other Dermatological Disorders	308,454	-60	-2.92	0	.	0	.
154	Severe Head Injury	335	12,884	25.12	12,845	25.01	12,772	24.83
155	Major Head Injury	15,897	1,737	22.69	1,647	21.49	1,641	21.45
156	Concussion or Unspecified Head Injury	2,127	470	2.32	435	2.14	411	2.02
157	Vertebral Fractures	16,330	2,085	27.56	2,037	26.95	2,089	28.07
158	Hip Fracture/Dislocation	28,358	5,957	101.34	5,868	100.11	5,971	102.46
159	Major Fracture, Except of Skull, Vertebrae, or Hip	23,101	1,703	27.06	1,651	26.24	1,551	24.71
160	Internal Injuries	4,374	2,863	20.06	2,851	19.95	2,891	20.21
161	Traumatic Amputation	2,619	10,803	57.96	10,849	58.14	10,882	58.27
162	Other Injuries	228,752	59	2.63	-47	-2.14	0	.
163	Poisonings and Allegic Reactions	58,973	591	14.71	551	13.73	483	12.05
164	Major Complications of Medical Care and Trauma	42,941	8,354	169.48	8,431	170.98	8,537	173.00
165	Other Complications of Medical Care	19,583	5,638	82.57	5,667	82.90	5,709	83.45
166	Major Symptoms, Abnormalities	572,501	228	10.69	329	17.17	0	.
167	Minor Symptoms, Signs, Findings	264,395	-414	-18.17	0	.	0	.
168	Extremely Low Birthweight Neonates	8	-66	-0.02	4,076	21.82	4,084	21.83
169	Very Low Birthweight Neonates	2	589	0.09	4,076	21.82	4,084	21.83
170	Serious Perinatal Problem Affecting Newborn	2,508	4,126	22.07	4,076	21.82	4,084	21.83
171	Other Perinatal Problems Affecting Newborn	1,850	1,024	4.71	954	4.39	898	4.13
172	Normal, Single Birth	11	2,965	1.05	2,798	0.99	898	4.13
173	Major Organ Transplant	.	0	.	0	.	0	.
174	Major Organ Transplant Status	1,095	7,831	27.44	7,827	27.40	7,767	27.16
175	Other Organ Transplant/Replacement	3,556	1,228	7.81	1,084	6.89	939	5.96
176	Artificial Openings for Feeding or Elimination	10,155	4,373	44.97	4,408	45.28	4,455	45.70
177	Amputation Status, Lower Limb/Amputation Complications	2,731	6,872	37.89	6,950	38.28	6,997	38.49
178	Amputation Status, Upper Limb	183	3,490	5.06	3,520	5.09	3,502	5.06
179	Post-Surgical States/Aftercare/Elective	241,138	1,476	64.55	1,342	59.18	1,183	52.97
180	Radiation Therapy	6,520	2,890	24.32	2,916	24.50	2,913	24.44
181	Chemotherapy	8,851	5,321	49.96	5,411	50.75	5,424	50.80
182	Rehabilitation	35,251	6,384	121.89	6,423	122.58	6,504	124.32
183	Screening/Observation/Special Exams	816,736	-355	-20.80	0	.	0	.
184	History of Disease	165,637	783	29.54	740	28.04	631	24.22
185	Oxygen	.	.	.	.	.	.	.

Table 7-1 (continued)

Concurrent Medicare Models Using 1997 Data

	Variable	Number of Person Years	Model 2 No Exclusions Parameters	Model 2 No Exclusions t-ratios	Model 3 Exclusions Parameters	Model 3 Exclusions t-ratios	Model 4 Exclusions, Constraints, NOHCC Parameters	Model 4 Exclusions, Constraints, NOHCC t-ratios
186	CPAP/IPPB/Nebulizers	.	.	.	.	.	.	.
187	Patient Lifts, Power Operated Vehicles, Beds	.	.	.	.	.	.	.
188	Wheelchairs, Commodes	.	.	.	.	.	.	.
189	Walkers	.	.	.	.	.	.	.

[1] Female 65-69 is the omitted category in the age/sex model. Predicted expenditures for this age/sex group are given by the intercept term, and predicted expenditures for all other age/sex groups are obtained by adding the intercept to their coefficient.

SOURCE: Health Economics Research, Inc. analysis of 1997 Medicare claims data.

Figure 7-1

Comparison of Actual and DCG/HCC Predicted Concurrent Spending

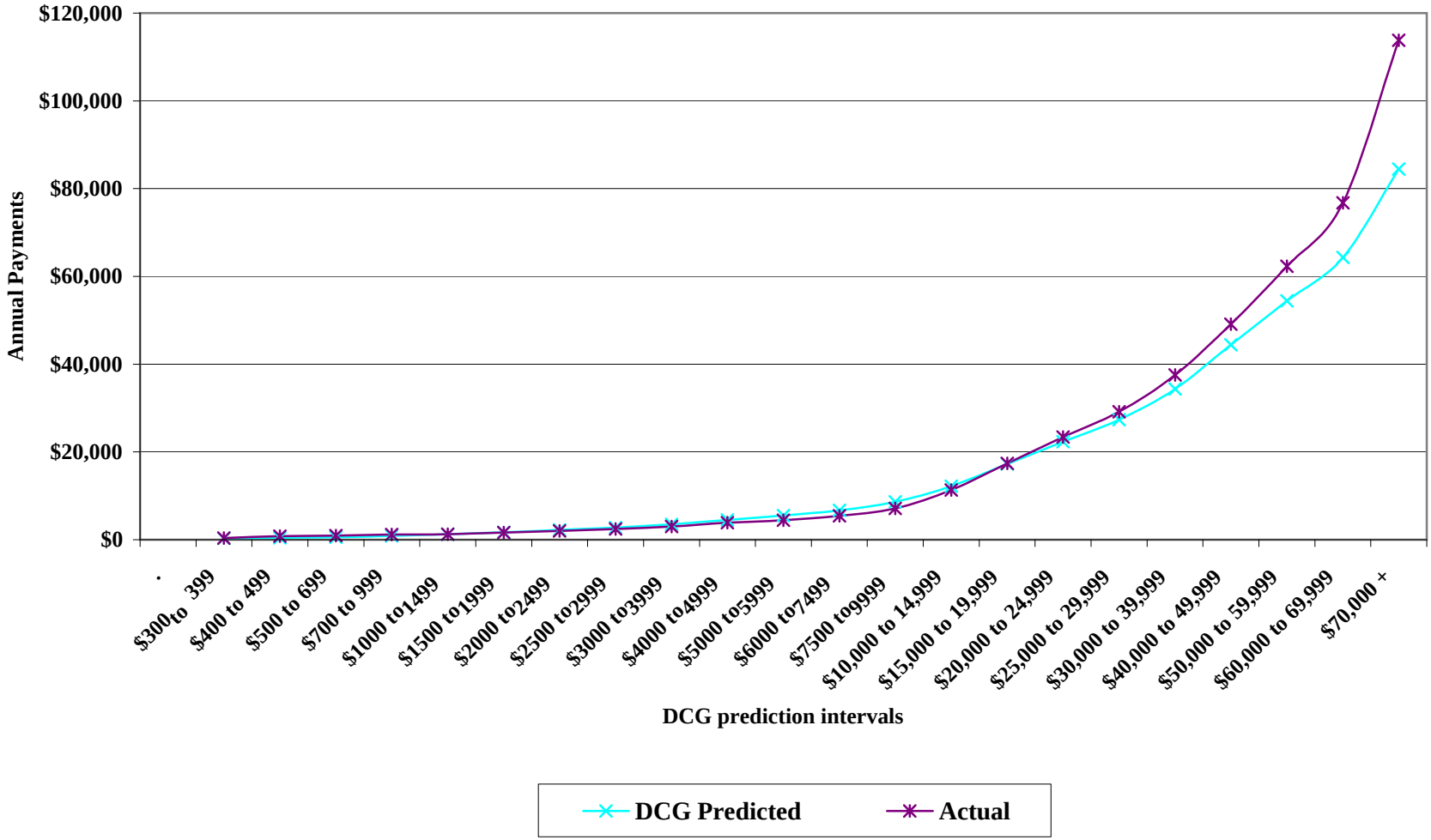


Table 7-2

Alternative Concurrent Medicare Models Using 1997 Data

	Model 4		Model 5		Model 6	
	Base Model[1]		Alternative Profiling Model		Payment Model	
Model Name	CON6		CON7		CON8	
Number of Obs	1,581,370		1,581,370		1,581,370	
Dependent Variable Mean	5,156.98		5,156.98		5,156.98	
Model Parameters	117		99		89	
Standard error	9,362		9,625		9,662	
CV	182		187		187	
R-Square	0.5215		0.4944		0.4905	
Adj. R-Square	0.5215		0.4944		0.4905	
Computer Output	d9cn03r		d9cn03a6.out (regression #1)		d9cn03a6.out (regression #2)	
Variable	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**
INTERCEPT	-	-	-	-	-	-
NOHCC	353	24.56	412	29.40	613	48.05
Male, age 0 to 34	-	-	-	-	-	-
Male, age 35 to 44	-	-	-	-	-	-
Male, age 45 to 54	-	-	-	-	-	-
Male, age 55 to 59	-	-	-	-	-	-
Male, age 60 to 64	-	-	-	-	-	-
Male, age 65 to 69	-	-	-	-	-	-
Male, age 70 to 74	-	-	-	-	-	-
Male, age 75 to 79	-	-	-	-	-	-
Male, age 80 to 84	-	-	-	-	-	-
Male, age 85 to 89	-	-	-	-	-	-
Male, age 90 to 94	-	-	-	-	-	-
Male, age 95 and over	-	-	-	-	-	-
Female, age 0 to 34	-	-	-	-	-	-
Female, age 35 to 44	-	-	-	-	-	-
Female, age 45 to 54	-	-	-	-	-	-
Female, age 55 to 59	-	-	-	-	-	-
Female, age 60 to 64	-	-	-	-	-	-
Female, age 65 to 69[1]	-	-	-	-	-	-
Female, age 70 to 74	-	-	-	-	-	-
Female, age 75 to 79	-	-	-	-	-	-
Female, age 80 to 84	-	-	-	-	-	-
Female, age 85 to 89	-	-	-	-	-	-
Female, age 90 to 94	-	-	-	-	-	-
Female, age 95 and over	-	-	-	-	-	-
Medicaid Status, 1997	-	-	-	-	-	-
Originally Disabled	-	-	-	-	-	-

Table 7-2 (continued)

Alternative Concurrent Medicare Models Using 1997 Data

	Model 4		Model 5		Model 6	
	Base Model[1]		Alternative Profiling Model		Payment Model	
Variable	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
1 HIV/AIDS	1,533	7.93	1,413	7.12	1,552	7.79
2 Septicemia/Shock	10,382	151.94	11,856	170.32	12,024	172.23
3 Central Nervous System Infection	2,679	20.59	3,249	24.31	3,482	25.96
4 Tuberculosis	1,033	5.96	1,005	5.64	1,167	6.53
5 Opportunistic Infections	9,341	54.44	10,073	57.13	10,153	57.36
6 Other Infectious Diseases	0	.	0	.	0	.
7 Metastatic Cancer and Acute Leukemia	7,563	115.04	10,041	157.07	10,320	161.16
8 Lung, Upper Digestive Tract, and Other Severe Cancers	1,904	24.55	2,879	36.35	3,114	39.21
9 Lymphatic, Head and Neck, Brain, and Other Major Cancers	949	14.03	1,941	28.09	2,172	31.35
10 Breast, Prostate, Colorectal and Other Cancers and Tumors	343	11.16	1,114	36.77	1,356	44.11
11 Other Respiratory and Heart Neoplasms	343	11.16	1,114	36.77	0	.
12 Other Digestive and Urinary Neoplasms	0	.	0	.	0	.
13 Other Neoplasms	0	.	0	.	0	.
14 Benign Neoplasms of Skin, Breast, Eye	0	.	0	.	0	.
15 Diabetes with Renal Manifestation	1,614	13.85	1,908	15.93	1,862	15.49
16 Diabetes with Neurologic or Peripheral Circulatory Manifestation	942	16.39	1,013	19.24	1,139	21.58
17 Diabetes with Acute Complications	826	8.71	1,013	19.24	1,139	21.58
18 Diabetes with Ophthalmologic Manifestation	0	.	0	.	0	.
19 Diabetes with No or Unspecified Complications	0	.	0	.	0	.
20 Type I Diabetes Mellitus	1,611	40.56	1,858	45.54	2,016	49.28
21 Protein-Calorie Malnutrition	8,726	120.27	10,039	135.36	10,038	134.83
22 Other Significant Endocrine and Metabolic Disorders	1,224	16.90	1,843	24.79	2,052	27.50
23 Disorders of Fluid/Electrolyte/Acid-Base Balance	3,333	102.13	0	.	0	.
24 Other Endocrine/Metabolic/Nutritional Disorders	0	.	0	.	0	.
25 End-Stage Liver Disease	4,881	29.64	5,480	32.39	5,825	34.32
26 Cirrhosis of Liver	342	2.95	555	8.44	924	7.72
27 Chronic Hepatitis	342	2.95	555	8.44	924	7.72
28 Acute Liver Failure/Disease	1,739	7.21	2,108	8.53	2,592	10.42
29 Other Hepatitis and Liver Disease	0	.	555	8.44	0	.
30 Gallbladder and Biliary Tract Disorders	2,761	43.74	3,460	53.27	0	.
31 Intestinal Obstruction/Perforation	4,972	89.33	6,846	121.10	7,337	130.10
32 Pancreatic Disease	1,806	20.54	2,261	25.03	3,151	35.16
33 Inflammatory Bowel Disease	796	7.63	1,950	60.49	2,290	71.11
34 Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	1,222	36.97	1,950	60.49	2,290	71.11
35 Appendicitis	2,942	12.79	4,108	17.37	0	.
36 Other Gastrointestinal Disorders	0	.	0	.	0	.
37 Bone/Joint/Muscle Infections/Necrosis	4,311	50.93	5,458	62.82	6,107	70.40

Table 7-2 (continued)

Alternative Concurrent Medicare Models Using 1997 Data

	Model 4		Model 5		Model 6	
	Base Model[1]		Alternative Profiling Model		Payment Model	
Variable	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**	**Parameters**	**t-ratios**
38 Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	668	25.02	1,614	59.51	915	22.22
39 Disorders of the Vertebrae and Spinal Discs	0	.	548	18.99	0	.
40 Osteoarthritis of Hip or Knee	668	25.02	1,614	59.51	0	.
41 Osteoporosis and Other Bone/Cartilage Disorders	0	.	0	.	0	.
42 Congenital/Developmental Skeletal and Connective Tissue Disorders	1,312	4.91	2,168	7.88	0	.
43 Other Musculoskeletal and Connective Tissue Disorders	0	.	0	.	0	.
44 Severe Hematological Disorders	4,776	51.27	5,003	68.97	5,128	70.43
45 Disorders of Immunity	4,134	41.61	5,003	68.97	5,128	70.43
46 Coagulation Defects and Other Specified Hematological Disorders	1,822	38.06	1,957	40.24	2,149	44.06
47 Iron Deficiency and Other/Unspecified Anemias and Blood Disease	1,680	61.16	0	.	0	.
48 Delirium and Encephalopathy	4,795	71.55	5,298	76.85	5,324	76.76
49 Dementia	614	18.57	817	23.99	725	20.08
50 Senility, Nonpsychotic Organic Brain Syndromes/Conditions	614	18.57	817	23.99	0	.
51 Drug/Alcohol Psychosis	4,024	32.71	4,840	38.35	4,829	38.11
52 Drug/Alcohol Dependence	2,948	29.98	3,338	33.08	3,314	32.67
53 Drug/Alcohol Abuse, Without Dependence	1,419	23.73	1,872	30.48	0	.
54 Schizophrenia	3,210	51.24	3,335	51.78	3,612	56.02
55 Major Depressive, Bipolar, and Paranoid Disorders	2,491	54.68	2,832	60.37	3,132	66.64
56 Reactive and Unspecified Psychosis	0	.	577	15.34	835	22.13
57 Personality Disorders	0	.	577	15.34	835	22.13
58 Depression	0	.	577	15.34	835	22.13
59 Anxiety Disorders	0	.	0	.	0	.
60 Other Psychiatric Disorders	0	.	0	.	0	.
61 Profound Mental Retardation/Developmental Disability	0	.	0	.	0	.
62 Severe Mental Retardation/Developmental Disability	0	.	0	.	0	.
63 Moderate Mental Retardation/Developmental Disability	0	.	0	.	0	.
64 Mild/Unspecified Mental Retardation/Developmental Disability	0	.	0	.	0	.
65 Other Developmental Disability	0	.	0	.	0	.
66 Attention Deficit Disorder	0	.	0	.	0	.
67 Quadriplegia, Other Extensive Paralysis	5,530	42.11	7,179	105.02	7,219	105.21
68 Paraplegia	5,530	42.11	7,179	105.02	7,219	105.21
69 Spinal Cord Disorders/Injuries	2,265	26.08	3,313	37.25	3,439	38.55
70 Muscular Dystrophy	579	1.52	753	1.93	965	2.46
71 Polyneuropathy	1,257	23.98	1,649	30.80	1,908	35.56
72 Multiple Sclerosis	1,881	13.79	2,389	17.07	2,551	18.15
73 Parkinson's and Huntington's Diseases	627	9.81	913	13.90	1,033	15.67
74 Seizure Disorders and Convulsions	888	18.32	1,117	22.44	1,257	25.15

Table 7-2 (continued)

Alternative Concurrent Medicare Models Using 1997 Data

	Model 4		Model 5		Model 6	
	Base Model[1]		Alternative Profiling Model		Payment Model	
Variable	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
75 Coma, Brain Compression/Anoxic Damage	9,994	65.92	10,252	65.79	10,118	64.67
76 Mononeuropathy, Other Neurological Conditions/Injuries	0	.	0	.	0	.
77 Respirator Dependence/Tracheostomy Status	42,450	218.52	43,608	218.64	43,549	217.50
78 Respiratory Arrest	17,606	109.27	17,974	108.54	17,917	107.79
79 Cardio-Respiratory Failure and Shock	7,299	149.82	7,890	157.82	7,903	157.54
80 Congestive Heart Failure	1,257	46.53	1,554	56.13	1,724	62.31
81 Acute Myocardial Infarction	9,468	134.88	10,692	148.52	10,923	151.47
82 Unstable Angina and Other Acute Ischemic Heart Disease	4,302	100.39	5,103	116.43	5,415	123.65
83 Angina Pectoris/Old Myocardial Infarction	533	14.98	925	25.34	1,216	33.33
84 Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	0	.	0	.	0	.
85 Heart Infection/Inflammation, Except Rheumatic	6,019	51.64	6,800	56.77	6,919	57.55
86 Valvular and Rheumatic Heart Disease	1,085	35.39	1,414	44.92	1,602	50.92
87 Major Congenital Cardiac/Circulatory Defect	4,761	9.18	5,310	9.96	5,321	9.94
88 Other Congenital Heart/Circulatory Disease	788	5.96	1,029	7.57	0	.
89 Hypertensive Heart and Renal Disease or Encephalopathy	651	6.06	959	8.69	1,074	9.69
90 Hypertensive Heart Disease	0	.	0	.	0	.
91 Hypertension	0	.	0	.	0	.
92 Specified Heart Arrhythmias	1,485	51.17	2,182	73.97	2,169	74.20
93 Other Heart Rhythm and Conduction Disorders	576	16.71	1,055	29.82	0	.
94 Other and Unspecified Heart Disease	0	.	0	.	0	.
95 Cerebral Hemorrhage	5,267	50.91	5,832	54.93	5,951	55.84
96 Ischemic or Unspecified Stroke	1,735	41.85	2,033	48.09	2,197	51.81
97 Precerebral Arterial Occlusion and Transient Cerebral Ischemia	355	9.23	643	16.29	883	22.32
98 Cerebral Atherosclerosis and Aneurysm	0	.	0	.	638	5.78
99 Cerebrovascular Disease, Unspecified	0	.	0	.	0	.
100 Hemiplegia/Hemiparesis	6,017	79.00	7,179	105.02	7,219	105.21
101 Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes	982	6.53	1,586	10.26	1,777	11.45
102 Speech, Language, Cognitive, Perceptual Deficits	1,736	17.91	2,428	24.49	2,385	23.97
103 Cerebrovascular Disease Late Effects, Unspecified	427	6.14	837	11.73	864	12.05
104 Vascular Disease with Complications	6,134	107.63	7,276	123.97	7,412	126.70
105 Vascular Disease	368	13.61	785	34.91	962	34.73
106 Other Circulatory Disease	0	.	785	34.91	0	.
107 Cystic Fibrosis	1,088	2.49	1,279	53.26	1,570	65.84
108 Chronic Obstructive Pulmonary Disease	986	42.13	1,279	53.26	1,570	65.84
109 Fibrosis of Lung and Other Chronic Lung Disorders	986	42.13	1,279	53.26	1,570	65.84
110 Asthma	0	.	0	.	0	.
111 Aspiration and Specified Bacterial Pneumonias	9,935	128.75	10,560	133.40	10,471	131.76

Table 7-2 (continued)

Alternative Concurrent Medicare Models Using 1997 Data

	Model 4		Model 5		Model 6	
	Base Model[1]		Alternative Profiling Model		Payment Model	
Variable	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
112 Pneumococcal Pneumonia, Empyema, Lung Abscess	2,375	22.24	2,736	24.93	2,855	25.92
113 Viral and Unspecified Pneumonia, Pleurisy	1,300	38.32	1,723	49.58	1,868	53.58
114 Pleural Effusion/Pneumothorax	7,586	141.62	8,707	158.58	8,716	158.17
115 Other Lung Disorders	0	.	0	.	0	.
116 Legally Blind	1,560	10.85	0	.	0	.
117 Major Eye Infections/Inflammations	0	.	493	3.08	0	.
118 Retinal Detachment	0	.	743	6.27	956	8.04
119 Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0	.	0	.	0	.
120 Diabetic and Other Vascular Retinopathies	0	.	0	.	0	.
121 Retinal Disorders, Except Detachment and Vascular Retinopathies	0	.	0	.	0	.
122 Glaucoma	0	.	0	.	0	.
123 Cataract	0	.	0	.	0	.
124 Other Eye Disorders	0	.	0	.	0	.
125 Significant Ear, Nose, and Throat Disorders	0	.	0	.	0	.
126 Hearing Loss	0	.	0	.	0	.
127 Other Ear, Nose, Throat, and Mouth Disorders	0	.	0	.	0	.
128 Kidney Transplant Status	464	1.85	1,445	5.59	1,580	6.09
129 End Stage Renal Disease	0	.	0	.	0	.
130 Dialysis Status	4,622	16.73	8,882	31.36	8,865	31.18
131 Renal Failure	4,257	74.08	5,348	91.30	5,338	90.78
132 Nephritis	1,083	7.11	1,584	10.12	1,765	11.23
133 Urinary Obstruction and Retention	1,068	27.84	0	.	0	.
134 Incontinence	767	14.60	0	.	0	.
135 Urinary Tract Infection	687	27.60	0	.	0	.
136 Other Urinary Tract Disorders	0	.	0	.	0	.
137 Female Infertility	1,616	1.84	1,862	2.06	2,339	2.58
138 Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	0	.	945	17.41	1,276	23.46
139 Other Female Genital Disorders	0	.	0	.	0	.
140 Male Genital Disorders	0	.	0	.	0	.
141 Ectopic Pregnancy	619	1.10	0	.	0	.
142 Miscarriage/Abortion	619	1.10	0	.	0	.
143 Completed Pregnancy With Major Complications	5,729	6.34	6,814	7.34	7,189	7.71
144 Completed Pregnancy With Complications	1,933	3.52	2,428	4.31	2,752	4.86
145 Completed Pregnancy Without Complications (Normal Delivery)	906	0.96	1,466	2.17	1,711	2.52
146 Uncompleted Pregnancy With Complications	619	1.10	1,466	2.17	1,711	2.52
147 Uncompleted Pregnancy With No or Minor Complications	0	.	0	.	0	.
148 Decubitus Ulcer of Skin	5,901	85.18	6,362	89.65	6,527	91.85

Table 7-2 (continued)

Alternative Concurrent Medicare Models Using 1997 Data

	Model 4		Model 5		Model 6	
	Base Model[1]		Alternative Profiling Model		Payment Model	
Variable	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
149 Chronic Ulcer of Skin, Except Decubitus	0	.	0	.	0	.
150 Extensive Third-Degree Burns	33,801	27.76	36,015	28.78	35,962	28.62
151 Other Third-Degree and Extensive Burns	4,135	9.89	5,398	12.56	5,711	13.24
152 Cellulitis, Local Skin Infection	617	20.33	1,045	33.48	0	.
153 Other Dermatological Disorders	0	.	0	.	0	.
154 Severe Head Injury	12,772	24.83	13,731	25.97	13,927	26.24
155 Major Head Injury	1,641	21.45	1,988	25.28	2,228	28.23
156 Concussion or Unspecified Head Injury	411	2.02	701	3.35	1,055	5.03
157 Vertebral Fractures	2,089	28.07	2,629	34.37	2,855	37.24
158 Hip Fracture/Dislocation	5,971	102.46	7,989	134.63	8,506	143.74
159 Major Fracture, Except of Skull, Vertebrae, or Hip	1,551	24.71	2,331	36.16	0	.
160 Internal Injuries	2,891	20.21	3,933	26.77	4,244	28.79
161 Traumatic Amputation	10,882	58.27	12,492	65.13	12,534	65.12
162 Other Injuries	0	.	0	.	0	.
163 Poisonings and Allegic Reactions	483	12.05	0	.	0	.
164 Major Complications of Medical Care and Trauma	8,537	173.00	0	.	0	.
165 Other Complications of Medical Care	5,709	83.45	0	.	0	.
166 Major Symptoms, Abnormalities	0	.	0	.	0	.
167 Minor Symptoms, Signs, Findings	0	.	0	.	0	.
168 Extremely Low Birthweight Neonates	4,084	21.83	0	.	0	.
169 Very Low Birthweight Neonates	4,084	21.83	0	.	0	.
170 Serious Perinatal Problem Affecting Newborn	4,084	21.83	0	.	0	.
171 Other Perinatal Problems Affecting Newborn	898	4.13	0	.	0	.
172 Normal, Single Birth	898	4.13	0	.	0	.
173 Major Organ Transplant	0	.	0	.	0	.
174 Major Organ Transplant Status	7,767	27.16	8,656	29.45	8,822	29.90
175 Other Organ Transplant/Replacement	939	5.96	0	.	0	.
176 Artificial Openings for Feeding or Elimination	4,455	45.70	7,138	71.81	7,169	71.85
177 Amputation Status, Lower Limb/Amputation Complications	6,997	38.49	8,273	44.29	8,331	44.46
178 Amputation Status, Upper Limb	3,502	5.06	4,836	6.80	0	.
179 Post-Surgical States/Aftercare/Elective	1,183	52.97	0	.	0	.
180 Radiation Therapy	2,913	24.44	0	.	0	.
181 Chemotherapy	5,424	50.80	0	.	0	.
182 Rehabilitation	6,504	124.32	0	.	0	.
183 Screening/Observation/Special Exams	0	.	0	.	0	.
184 History of Disease	631	24.22	0	.	0	.
185 Oxygen	.	.	0	.	0	.

Table 7-2 (continued)

Alternative Concurrent Medicare Models Using 1997 Data

		Model 4		Model 5		Model 6	
		Base Model[1]		Alternative Profiling Model		Payment Model	
	Variable	Parameters	t-ratios	Parameters	t-ratios	Parameters	t-ratios
186	CPAP/IPPB/Nebulizers	.	.	0	.	0	.
187	Patient Lifts, Power Operated Vehicles, Beds	.	.	0	.	0	.
188	Wheelchairs, Commodes	.	.	0	.	0	.
189	Walkers	.	.	0	.	0	.

[1] Repeated from Model 4 of Table 7-1.

SOURCE: Health Economics Research, Inc. analysis of 1997 Medicare claims data.

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Appendix A

Table A-1

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
1	HIV/AIDS 1.01 HIV/AIDS 1.02 HIV positive	6		Infection 1
2	Septicemia/Shock 2.01 septicemia (blood poisoning)/shock	6		Infection 2
3	Central Nervous System Infection 3.01 bacterial/fungal/nonviral meningitis, brain/spinal abcess 3.02 non-viral encephalitis, meningoencephalitis, other CNS infection 3.03 viral encephalitis, including acute poliomyelitis, excluding slow virus infection 3.04 viral meningitis 3.05 late effects of central nervous system infection 3.06 meningitis of unspecified cause	6		Infection 3
4	Tuberculosis 4.01 tuberculosis, except central nervous system	6		Infection 4
5	Opportunistic Infections 5.01 pulmonary mycobacteria/cryptosporidiosis/spec toxoplasmosis/zygomycosis 5.02 cytomegaloviral disease, including pneumonia 5.03 candidasis of lung, esophagus, or disseminated 5.04 aspergillosis/cryptococcosis 5.05 pneumocystis (carinii) pneumonia	6,112,113,115		Infection 5
6	Other Infectious Diseases 6.01 other intestinal infections 6.02 other bacterial infections 6.03 viral enteritis (intestinal infections) 6.04 strep throat/scarlet fever 6.05 bacterial infection in other diseases 6.06 other viral infections 6.07 herpes zoster (shingles), excluding neurological complications 6.08 herpes simplex 6.09 viral hepatitis A and unspecified, without hepatic coma 6.10 other infections 6.11 Lyme disease 6.12 veneral diseases, except neuro-and cardiovascular syphilis 6.13 dermatophytosis (fungal skin infections, e.g., athlete's foot) 6.14 oral candidiasis (thrush) 6.15 histoplasmosis/coccidioidomycosis/blastomycosis 6.16 infection late effects, excluding central nervous system 6.17 bacteremia		Exclude	Infection 6
7	Metastatic Cancer and Acute Leukemia 7.01 secondary cancer of lymph node 7.02 secondary cancer of respiratory and digestive systems 7.03 secondary cancer of other site 7.04 disseminated cancer 7.05 acute lymphoid and other acute leukemias, except myeloid 7.06 acute myeloid leukemia	8,9,10,11,12,13,14		Neoplasm1
8	Lung, Upper Digestive Tract, and Other Severe Cancers 8.01 cancer of esophagus 8.02 cancer of stomach 8.03 cancer of small bowel/peritoneum/gallbladder/bile ducts 8.04 cancer of liver 8.05 cancer of pancreas 8.06 cancer of trachea, bronchus, lung, and pleura 8.07 multiple myeloma 8.08 chronic myeloid and other specific non-acute leukemias, except lymphoid	9,10,11,12,13,14		Neoplasm 2
9	Lymphatic, Head and Neck, Brain, and Other Major Cancers 9.01 cancer of mouth/tongue 9.02 cancer of pharynx 9.03 other respiratory/intrathoracic cancer 9.04 cancer of larynx 9.05 cancer of bone and articular cartilage 9.06 cancer of connective and other soft tissue	10,11,12,13,14		Neoplasm 3

Table A-1 (continued)

Hierarchical Condition Categories

			If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
		9.07 Kaposi's sarcoma			
		9.08 cancer of ovaries/placenta/uterine adnexia			
		9.09 cancer of the brain/nervous system/pituitary, pineal glands			
		9.10 adrenal gland cancer			
		9.11 non-Hodgkin's lymphomas			
		9.12 Hodgkin's disease			
		9.13 chronic lymphoid and unspecified cell leukemias, not specified as acute			
10		Breast, Prostate, Colorectal and Other Cancers and Tumors	11,12,13,14		Neoplasm 4
		10.01 colon cancer			
		10.02 rectal cancer			
		10.03 other, unspecified cancer of digestive organs/peritoneum			
		10.04 melanoma			
		10.05 breast cancer, age 45+			
		10.06 cancer of uterus			
		10.07 cancer of cervix/female genital organs			
		10.08 prostate cancer			
		10.09 cancer of testis/male genital organs			
		10.10 cancer of bladder, ureter, urethra and other urinary tract			
		10.11 cancer of kidney and renal pelvis			
		10.12 cancer of the eye			
		10.13 thyroid/endocrine cancer, except adrenal, pituitary, pineal			
		10.14 other/ill-defined site cancer			
		10.15 benign neoplasm of brain/nervous system/pituitary, pineal glands			
		10.16 uncertain/unspecified neoplasm of brain/nervous system/pituitary, pineal glands			
		10.17 neurofibromatosis			
		10.18 tuberous sclerosis and other hamartoses (Peutz-Jeghers/Sturge-Weber, etc)			
		10.19 breast cancer, age < 45			
11		Other Respiratory and Heart Neoplasms	12,13,14	Exclude	Neoplasm 5
		11.01 benign neoplasm of respiratory system			
		11.02 benign neoplasm of heart			
		11.03 carcinoma in situ of respiratory system			
		11.04 uncertain/unspecified neoplasm of respiratory system			
12		Other Digestive and Urinary Neoplasms	13,14	Exclude	Neoplasm 6
		12.01 benign neoplasm of digestive system			
		12.02 benign neoplasm of urinary tract			
		12.03 carcinoma in situ of digestive organs			
		12.04 carcinoma in situ of urinary organs			
		12.05 uncertain/unspecified neoplasm of digestive organs			
		12.06 uncertain/unspecified neoplasm of urinary organs			
13		Other Neoplasms	14	Exclude	Neoplasm 7
		13.01 skin cancer, except melanoma, including lip			
		13.02 benign neoplasms, exc respiratory, digestive, urinary, skin, breast, eye, cns			
		13.03 carcinoma in situ, except respiratory, digestive, urinary, skin			
		13.04 uncertain neoplasm, exc respiratory, digestive, urinary, skin, cns			
		13.05 unspecified neoplasm, exc respiratory, digestive, bladder, brain			
14		Benign Neoplasms of Skin, Breast, Eye		Exclude	Neoplasm 8
		14.01 benign neoplasm of skin			
		14.02 benign neoplasm of breast/other breast disorders			
		14.03 benign neoplasm of eye			
		14.04 uncertain neoplasm, skin			
15		Diabetes with Renal Manifestation	16,17,18,19		Diabetes 1
		15.01 type II diabetes with renal manifestation			
		15.02 type I diabetes with renal manifestation			
16		Diabetes with Neurologic or Peripheral Circulatory Manifestation	17,18,19		Diabetes 2
		16.01 type II diabetes with neurological manifestations			
		16.02 type I diabetes with neurological manifestations			
		16.03 type II diabetes with peripheral circulatory disorders			
		16.04 type I diabetes with peripheral circulatory disorders			
	D	71.04 diabetic neuropathy			
17		Diabetes with Acute Complications	18,19		Diabetes 3
		17.01 type II diabetes with ketoacidosis or coma			

Table A-1 (continued)

Hierarchical Condition Categories

			If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
		17.02 type I diabetes with ketoacidosis or coma			
		17.03 type II diabetes with other specified manifestations, incl hypoglycemic shock			
		17.04 type I diabetes with other specified manifestations, incl hypoglycemic shock			
18		Diabetes with Ophthalmologic Manifestation	19		Diabetes 4
		18.01 type II diabetes with ophthalmologic manifestations			
		18.02 type I diabetes with ophthalmologic manifestations			
	D	119.01 proliferative diabetic retinopathy			
	D	120.01 diabetic retinopathy			
19		Diabetes with No or Unspecified Complications			Diabetes 5
		19.01 type II diabetes without complications			
		19.02 type I diabetes without complications			
		19.03 type II diabetes with unspecified complication			
		19.04 type I diabetes with unspecified complication			
	D	146.07 diabetes mellitus complicating pregnancy			
20		Type I Diabetes Mellitus			Diabetes 6
	D	15.02 type I diabetes with renal manifestation			
	D	16.02 type I diabetes with neurological manifestations			
	D	16.04 type I diabetes with peripheral circulatory disorders			
	D	17.02 type I diabetes with ketoacidosis or coma			
	D	17.04 type I diabetes with other specified manifestations			
	D	18.02 type I diabetes with ophthalmologic manifestations			
	D	19.02 type I diabetes without complications			
	D	19.04 type I diabetes with unspecified complication			
21		Protein-Calorie Malnutrition	24		Metabolic 1
		21.01 protein-calorie malnutrition/wasting disease (cachexia)			
22		Other Significant Endocrine and Metabolic Disorders	24		Metabolic 2
		22.01 adrenal gland disorders e.g., Cushing's syndrome			
		22.02 nondiabetic hypoglycemic coma			
		22.03 pituitary/parathyroid/thymus/polyglandular disorders, except pituitary dwarfism			
		22.04 pituitary dwarfism			
		22.05 inborn errors of metabolism			
		22.06 macroglobulinemia and paraproteinemias, except monoclonal			
		22.07 hemochromatosis, other disorders of iron, copper, and phosphorus metabolism			
		22.08 porphyria, histiocytosis, other specified metabolic disorders			
		22.09 amyloidosis/familial Mediterranean fever			
		22.10 alpha 1-antitrypsin deficiency/hereditary angioedema			
23		Disorders of Fluid/Electrolyte/Acid-Base Balance	24	Exclude	Metabolic 3
		23.01 disorders of fluid/electrolyte/acid-base balance, e.g., dehydration			
24		Other Endocrine/Metabolic/Nutritional Disorders		Exclude	Metabolic 4
		24.01 goiter			
		24.02 thyrotoxicosis, including Graves' disease			
		24.03 congenital hypothyroidism (cretinism)			
		24.04 thyroid disorders, except goiter and thyrotoxicosis			
		24.05 other hypoglycemia			
		24.06 ovarian dysfunction			
		24.07 testicular dysfunction			
		24.08 other endocrine disorders			
		24.09 vitamin B/other nutritional deficiencies			
		24.10 lactose intolerance, other/unspecified disorders of carbohydrate metabolism			
		24.11 disorders of lipoid metabolism (high cholesterol), except lipidoses			
		24.12 other and unspecified disorders of plasma protein metabolism			
		24.13 disorders of magnesium, calcium, and unspecified mineral metabolism			
		24.14 disorders of bilirubin excretion and unspecified metabolism disorders			
		24.15 other hyperalimentation			
		24.16 obesity/localized adiposity			
		24.17 congenital anomalies of endocrine glands			
25		End-Stage Liver Disease	26,27,28,29,34,36		Liver 1
		25.01 esophageal varices			
		25.02 end stage liver disorders, including hepatic coma and liver failure			
26		Cirrhosis of Liver	27,29		Liver 2

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	26.01 cirrhosis of liver			
27	Chronic Hepatitis 27.01 chronic viral hepatitis 27.02 chronic hepatitis, except viral	29		Liver 3
28	Acute Liver Failure/Disease 28.01 acute liver disease, including acute liver necrosis/failure, abcess, infarction 28.02 viral hepatitis, acute or unspecified, with hepatic coma	29		Liver 4
29	Other Hepatitis and Liver Disease 29.01 viral hepatitis, except type A or unspec, acute or unspec w/o hepatic coma 29.02 toxic and other/unspecified non-viral hepatitis/other liver disorders		Exclude	Liver 5
30	Gallbladder and Biliary Tract Disorders 30.01 gallstones with gallbladder inflammation and other gallbladder disease 30.02 specified biliary tract disease (e.g., cholangitis, obstruction, perforation)		Exclude	Liver 6
31	Intestinal Obstruction/Perforation 31.01 peritonitis, excluding appendicitis and female pelvic 31.02 perforated peptic ulcer or intestines 31.03 intestinal obstruction	34,36		GI 1
32	Pancreatic Disease 32.01 chronic pancreatitis/ other pancreatic diseases/intestinal malabsorption 32.02 acute pancreatitis	36		GI 2
33	Inflammatory Bowel Disease 33.01 regional enteritis (Crohn's disease), age 18+ 33.02 ulcerative colitis, age 18+ 33.03 inflammatory bowel disease, age < 18	34,36		GI 3
34	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders 34.01 bacterial enteritis (intestinal infections) 34.02 peptic ulcer not specified as with perforation, hemorrhage, or obstruction 34.03 gastrointestinal hemorrhage, except peptic ulcer and anal/rectal 34.04 peptic ulcer with hemorrhage, without perforation 34.05 peptic ulcer with obstruction, without perforation or hemorrhage 34.06 pyloric/duodenal obstruction 34.07 intestinal abcess, fistula, and other specified disorders 34.08 abdominal hernia, complicated 34.09 peritoneal disorders, except peritonitis	36		GI 4
35	Appendicitis 35.01 appendicitis, including with perforation and peritonitis		Exclude	GI 5
36	Other Gastrointestinal Disorders 36.01 hemorrhoids 36.02 disease of esophagus, except ulcer and hemorrhage 36.03 stomach/intestinal disorders/symptoms, except obstruction, ulcer, and hemorrhage 36.04 abdominal hernia/uncomplicated 36.05 other and unspecified intestinal disorders 36.06 divercula of intestine, without hemorrhage 36.07 anal/rectal disorders 36.08 gallstones without gallbladder inflammation 36.09 esophageal atresia/stenosis, oth cong gastrointestinal anomalies, age 2+ 36.10 foreign body gastrointestinal tract		Exclude	GI 6
37	Bone/Joint/Muscle Infections/Necrosis 37.01 arthopathy with infection 37.02 osteomyelitis 37.03 necrotizing fasciitis 37.04 aseptic necrosis of bone	43		MSK 1
38	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease 38.01 Behcet's syndrome 38.02 systemic lupus erythematosus/giant cell arteritis/oth connective tissue disease 38.03 rheumatoid arthritis and other inflammatory polyarthropathy 38.04 inflammatory spondylopathies	39,40,43		MSK 2

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	38.05 polymyalgia rheumatica			
39	Disorders of the Vertebrae and Spinal Discs 39.01 spondylosis and allied disorders (osteoarthritis of spine) 39.02 intervertebral disc disorders (herniated, prolapsed, degenerated disc) 39.03 spinal stenosis 39.04 curvature/deformity of the spine 39.05 spondylolisthesis/spondylolysis, congenital or acquired 39.06 congenital anomalies of spine, except spondylolisthesis/spondylolysis	43	Exclude	MSK 3
40	Osteoarthritis of Hip or Knee 40.01 osteoarthritis of pelvic region and thigh (hip) 40.02 osteoarthritis of lower leg (knee)	43	Exclude	MSK 4
41	Osteoporosis and Other Bone/Cartilage Disorders 41.01 osteomalacia/rickets, except vitamin D-resistant 41.02 other bone/cartilage disorders (e.g,.Paget's disease) 41.03 osteoporosis	43	Exclude	MSK5
42	Congenital/Developmental Skeletal and Connective Tissue Disorders 42.01 juvenile osteochondrosis spine/pelvis, slipped capital femoral epiphysis 42.02 congenital hip dislocation/dysplasia 42.03 osteogenesis imperfecta and other osteodystrophies 42.04 Marfan and Ehlers-Danlos syndromes	43		MSK6
43	Other Musculoskeletal and Connective Tissue Disorders 43.01 Reiter's syndrome 43.02 gout/crystal arthropathy 43.03 psoriatic arthopathy 43.04 arthropathy/joint disorders, derangements, joint pain/stiffness, excluding gout 43.05 osteoarthritis, not specified to be of spine, hip, or knee 43.06 difficulty walking due to pelvic/lower leg joint disorder/wheelchair 43.07 nonspecific backache and other back/neck pain/disorders 43.08 disorders of soft tissue (e.g., tendonitis, bursitis, muscle disorders) 43.09 flat foot, acquired deformities of toe 43.10 acquired limb deformities, except toe, flat foot 43.11 cleft lip/cleft palate 43.12 other congenital musculoskeletal abnormalities 43.13 chondrodystrophy 43.14 dislocation (displacement/subluxation) of vertebra		Exclude	MSK 7
44	Severe Hematological Disorders 44.01 myelodysplastic syndrome 44.02 other/unspecified sickle cell anemia 44.03 sickle cell Hb-S disease 44.04 acquired hemolytic anemia 44.05 aplastic anemia 44.06 hemophilia (congenital factors VIII and IX coagulation defects)	46,47		Blood 1
45	Disorders of Immunity 45.01 immune disorders, age 18+ 45.02 agranulocytosis, chr granulomatous dis, oth spec white blood cell dis, age 18+ 45.03 immune/white blood cell disorders, age < 18	47		Blood 2
46	Coagulation Defects and Other Specified Hematological Disorders 46.01 polycythemia vera 46.02 thalassemias and other hereditary hemolytic anemias 46.03 sideroblastic anemia 46.04 coagulation defects, except congenital factors VIII and IX 46.05 purpura/thrombocytopathy/hemorrhagic conditions 46.06 myelofibrosis and other specified blood diseases	47		Blood 3
47	Iron Deficiency and Other/Unspecified Anemias and Blood Disease 47.01 iron deficiency and other/unspecified anemias 47.02 megaloblastic and other deficiency anemias (pernicious/folic acid) 47.03 other and unspecified white blood cell disease 47.04 other and unspecified blood disease		Exclude	Blood 4
48	Delirium and Encephalopathy	50		Cognitive 1

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	48.01 transient organic psychosis (delirium/delusions/hallucinations) 48.02 toxic/unspecified encephalopathy 48.03 visual agnosia/disorientation/hallucinations 48.04 hallucinations, nos			
49	Dementia 49.01 slow viral central nervous system infection 49.02 uncomplicated/unspecified dementia 49.03 dementia with delirium 49.04 dementia with delusions 49.05 dementia with depression 49.06 dementia in other disorders and other chronic organic psychotic conditions 49.07 cerebral degeneration/Alzheimer's disease 49.08 hydrocephalus, acquired	50		Cognitive 2
50	Senility, Nonpsychotic Organic Brain Syndromes/Conditions 50.01 nonpsychotic organic brain syndrome 50.02 other/unspecified brain/central nervous system conditions 50.03 senility without psychosis		Exclude	Cognitive 3
51	Drug/Alcohol Psychosis 51.01 alcoholic psychoses 51.02 drug psychoses	52,53		SA1
52	Drug/Alcohol Dependence 52.01 alcohol dependence 52.02 drug dependence	53		SA 2
53	Drug/Alcohol Abuse, Without Dependence 53.01 nondependent drug abuse, except alcohol and tobacco 53.02 nondependent abuse of alcohol 53.03 tobacco use disorder		Exclude	SA 3
54	Schizophrenia 54.01 schizophrenic disorders	55,56,57,58,59,60		Psychiatric 1
55	Major Depressive, Bipolar, and Paranoid Disorders 55.01 manic and depressive (bipolar) disorders 55.02 major depressive disorders 55.03 paranoid disorders and states 55.04 attempted suicide/self-inflicted injury	56,57,58,59,60		Psychiatric 2
56	Reactive and Unspecified Psychosis 56.01 reactive and other/unspecified nonorganic psychoses	57,58,59,60		Psychiatric3
57	Personality Disorders 57.01 personality disorders and dissociative identity disorder	58,59,60		Psychiatric 4
58	Depression 58.01 depression, excluding major depressive and bipolar disorders	59,60		Psychiatric 5
59	Anxiety Disorders 59.01 panic disorders/attacks 59.02 generalized anxiety disorder 59.03 somatoform/dissociative disorders 59.04 phobic disorders 59.05 obsessive-compulsive disorders 59.06 anorexia nervosa/bulimia 59.07 prolonged posttraumatic stress disorder	60		Psychiatric 6
60	Other Psychiatric Disorders 60.01 other and unspecified neurotic disorders 60.02 other and unspecified anxiety states 60.03 sexual deviations and disorders 60.04 psychosomatic illness 60.05 other mental disorders 60.06 Tourette's disorder 60.07 acute reaction to stress 60.08 adjustment reaction, excluding prolonged depressive		Exclude	Psychiatric 7

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	60.09 behavior disorder			
61	Profound Mental Retardation/Developmental Disability 61.01 profound mental retardation 61.02 Edwards/Patau/deletion/autosomal anomaly syndromes	62,63,64,65,66		DD 1
62	Severe Mental Retardation/Developmental Disability 62.01 severe mental retardation	63,64,65,66		DD 2
63	Moderate Mental Retardation/Developmental Disability 63.01 moderate mental retardation	64,65,66		DD 3
64	Mild/Unspecified Mental Retardation/Developmental Disability 64.01 autism/pervasive developmental disorders, other childhood psychoses 64.02 mild/unspecified mental retardation 64.03 Down's syndrome 64.04 Prader-Willi/Fragile X syndromes	65,66		DD 4
65	Other Developmental Disability 65.01 emotional disorders of childhood/adolescence 65.02 learning/development disorders 65.03 unspecified chromosomal anomalies and congenital malformation syndromes, nec 65.04 sex chromosome abnormalities (e.g., Klinefelter's/Turner syndromes)	66		DD 5
66	Attention Deficit Disorder 66.01 attention deficit disorder, other hyperkinetic syndrome		Exclude	DD 6
67	Quadriplegia, Other Extensive Paralysis 67.01 motor neuron disease (including ALS) and spinal muscular atrophy 67.02 congenital/infantile quadriplegia (cerebral palsy) 67.03 quadriplegia, incomplete or unspecified 67.04 quadriplegia (C1-C7), complete 67.05 locked-in state 67.06 traumatic complete lesion cervical (C1-C7) spinal cord	,69,76,100,101,103,157,162		Spinal 1
68	Paraplegia 68.01 congenital/infantile diplegia/paraplegia (cerebral palsy) 68.02 paraplegia 68.03 traumatic complete lesion dorsal (T1-T12) spinal cord	9,76,100,101,103,157,162		Spinal 2
69	Spinal Cord Disorders/Injuries 69.01 spinocerebellar disease, including Friedreich's ataxia 69.02 syringomyelia, vascular, other/unspecified spinal cord disease 69.03 cauda equina syndrome 69.04 spina bifida, hydrocephalus, other congenital nervous system anomalies 69.05 fracture lumbar, sacral, coccygeal or unspecified vertebrae with spinal cord injury 69.06 fracture cervical vertebrae (C1-C7) with spinal cord injury, exc complete lesion 69.07 fracture dorsal vertebrae (T1-T12) with spinal cord injury, exc complete lesion 69.08 late effect of spinal cord injury 69.09 spinal cord injury w/o vertebral fracture, except severe cervical/dorsal 69.10 severe cervical/dorsal spinal cord injury w/o vertebral fracture, exc compl lesion	39,43,76,157,162		Spinal 3
70	Muscular Dystrophy 70.01 muscular dystrophy, age 18+ 70.02 muscular dystrophy, age < 18	43,76		Neuro 1
71	Polyneuropathy 71.01 autonomic nerve disorder 71.02 peripheral neuropathy/myopathy 71.03 inflammatory/toxic neuropathy, except diabetic 71.04 diabetic neuropathy 71.05 myoneural disorders/myasthenia gravis	76		Neuro 2
72	Multiple Sclerosis 72.01 multiple sclerosis, other central nervous system dymelination	76		Neuro 3
73	Parkinson's and Huntington's Diseases 73.01 Parkinson's disease 73.02 Huntington's and degenerative disease of basal ganglia	76		Neuro 4

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
74	Seizure Disorders and Convulsions 74.01 epilepsy, age 18+ 74.02 convulsions, except febrile 74.03 epilepsy, age < 18	76		Neuro 5
75	Coma, Brain Compression/Anoxic Damage 75.01 brain anoxic damage, edema, and compression (nontraumatic) 75.02 coma, nontraumatic 75.03 persistent vegetative state	48,50,76		Neuro 6
76	Mononeuropathy, Other Neurological Conditions/Injuries 76.01 postherpetic neuralgia/other neurological complications of herpes zoster 76.02 essential tremor and other abnormal movement disorders 76.03 migraine headaches 76.04 trigeminal nerve disorders 76.05 facial nerve disorders, including Bell's Palsy 76.06 other cranial nerve disorders 76.07 root/plexus disorders 76.08 other specified neuropathy 76.09 root/plexus lesions 76.10 neuropathy of upper limb (e.g., carpal tunnel syndrome) 76.11 neuropathy of leg 76.12 abnormal involuntary movements nec (e.g. spasms/tremor nos) 76.13 nerve injury, excluding spinal cord and brain		Exclude	Neuro 7
77	Respirator Dependence/Tracheostomy Status 77.01 tracheostomy status/complications 77.02 respirator dependence 77.03 tracheostomy (procedure) 77.04 ventilator (DME)	78,79,185,186		Arrest 1
78	Respiratory Arrest 78.01 respiratory arrest	79		Arrest 2
79	Cardio-Respiratory Failure and Shock 79.01 cardiac arrest/shock 79.02 acute lung edema nos 79.03 post trauma/surgery pulmonary insufficiency, incl adult respir distress syndr 79.04 respiratory failure			Arrest 3
80	Congestive Heart Failure 80.01 hypertensive heart disease, with heart failure 80.02 hypertensive heart/renal disease, with heart failure 80.03 pulmonary vascular disease, except pulmonary embolism 80.04 cardiomyopathy/myocarditis 80.05 heart failure D 131.03 hypertensive heart/renal disease, with heart/renal failure D 86.04 rheumatic heart failure	90,91,94		Heart 1
81	Acute Myocardial Infarction 81.01 acute myocardial infarction, initial episode of care	82,83,84,94		Heart 2
82	Unstable Angina and Other Acute Ischemic Heart Disease 82.01 myocardial infarction, subsequent episode of care, or unspecified 82.02 unstable angina and other acute ischemic heart disease 82.03 postmyocardial infarction syndrome	83,84,94		Heart 3
83	Angina Pectoris/Old Myocardial Infarction 83.01 old myocardial infarction 83.02 angina pectoris	84,94		Heart4
84	Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease 84.01 coronary atherosclerosis and other chronic ischemic heart disease 84.02 aneurysm and other congenital abnormalities of coronary artery	94		Heart 5
85	Heart Infection/Inflammation, Except Rheumatic 85.01 acute endo/myocarditis 85.02 pericarditis and other diseases of pericardium	86,88,94		Heart 6

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	85.03 cardiovascular syphilis			
86	Valvular and Rheumatic Heart Disease 86.01 rheumatic fever/heart disease 86.02 mitral or aortic valve/endocardia disease 86.03 mitral/aortic valve disorders 86.04 rheumatic heart failure 86.05 congenital abnormalities of heart valves 86.06 aortic atresia/stenosis and other congenital aortic abnormalities	88,94		Heart 7
87	Major Congenital Cardiac/Circulatory Defect 87.01 major congenital cardiac/circulatory system abnormality, age 18+ 87.02 major congenital cardiac/circulatory defect, age < 18	88,94		Heart 8
88	Other Congenital Heart/Circulatory Disease 88.01 other and unspecified congenital cardiac/circulatory system abnormality 88.02 ventricular septal defect 88.03 atrial septal defect 88.04 situs inversus/Kartagener's syndrome	94	Exclude	Heart 9
89	Hypertensive Heart and Renal Disease or Encephalopathy 89.01 hypertensive renal disease, without renal failure 89.02 hypertensive heart and renal disease, w/o heart or renal failure 89.03 hypertension encephalopathy	90,91,94		Heart 10
90	Hypertensive Heart Disease 90.01 hypertensive heart disease, without heart failure 90.02 malignant hypertensive heart disease, without heart failure	91,94		Heart 11
91	Hypertension 91.01 essential hypertension 91.02 malignant hypertension 91.03 secondary hypertension		Exclude	Heart 12
92	Specified Heart Arrhythmias 92.01 artioventricular block, complete (complete/third degree heart block) 92.02 atrial arrhythmia 92.03 paroxysmal ventricular tachycardia 92.04 sinoatrial node dysfunction, including sick sinus syndrome	93,94		Heart 13
93	Other Heart Rhythm and Conduction Disorders 93.01 other conduction disorders/cardiac dysrhythmias 93.02 second degree heart block	94	Exclude	Heart 14
94	Other and Unspecified Heart Disease 94.01 premature heart beats 94.02 other and unspecified heart disease 94.03 cardiomegaly (enlarged heart)		Exclude	Heart 15
95	Cerebral Hemorrhage 95.01 cerebral hemorrhage	96,97,98,99		CVD 1
96	Ischemic or Unspecified Stroke 96.01 precerebral or cerebral arterial occulsion with infarction 96.02 cerebrovascular accident, unspecified	97,98,99		CVD 2
97	Precerebral Arterial Occlusion and Transient Cerebral Ischemia 97.01 precerebral or cerebral arterial occlusion without infarction 97.02 transient cerebral ischemia	98,99		CVD 3
98	Cerebral Atherosclerosis and Aneurysm 98.01 cerebral atherosclerosis, ischemic and other specified cerebrovascular disease 98.02 cerebral aneurysm/arteriovenous malformation, nonruptured	99		CVD 4
99	Cerebrovascular Disease, Unspecified 99.01 unspecified cerebrovascular disease			CVD 5
100	Hemiplegia/Hemiparesis 100.01 hemiplegia and hemiparesis	101,103		CVD6

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	100.02 congenital/infantile hemiplegia (cerebral palsy) 100.03 hemiplegia/hemiparesis following stroke			
101	Diplegia (Upper), Monoplegia, and Other Paralytic Syndromes 101.01 monoplegic, other, and unspecified cerebral palsy 101.02 diplegia (upper), monoplegia, other, and unspecified paralytic syndromes 101.03 monoplegia and other paralysis following stroke, except hemiplegia	103		CVD7
102	Speech, Language, Cognitive, Perceptual Deficits 102.01 hemianopsia 102.02 cognitive deficits/apraxia following stroke 102.03 speech/language deficits following stroke 102.04 neurological neglect syndrome 102.05 aphasia (loss of language skills/comprehension)	103		CVD8
103	Cerebrovascular Disease Late Effects, Unspecified 103.01 cerebrovascular disease late effects, unspecified 103.02 dysphagia following stroke			CVD9
104	Vascular Disease with Complications 104.01 gangrene, unspecified and gas 104.02 pulmonary embolism 104.03 atherosclerosis of the extemities with ulceration 104.04 atherosclerosis of the extemities with gangrene 104.05 aortic aneurysm, ruptured 104.06 arterial embolism and thrombosis 104.07 acute vascular insufficiency of intestine 104.08 vascular disorders of kidney (embolism, hemorrhage, thrombosis, infarction)	105,106,149,153		Vascular 1
105	Vascular Disease 105.01 atherosclerosis/arteriosclerosis of major vessel 105.02 aortic aneurysm, without mention of rupture 105.03 arterial aneurysm, except aortic 105.04 specified peripheral vascular disease 105.05 unspecified peripheral vascular disease 105.06 stricture of artery and other/unspecified arterial disease 105.07 hereditary hemorrhagic telangiectasia 105.08 deep vein thrombosis 105.09 vascular insufficiency of intestines, chronic or unspecified	106		Vascular 2
106	Other Circulatory Disease 106.01 vascular atherosclerosis/arteriosclerotic cardiovascular disease 106.02 Raynaud's syndrome/other peripheral vascular disease 106.03 disease of capillaries, except hereditary hemorrhagic telangiectasia 106.04 thrombophlebitis, excluding deep vein and superficial leg 106.05 superficial phlebitis-leg 106.06 varicose veins 106.07 noninfectious lymphatic disorders 106.08 hypotension 106.09 other circulatory disease/postphlebitic syndrome 106.10 hemorrhage nos 106.11 compression of vein 106.12 other specified circulatory disorders		Exclude	Vascular 3
107	Cystic Fibrosis 107.01 cystic fibrosis, age 18+ 107.02 cystic fibrosis, age < 18	108,109,110,115		Lung 1
108	Chronic Obstructive Pulmonary Disease 108.01 emphysema/chronic bronchitis 108.02 chronic obstructive asthma	109,110,115		Lung 2
109	Fibrosis of Lung and Other Chronic Lung Disorders 109.01 sarcoidosis 109.02 bronchiectasis 109.03 pneumoconioses/lung disease due to specified external agents (e.g., black lung) 109.04 respiratory conditions due to other and unspecified external agents 109.05 postinflammatory and interstitial pulmonary fibrosis 109.06 pulmonary eosinophilia	110,115		Lung 3

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
110	Asthma 110.01 asthma, except chronic obstructive	115		Lung 4
111	Aspiration and Specified Bacterial Pneumonias 111.01 gram-negative/staphylococcus pneumonia 111.02 aspiration pneumonia	112,113,115		Lung 5
112	Pneumococcal Pneumonia, Empyema, Lung Abscess 112.01 pneumococcal and other specific bacterial pneumonia 112.02 empyema, lung abcess 112.03 fungal and parasitic lung infections, except candida	113,115		Lung 6
113	Viral and Unspecified Pneumonia, Pleurisy 113.01 viral pneumonia 113.02 other and unspecified pneumonia 113.03 influenza with pneumonia 113.04 pleurisy, excluding pleural effusion 113.05 pulmonary congestion/hypostasis	115		Lung 7
114	Pleural Effusion/Pneumothorax 114.01 pleural effusion 114.02 pneumothorax (not tension) 114.03 tension pneumothorax (collapsed lung)	115		Lung 8
115	Other Lung Disorders 115.01 acute or unspecified bronchitis and bronchiolitis 115.02 influenza, except that with pneumonia 115.03 other and unspecified lung/respiratory system disease 115.04 atelectasis/pulmonary collapse 115.05 congenital lung/respiratory anomaly 115.06 foreign body trachea/bronchus/lung		Exclude	Lung 9
116	Legally Blind 116.01 blind, WHO or USA legal definition	124	Exclude	Eye 1
117	Major Eye Infections/Inflammations 117.01 endophthalmitis 117.02 corneal ulcer/abcess 117.03 acute inflammation of the orbit, including orbital cellulitis	124	Exclude	Eye 2
118	Retinal Detachment 118.01 retinal detachment	121,124		Eye 3
119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage 119.01 proliferative diabetic retinopathy 119.02 vitreous hemorrhage	120,121,124		Eye 4
120	Diabetic and Other Vascular Retinopathies 120.01 diabetic retinopathy 120.02 vascular retinopathies, except diabetic 120.03 retinal hemorrhage, edema	121,124		Eye 5
121	Retinal Disorders, Except Detachment and Vascular Retinopathies 121.01 retinal defects without detachment 121.02 other and unspecified retinal disorders 121.03 macular degeneration 121.04 retinitis pigmentosa, other hereditary retinal dystrophies	124	Exclude	Eye 6
122	Glaucoma 122.01 other and unspecified glaucoma 122.02 borderline glaucoma 122.03 open-angle glaucoma 122.04 primary angle-closure glaucoma, non-acute or unspecified 122.05 acute primary angle-closure glaucoma	124	Exclude	Eye 7
123	Cataract 123.01 cataract 123.02 diabetic cataract	124	Exclude	Eye 8

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
124	Other Eye Disorders 124.01 disorders of the optic nerve and visual pathways, including optic neuritis 124.02 uveitis 124.03 other and unspecified eye disorders 124.04 disorders of refraction and accommodation (e.g., near-sightedness) 124.05 visual loss, one eye or unspecified 124.06 visual loss, both eyes 124.07 keratoconus 124.08 congenital anomalies of eye 124.09 open wound of ocular adnexa, foreign body on external eye, burn eye/adnexa 124.10 open wound of eyeball, including penetrating foreign body		Exclude	Eye 9
125	Significant Ear, Nose, and Throat Disorders 125.01 perichondritis of pinna 125.02 malignant otitis externa 125.03 mastoiditis and related conditions 125.04 cholesteatoma of middle ear and mastoid 125.05 Meniere's Disease 125.06 larynx/vocal cord diseases 125.07 paralysis of vocal cords/larynx	127	Exclude	ENT 1
126	Hearing Loss 126.01 hearing loss	127	Exclude	ENT 2
127	Other Ear, Nose, Throat, and Mouth Disorders 127.01 other ear disorders 127.02 impacted earwax 127.03 otitis media, except chronic purulent 127.04 chronic purulent otitis media 127.05 vertiginous syndromes, except Meniere's disease 127.06 acute nose/throat infection (e.g., common cold) 127.07 other diseases of upper respiratory system 127.08 nasal polyps/allergic rhinitis (e.g., hay fever) 127.09 chronic sinusitis 127.10 disorders of teeth, gum, and jaw (e.g., gingivitis, periodontitis) 127.11 other oral soft tissue/tongue/jaw disorders 127.12 salivary gland diseases 127.13 congenital anomalies of ear, face, neck, nose, mouth, and pharynx 127.14 foreign body ear/nose/pharyx/larynx		Exclude	ENT 3
128	Kidney Transplant Status 128.01 kidney transplant status/complications 128.02 kidney transplant (procedure)	9,130,131,132,136,175		Urinary 1
129	End Stage Renal Disease 129.01 enrolled in Medicare End Stage Renal Disease (ESRD) program	130,131,132,136		Urinary 2
130	Dialysis Status 130.01 dialysis status/complications 130.02 dialysis (procedure) 130.03 dialysis supplies and equipment (DME)	131,132,136		Urinary 3
131	Renal Failure 131.01 hypertensive renal disease, with renal failure 131.02 hypertensive heart/renal disease, with renal failure 131.03 hypertensive heart/renal disease, with heart/renal failure 131.04 acute renal failure 131.05 chronic renal failure 131.06 renal failure, unspecified	132,136		Urinary 4
132	Nephritis 132.01 nephritis	136		Urinary 5
133	Urinary Obstruction and Retention 133.01 hydronephrosis, bladder/ureter, other urinary tract obstruction 133.02 renal/ureteral/bladder calculus (e.g., kidney stones) 133.03 vesicoureteral reflux 133.04 neurogenic bladder		Exclude	Urinary 6

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	133.05 urethral stricture 133.06 retention of urine			
134	Incontinence 134.01 fecal incontinence 134.02 incontinence/urethral discharge		Exclude	Urinary 7
135	Urinary Tract Infection 135.01 cystitis, other urinary tract infections 135.02 kidney infection		Exclude	Urinary 8
136	Other Urinary Tract Disorders 136.01 impaired renal function 136.02 other urinary disorders 136.03 kidney cysts 136.04 congenital kidney/urinary abnormalities, exc obstruction/cysts 136.05 congenital polycystic/medullary kidney disease, except recessive 136.06 foreign body genitourinary tract		Exclude	Urinary 9
137	Female Infertility 137.01 female infertility	138,139		Genital 1
138	Pelvic Inflammatory Disease and Other Specified Female Genital Disorders 138.01 pelvic inflammatory disease 138.02 diseases of female pelvic organs 138.03 endometriosis 138.04 genital prolapse 138.05 ovarian cyst	139		Genital 2
139	Other Female Genital Disorders 139.01 vaginal and cervical diseases 139.02 other diseases of female genital organs 139.03 female stress incontinence 139.04 menopausal and postmenopausal disorders 139.05 congenital anomalies of female or unspecified genital organs		Exclude	Genital 3
140	Male Genital Disorders 140.01 hyperplasia of prostate 140.02 prostatic disorders, except enlarged prostate 140.03 penis/testis/male genital organs disorders 140.04 male infertility 140.05 impotence, organic 140.06 congenital anomalies of male genital organs		Exclude	Genital 4
141	Ectopic Pregnancy 141.01 ectopic pregnancy	142,146,147		Preg 1
142	Miscarriage/Abortion 142.01 miscarriage/abortion	146,147		Preg 2
143	Completed Pregnancy With Major Complications 143.01 pregnancy with major renal/hypertension/eclampsia 143.02 shock/septicemia in pregnancy 143.03 premature delivery 143.04 major complications of labor/delivery 143.05 cesarean section	144,145,146,147		Preg 3
144	Completed Pregnancy With Complications 144.01 completed pregnancies with diagnosis in HCC 146 144.02 premature separation of placenta (abruptio placentae) 144.03 pregnancy with malposition 144.04 pregnancy with disproportion/obstruction 144.05 premature rupture of membranes/other amniotic cavity problem 144.06 minor complications of labor/delivery 144.07 trauma in labor/delivery 144.08 postpartum hemorrhage 144.09 multiple birth	145,146,147		Preg 4
145	Completed Pregnancy Without Complications (Normal Delivery)	146,147		Preg 5

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	145.01 completed pregnancies with diagnosis in HCC 147 145.02 normal delivery 145.03 routine postpartum care			
146	Uncompleted Pregnancy With Complications 146.01 other and unspecified antepartum hemorrhage 146.02 placenta previa 146.03 uncompleted pregnancies with diagnosis in HCC 143,144 146.04 pregnancy with other renal/hypertension/eclampsia 146.05 threatened labor/cervical incompetence 146.06 significant maternal diseases complicating pregnancy, except diabetes mellitus 146.07 diabetes mellitus complicating pregnancy 146.08 multiple gestation 146.09 pregnancy with deep vein thrombosis/embolism	147		Preg 6
147	Uncompleted Pregnancy With No or Minor Complications 147.01 hemorrhage in early pregnancy 147.02 minor complications of pregnancy 147.03 maternal diseases in pregnancy 147.04 pregnancy with fetal abnormality 147.05 routine antenatal care/normal pregnancy 147.06 miscellaneous other problems of pregnancy			Preg 7
148	Decubitus Ulcer of Skin 148.01 decubitus ulcer of skin	149,153		Skin 1
149	Chronic Ulcer of Skin, Except Decubitus 149.01 chronic ulcer of skin, except decubitus	153		Skin 2
150	Extensive Third-Degree Burns 150.01 third degree burns, 10%+ of body surface	151,153		Skin 3
151	Other Third-Degree and Extensive Burns 151.01 other/unspecified third degree burns (<10% of body surface) 151.02 burn, 10%+ of body surface, less than 10% third degree or unspecified	153	Exclude	Skin 4
152	Cellulitis, Local Skin Infection 152.01 cellulitis/abcess/other local skin infection	153	Exclude	Skin 5
153	Other Dermatological Disorders 153.01 other dermatological disorders 153.02 dermatitis from substances taken internally (e.g., food, drugs) 153.03 bullous dermatoses, except pemphigus/pemphigoid 153.04 pemphigus/pemphigoid 153.05 other specified erythematous conditions, except rosacea 153.06 erythema multiforme, including toxic epidermal necrolysis 153.07 discoid lupus erythematosus 153.08 psoriasis and parapsoriasis without arthopathy 153.09 other dermatosis 153.10 diseases of nail (e.g., ingrown toenail) 153.11 congenital anomalies of the integument 153.12 burns, except third degree or 10%+ body surface		Exclude	Skin 6
154	Severe Head Injury 154.01 fracture of skull/face with coma > 1 hour 154.02 cerebral laceration, contusion, hemorrhage following injury with coma > 1 hour 154.03 intracranial injury of other and unspecified nature w/ coma >1 hour	50,75,76,155,156,162		Injury 1
155	Major Head Injury 155.01 fracture of skull/face with coma < 1 hour or unspecified 155.02 concussion with loss of consciousness> 1 hour 155.03 cerebral laceration, contusion, hemorrhage foll injury w/ coma < 1 hour or unspec 155.04 intracranial injury of other and unspecified nature w/coma < 1 hour or unspec 155.05 late effects of skull/face fracture, intracranial injury	50,156,162		Injury 2
156	Concussion or Unspecified Head Injury 156.01 concussion, except with loss of consciousness > 1 hour 156.02 head injury, unspecified		Exclude	Injury 3

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
157	Vertebral Fractures 157.01 pathological/compression fracture/collapse of vertebrae 157.02 vertebral fracture without spinal cord injury	39,43,162		Injury 4
158	Hip Fracture/Dislocation 158.01 pathological hip fracture 158.02 pelvic fracture 158.03 femoral (hip) fracture 158.04 dislocation of hip	162		Injury 5
159	Major Fracture, Except of Skull, Vertebrae, or Hip 159.01 pathological fracture of humerous 159.02 pathological fracture of tibia or fibula 159.03 open fracture of ribs, fracture of sternum, larynx, trachea, trunk bones 159.04 fracture of humerous, multiple upper limb bones 159.05 fractures of patella, tibia, fibula, multiple lower/upper limb bones 159.06 fractures of ankle	162	Exclude	Injury 6
160	Internal Injuries 160.01 injury to heart/lung/intrathoracic organs/blood vessels of thorax 160.02 gastrointestinal/liver/kidney/spleen/pelvis injury	162		Injury 7
161	Traumatic Amputation 161.01 traumatic amputation of leg/arm/hand/foot/toe, compl reattached body part	162,177,178		Injury 8
162	Other Injuries 162.01 unspecified pathological fractures 162.02 pathological fracture of distal radius and ulna 162.03 fractures of nasal bone 162.04 fracture of rib, closed 162.05 fracture of clavicle, scapula 162.06 fracture of hand/wrist/lower arm 162.07 fracture of foot 162.08 fractures of unspecified bones 162.09 traumatic dislocations, except knee, shoulder, and vertebrae 162.10 shoulder dislocation 162.11 dislocation of knee, including cartilage/meniscus tear 162.12 sprains 162.13 open wound, except eye and lower arm 162.14 open wound/injury of lower arm 162.15 injury late effects, except spinal cord, skull/face fracture, and intracranial 162.16 contusion/superficial injury 162.17 crushing injury 162.18 other accidents 162.19 accidental falls		Exclude	Injury 9
163	Poisonings and Allegic Reactions 163.01 poisoning by (unintentional) provider or patient medication error 163.02 poisoning by specified nonmedicinal substances, injury external causes 163.03 poisoning by other and unspecified nonmedical substances 163.04 anaphylactic shock 163.05 adverse effects of correctly prescribed and administered drugs 163.06 unspecified allergic reaction		Exclude	Allergy
164	Major Complications of Medical Care and Trauma 164.01 mechanical/other complications of internal device/implant/graft, exc orthopedic 164.02 early complications of trauma 164.03 mechanical complication of internal orthopedic device/implant/graft 164.04 infection/inflammation from internal device/implant/graft 164.05 cerebral/cardiac/respiratory/hepatic/renal/other complications of procedures	165		Compl 1
165	Other Complications of Medical Care 165.01 other and unspecified complications of procedures and medical care 165.02 hemorrhage/hematoma/seroma complicating a procedure 165.03 misadventure to patient during surgery or medical care 165.04 postoperative infection		Exclude	Compl 2
166	Major Symptoms, Abnormalities 166.01 stupor/altered consciousness/trans global amnesia/febrile convulsions	167	Exclude	Symptom 1

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	166.02 unspecified congenital anomalies 166.03 syncope and collapse 166.04 fever 166.05 other and unspecified nervous/musculoskeletal symptoms 166.06 abnormality of gait (ataxic, paralytic, spastic, staggering) 166.07 ataxia (muscular incoordination), transient limb paralysis 166.08 anorexia 166.09 abnormal weight loss 166.10 feeding difficulties 166.11 lack of expected normal physiological development 166.12 respiratory/other chest symptoms 166.13 speech disturbance nec (e.g., dysarthria/dysphasia/slurred speech) 166.14 symbolic dysfunction (e.g., apraxia/alexia/dyslexia/agraphia/amnesia) 166.15 dyspnea (labored breathing)/other respiratory abnormalities 166.16 respiratory distress/insufficiency 166.17 hemoptysis (coughing up blood) 166.18 chest pain 166.19 dysphagia 166.20 abdominal/pelvis symptoms 166.21 ascites 166.22 debility, nos			
167	Minor Symptoms, Signs, Findings 167.01 headache excluding migraine 167.02 other general symptoms 167.03 somatic/segmental dysfunction 167.04 dizziness and giddiness 167.05 malaise and fatigue, including chronic fatigue syndrome 167.06 cardiovascular symptoms, except chest pain 167.07 cough 167.08 urinary system symptoms, except incontinence and retention of urine 167.09 unhealthy lifestyle/abused person/psychological, behavioral problems 167.10 infectious disease contact/carrier 167.11 problems of internal organs/external sites 167.12 care not delivered		Exclude	Symptom 2
168	Extremely Low Birthweight Neonates 168.01 extremely low birthweight neonates	169,170,171,172		Neonate 1
169	Very Low Birthweight Neonates 169.01 very low birthweight neonates	170,171,172		Neonate 2
170	Serious Perinatal Problem Affecting Newborn 170.01 respiratory distress syndrome/other serious perinatal respiratory complication 170.02 necrotizing enterocolitis and other major gastrointestinal disorders of infant 170.03 drug/alcohol affected newborn, including Fetal Alcohol Syndrome 170.04 low birthweight, weight not given 170.05 somewhat low birthweight neonates 170.06 convulsions, cerebral hemorrhage, and other perinatal neurologic disorders 170.07 esophageal atresia/stenosis, oth cong gastrointestinal anomalies, age < 2	171,172		Neonate 3
171	Other Perinatal Problems Affecting Newborn 171.01 newborn infections 171.02 perinatal disorders of digestive system 171.03 other perinatal problem 171.04 fetal distress/asphyxia 171.05 fetal death 171.06 neonatal hemorrhage 171.07 perinatal hemolytic disorders 171.08 perinatal jaundice 171.09 endocrine disorder of newborn 171.10 newborn skin/temperature problem 171.11 multiple birth	172		Neonate 4
172	Normal, Single Birth 172.01 single birth			Neonate 5
173	Major Organ Transplant 173.01 lung transplant (procedure)	174,175		Transplant1

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	173.02 heart transplant (procedure) 173.03 bone marrow transplant (procedure) 173.04 liver transplant (procedure) 173.05 pancreas transplant (procedure)			
174	Major Organ Transplant Status 174.01 liver transplant status/complications 174.02 heart transplant status/complications 174.03 lung transplant status/complications 174.04 bone marrow transplant status/complications 174.05 pancreas transplant status/complications	175		Transplant2
175	Other Organ Transplant/Replacement 175.01 other organ transplant status/complications 175.02 other organ replacement		Exclude	Transplant3
176	Artificial Openings for Feeding or Elimination 176.01 artificial opening of gastrointestinal tract status/complications 176.02 other and unspecified artficial opening status 176.03 artificial opening of urinary tract status 176.04 gastrostomy (procedure) 176.05 enterostomy (procedure) 176.06 enteral nutrition (DME) 176.07 parenteral nutrition (DME)			Openings
177	Amputation Status, Lower Limb/Amputation Complications 177.01 amputation status (lower limb), amputation complications 177.02 amputation, lower limb (procedure) 177.03 lower limb prostheses (DME)			Amputation 1
178	Amputation Status, Upper Limb 178.01 amputation status, upper limb 178.02 amputation, upper limb (procedure) 178.03 upper limb prostheses (DME)		Exclude	Amputation 2
179	Post-Surgical States/Aftercare/Elective 179.01 heart valve replacement status 179.02 postsurgical states, eye 179.03 joint replacement 179.04 other postsurgical states 179.05 status cardiac pacemaker, other, and unspecified cardiac device 179.06 status automatic implantable cardiac defibrillator 179.07 status cerebrospinal fluid drainage device/shunt 179.08 elective surgery 179.09 prothesis/other device fitting, adjustment 179.10 other orthopedic aftercare 179.11 aftercare 179.12 donor		Exclude	Surgery
180	Radiation Therapy 180.01 radiation therapy 180.02 radiation therapy (procedure)		Exclude	Radiation
181	Chemotherapy 181.01 chemotherapy 181.02 chemotherapy (procedure)		Exclude	Chemo
182	Rehabilitation 182.01 rehabilitation procedures		Exclude	Rehab
183	Screening/Observation/Special Exams 183.01 screening/observation/special exams 183.02 vaccination, medical exam, other preventive 183.03 administrative/consultation 183.04 screening for malignant neoplasm		Exclude	Screening
184	History of Disease 184.01 history of malignant neoplasm 184.02 history of mental disorder/other disease		Exclude	History

Table A-1 (continued)

Hierarchical Condition Categories

		If in this HCC then Ignore HCC:	Payment Model Exclusions	Short HCC Name
	184.03 history of drug allergy/other health hazard 184.04 family history of disease			
185	Oxygen 185.01 oxygen supplies/equipment (DME)	186		RespirTher1
186	CPAP/IPPB/Nebulizers 186.01 nebulizers and related drugs (DME) 186.02 continuous positive airway pressure system (DME) 186.03 intermittent positive pressure breathing system (DME)			RespirTher2
187	Patient Lifts, Power Operated Vehicles, Beds 187.01 hospital beds (DME) 187.02 patient lifts (DME) 187.03 power operated vehicles (DME)	188,189		Mobility1
188	Wheelchairs, Commodes 188.01 wheelchairs (DME) 188.02 commodes (DME)	189		Mobility2
189	Walkers 189.01 walkers (DME)			Mobility3

SOURCE: Health Economics Research, Inc.

Table A-2

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
	Overall Sample	1,394,701	1,338,647	$5,314	12	$13,822	260%
-1	Invalid diagno	197,817	188,211	6,675	36	15,674	235
0	No diagnoses	112,591	109,022	1,712	25	8,238	481
1.01	HIV/AIDS	1,587	1,504	12,279	638	24,726	201
1.02	HIV positive	636	606	13,214	935	23,027	174
2.01	septicemia (blood poisoning)/shock	16,321	13,911	19,910	305	35,941	181
3.01	bacterial/fungal/nonviral meningitis, brain/spinal abcess	1,022	928	13,431	904	27,542	205
3.02	non-viral encephalitis, meningoencephalitis, other CNS infection	962	894	13,120	769	22,985	175
3.03	viral encephalitis, including acute poliomyelitis, excluding slow virus infection	476	452	10,638	1,322	28,103	264
3.04	viral meningitis	650	620	7,809	628	15,630	200
3.05	late effects of central nervous system infection	1,108	1,057	10,420	767	24,952	239
3.06	meningitis of unspecified cause	1,005	936	12,644	785	24,017	190
4.01	tuberculosis, except central nervous system	3,319	3,111	10,399	440	24,530	236
5.01	pulmonary mycobacteria/cryptosporidiosis/spec toxoplasmosis/zygomycosis	328	300	14,041	1,476	25,583	182
5.02	cytomegaloviral disease, including pneumonia	222	199	19,732	2,060	29,027	147
5.03	candidasis of lung, esophagus, or disseminated	1,304	1,123	20,917	1,096	36,727	176
5.04	aspergillosis/cryptococcosis	243	214	22,576	4,859	71,093	315
5.05	pneumocystis (carinii) pneumonia	299	264	19,191	2,217	35,989	188
6.01	other intestinal infections	4,949	4,691	9,124	281	19,263	211
6.02	other bacterial infections	5,100	4,794	9,516	300	20,779	218
6.03	viral enteritis (intestinal infections)	5,549	5,268	8,761	253	18,339	209
6.04	strep throat/scarlet fever	2,139	2,071	6,415	299	13,617	212
6.05	bacterial infection in other diseases	30,019	26,882	15,505	153	25,137	162
6.06	other viral infections	33,715	32,491	6,474	86	15,559	240
6.07	herpes zoster (shingles), excluding neurological complications	14,530	13,803	6,881	136	16,021	233
6.08	herpes simplex	5,301	5,089	7,709	274	19,528	253
6.09	viral hepatitis A and unspecified, without hepatic coma	680	644	9,255	752	19,092	206
6.1	other infections	18,432	17,102	10,478	165	21,545	206
6.11	Lyme disease	913	886	5,398	395	11,743	218
6.12	veneral diseases, except neuro-and cardiovascular syphilis	1,501	1,431	9,823	615	23,254	237
6.13	dermatophytosis (fungal skin infections, e.g., athlete's foot)	138,171	129,238	8,927	50	18,034	202
6.14	oral candidiasis (thrush)	4,032	3,637	14,288	409	24,659	173
6.15	histoplasmosis/coccidioidomycosis/blastomycosis	736	707	6,323	504	13,414	212
6.16	infection late effects, excluding central nervous system	369	348	11,417	1,125	20,981	184
6.17	bacteremia	2,271	2,011	17,823	729	32,692	183
7.01	secondary cancer of lymph node	4,302	3,589	15,672	401	24,025	153

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
7.02	secondary cancer of respiratory and digestive systems	5,699	4,152	20,943	406	26,144	125
7.03	secondary cancer of other site	9,144	7,353	16,861	303	25,945	154
7.04	disseminated cancer	1,477	1,227	15,127	723	25,338	168
7.05	acute lymphoid and other acute leukemias, except myeloid	586	479	20,960	1,560	34,135	163
7.06	acute myeloid leukemia	432	352	23,188	2,092	39,268	169
8.01	cancer of esophagus	867	707	17,251	1,204	32,005	186
8.02	cancer of stomach	1,341	1,131	13,761	739	24,867	181
8.03	cancer of small bowel/peritoneum/gallbladder/bile ducts	1,094	896	16,455	856	25,629	156
8.04	cancer of liver	1,080	808	18,428	1,025	29,138	158
8.05	cancer of pancreas	1,031	779	18,125	1,022	28,533	157
8.06	cancer of trachea, bronchus, lung, and pleura	10,251	8,320	15,171	282	25,751	170
8.07	multiple myeloma	1,989	1,742	15,501	639	26,679	172
8.08	chronic myeloid and other specific non-acute leukemias, except lymphoid	730	627	17,409	1,354	33,908	195
9.01	cancer of mouth/tongue	1,951	1,763	11,024	537	22,536	204
9.02	cancer of pharynx	1,321	1,168	12,778	679	23,199	182
9.03	other respiratory/intrathoracic cancer	851	749	13,716	941	25,745	188
9.04	cancer of larynx	2,023	1,851	10,773	524	22,561	209
9.05	cancer of bone and articular cartilage	1,953	1,663	14,009	569	23,216	166
9.06	cancer of connective and other soft tissue	2,051	1,853	11,341	480	20,648	182
9.07	Kaposi's sarcoma	210	194	15,035	1,545	21,513	143
9.08	cancer of ovaries/placenta/uterine adnexia	2,265	2,014	13,283	479	21,485	162
9.09	cancer of the brain/nervous system/pituitary, pineal glands	3,155	2,769	12,409	452	23,797	192
9.1	adrenal gland cancer	166	143	9,871	1,360	16,229	164
9.11	non-Hodgkin's lymphomas	6,488	5,859	12,364	297	22,711	184
9.12	Hodgkin's disease	810	728	12,834	1,018	27,468	214
9.13	chronic lymphoid and unspecified cell leukemias, not specified as acute	3,853	3,486	12,239	405	23,889	195
10.01	colon cancer	12,609	11,548	9,773	180	19,376	198
10.02	rectal cancer	9,375	8,553	10,281	212	19,561	190
10.03	other, unspecified cancer of digestive organs/peritoneum	808	712	11,301	759	20,235	179
10.04	melanoma	4,089	3,858	7,026	252	15,624	222
10.05	breast cancer, age 45+	29,516	28,109	6,527	88	14,747	226
10.06	cancer of uterus	3,596	3,379	7,762	326	18,954	244
10.07	cancer of cervix/female genital organs	2,133	1,971	9,216	419	18,616	202
10.08	prostate cancer	38,415	36,279	8,033	87	16,619	207
10.09	cancer of testis/male genital organs	530	498	9,117	1,002	22,357	245
10.1	cancer of bladder, ureter, urethra and other urinary tract	10,085	9,383	9,537	188	18,252	191
10.11	cancer of kidney and renal pelvis	2,929	2,673	9,568	361	18,676	195

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
10.12	cancer of the eye	746	703	7,872	555	14,729	187
10.13	thyroid/endocrine cancer, except adrenal, pituitary, pineal	1,356	1,276	8,353	497	17,740	212
10.14	other/ill-defined site cancer	11,704	10,166	12,732	233	23,537	185
10.15	benign neoplasm of brain/nervous system/pituitary, pineal glands	3,838	3,611	9,334	307	18,420	197
10.16	uncertain/unspecified neoplasm of brain/nervous system/pituitary, pineal glands	3,312	2,987	11,241	405	22,146	197
10.17	neurofibromatosis	288	276	7,865	865	14,367	183
10.18	tuberous sclerosis and other hamartoses (Peutz-Jeghers/Sturge-Weber, etc)	206	194	7,463	1,085	15,116	203
10.19	breast cancer, age < 45	107	101	11,915	1,817	18,272	153
11.01	benign neoplasm of respiratory system	2,433	2,186	12,401	637	29,765	240
11.02	benign neoplasm of heart	94	92	9,710	2,211	21,149	218
11.03	carcinoma in situ of respiratory system	1,305	1,053	15,153	873	28,331	187
11.04	uncertain/unspecified neoplasm of respiratory system	4,859	4,139	13,984	389	25,046	179
12.01	benign neoplasm of digestive system	45,993	44,005	7,496	81	16,897	225
12.02	benign neoplasm of urinary tract	1,987	1,852	9,955	440	18,955	190
12.03	carcinoma in situ of digestive organs	2,722	2,414	12,136	472	23,216	191
12.04	carcinoma in situ of urinary organs	1,244	1,153	10,939	583	19,791	181
12.05	uncertain/unspecified neoplasm of digestive organs	9,766	8,929	10,480	223	21,029	201
12.06	uncertain/unspecified neoplasm of urinary organs	4,140	3,808	10,706	315	19,409	181
13.01	skin cancer, except melanoma, including lip	59,812	57,327	6,378	59	14,211	223
13.02	benign neoplasms, exc respiratory, digestive, urinary, skin, breast, eye, cns	31,792	30,547	6,561	88	15,445	235
13.03	carcinoma in situ, except respiratory, digestive, urinary, skin	7,868	7,409	8,272	199	17,164	207
13.04	uncertain neoplasm, exc respiratory, digestive, urinary, skin, cns	13,292	12,614	7,433	161	18,082	243
13.05	unspecified neoplasm, exc respiratory, digestive, bladder, brain	25,879	24,340	8,085	115	17,951	222
14.01	benign neoplasm of skin	45,531	44,173	5,364	60	12,561	234
14.02	benign neoplasm of breast/other breast disorders	129,883	126,669	4,663	34	11,979	257
14.03	benign neoplasm of eye	3,577	3,456	5,375	207	12,143	226
14.04	uncertain neoplasm, skin	28,533	27,563	5,903	83	13,765	233
15.01	type II diabetes with renal manifestation	3,775	3,306	17,435	525	30,213	173
15.02	type I diabetes with renal manifestation	2,466	2,102	22,170	673	30,843	139
16.01	type II diabetes with neurological manifestations	14,529	13,537	13,817	208	24,167	175
16.02	type I diabetes with neurological manifestations	7,179	6,527	18,103	346	27,935	154
16.03	type II diabetes with peripheral circulatory disorders	11,467	10,547	14,515	240	24,697	170
16.04	type I diabetes with peripheral circulatory disorders	5,579	5,058	19,072	403	28,643	150
17.01	type II diabetes with ketoacidosis or coma	5,233	4,804	13,564	353	24,466	180
17.02	type I diabetes with ketoacidosis or coma	1,800	1,621	16,735	703	28,319	169
17.03	type II diabetes with other specified manifestations, incl hypoglycemic shock	7,065	6,453	16,799	325	26,108	155
17.04	type I diabetes with other specified manifestations, incl hypoglycemic shock	4,380	3,933	19,230	439	27,556	143

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
18.01	type II diabetes with ophthalmologic manifestations	11,240	10,618	10,659	214	22,094	207
18.02	type I diabetes with ophthalmologic manifestations	4,988	4,613	14,402	352	23,897	166
19.01	type II diabetes without complications	191,677	181,334	8,908	44	18,794	211
19.02	type I diabetes without complications	59,078	55,008	12,487	97	22,695	182
19.03	type II diabetes with unspecified complication	15,336	14,339	11,652	189	22,687	195
19.04	type I diabetes with unspecified complication	4,894	4,529	16,027	390	26,255	164
21.01	protein-calorie malnutrition/wasting disease (cachexia)	13,419	11,107	19,301	318	33,555	174
22.01	adrenal gland disorders e.g., Cushing's syndrome	3,321	3,015	13,437	461	25,340	189
22.02	nondiabetic hypoglycemic coma	585	522	15,404	1,170	26,735	174
22.03	pituitary/parathyroid/thymus/polyglandular disorders, except pituitary dwarfism	5,967	5,614	9,754	267	20,019	205
22.04	pituitary dwarfism	48	44	9,869	2,811	18,594	188
22.05	inborn errors of metabolism	1,646	1,576	7,637	475	18,860	247
22.06	macroglobulinemia and paraproteinemias, except monoclonal	391	361	12,729	1,392	26,444	208
22.07	hemochromatosis, other disorders of iron, copper, and phosphorus metabolism	1,949	1,804	10,652	527	22,391	210
22.08	porphyria, histiocytosis, other specified metabolic disorders	395	375	9,773	982	18,999	194
22.09	amyloidosis/familial Mediterranean fever	265	240	11,794	1,399	21,654	184
22.1	alpha 1-antitrypsin deficiency/hereditary angioedema	111	106	12,249	2,028	20,832	170
23.01	disorders of fluid/electrolyte/acid-base balance, e.g., dehydration	97,625	87,875	13,303	82	24,315	183
24.01	goiter	10,447	10,090	6,350	150	15,044	237
24.02	thyrotoxicosis, including Graves' disease	13,464	12,908	6,853	131	14,870	217
24.03	congenital hypothyroidism (cretinism)	548	526	5,748	578	13,247	230
24.04	thyroid disorders, except goiter and thyrotoxicosis	113,272	108,481	6,718	47	15,397	229
24.05	other hypoglycemia	8,231	7,575	12,473	274	23,841	191
24.06	ovarian dysfunction	5,791	5,670	4,373	149	11,207	256
24.07	testicular dysfunction	1,875	1,813	7,577	480	20,417	269
24.08	other endocrine disorders	5,804	5,645	5,168	176	13,255	256
24.09	vitamin B/other nutritional deficiencies	10,237	9,605	8,888	189	18,503	208
24.1	lactose intolerance, other/unspecified disorders of carbohydrate metabolism	3,887	3,728	6,397	234	14,279	223
24.11	disorders of lipoid metabolism (high cholesterol), except lipidoses	249,985	242,527	5,118	27	13,073	255
24.12	other and unspecified disorders of plasma protein metabolism	3,552	3,209	12,944	467	26,448	204
24.13	disorders of magnesium, calcium, and unspecified mineral metabolism	8,859	8,171	11,604	256	23,125	199
24.14	disorders of bilirubin excretion and unspecified metabolism disorders	1,712	1,626	7,777	495	19,977	257
24.15	other hyperalimentation	634	597	9,198	991	24,210	263
24.16	obesity/localized adiposity	26,056	25,088	8,439	115	18,268	216
24.17	congenital anomalies of endocrine glands	555	530	6,594	614	14,131	214
25.01	esophageal varices	1,048	948	17,417	896	27,585	158
25.02	end stage liver disorders, including hepatic coma and liver failure	1,524	1,284	18,178	837	29,974	165

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
26.01	cirrhosis of liver	5,407	4,876	13,529	333	23,244	172
27.01	chronic viral hepatitis	929	860	13,938	940	27,565	198
27.02	chronic hepatitis, except viral	1,472	1,376	11,370	619	22,977	202
28.01	acute liver disease, including acute liver necrosis/failure, abcess, infarction	1,350	1,220	13,380	739	25,809	193
28.02	viral hepatitis, acute or unspecified, with hepatic coma	100	94	10,383	1,893	18,375	177
29.01	viral hepatitis, except type A or unspec, acute or unspec w/o hepatic coma	1,547	1,460	11,414	600	22,938	201
29.02	toxic and other/unspecified non-viral hepatitis/other liver disorders	15,197	14,081	10,776	181	21,436	199
30.01	gallstones with gallbladder inflammation and other gallbladder disease	20,163	19,048	9,239	166	22,965	249
30.02	specified biliary tract disease (e.g., cholangitis, obstruction, perforation)	3,573	3,212	12,598	466	26,408	210
31.01	peritonitis, excluding appendicitis and female pelvic	2,030	1,827	16,709	801	34,233	205
31.02	perforated peptic ulcer or intestines	2,301	2,132	13,078	732	33,787	258
31.03	intestinal obstruction	24,647	22,315	13,766	173	25,896	188
32.01	chronic pancreatitis/ other pancreatic diseases/intestinal malabsorption	6,322	5,845	12,435	321	24,568	198
32.02	acute pancreatitis	5,466	5,073	12,303	333	23,752	193
33.01	regional enteritis (Crohn's disease), age 18+	3,310	3,167	9,318	346	19,463	209
33.02	ulcerative colitis, age 18+	4,221	4,035	8,030	300	19,033	237
33.03	inflammatory bowel disease, age < 18	1	1	588	.	.	.
34.01	bacterial enteritis (intestinal infections)	3,530	3,177	15,222	472	26,601	175
34.02	peptic ulcer not specified as with perforation, hemorrhage, or obstruction	43,285	40,853	9,725	100	20,133	207
34.03	gastrointestinal hemorrhage, except peptic ulcer and anal/rectal	47,855	44,250	10,796	108	22,779	211
34.04	peptic ulcer with hemorrhage, without perforation	6,790	6,204	12,281	324	25,536	208
34.05	peptic ulcer with obstruction, without perforation or hemorrhage	782	726	9,920	860	23,182	234
34.06	pyloric/duodenal obstruction	1,498	1,351	13,673	746	27,436	201
34.07	intestinal abcess, fistula, and other specified disorders	6,774	6,315	11,109	279	22,171	200
34.08	abdominal hernia, complicated	3,373	3,184	9,791	348	19,657	201
34.09	peritoneal disorders, except peritonitis	4,178	3,929	11,106	336	21,046	189
35.01	appendicitis, including with perforation and peritonitis	1,558	1,473	8,998	571	21,917	244
36.01	hemorrhoids	40,144	38,685	6,561	80	15,656	239
36.02	disease of esophagus, except ulcer and hemorrhage	93,357	89,115	7,818	56	16,679	213
36.03	stomach/intestinal disorders/symptoms, except obstruction, ulcer, and hemorrhage	198,886	188,014	8,728	43	18,437	211
36.04	abdominal hernia/uncomplicated	67,434	64,179	7,979	65	16,568	208
36.05	other and unspecified intestinal disorders	53,175	50,392	9,087	85	19,149	211
36.06	divercula of intestine, without hemorrhage	75,716	72,477	7,447	62	16,825	226
36.07	anal/rectal disorders	41,283	39,348	7,797	89	17,734	227
36.08	gallstones without gallbladder inflammation	18,334	17,180	9,314	156	20,483	220
36.09	esophageal atresia/stenosis, oth cong gastrointestinal anomalies, age 2+	3,927	3,719	9,154	313	19,061	208

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
36.1	foreign body gastrointestinal tract	2,348	2,208	9,712	397	18,656	192
37.01	arthopathy with infection	2,594	2,438	12,478	509	25,109	201
37.02	osteomyelitis	7,748	7,132	15,419	307	25,950	168
37.03	necrotizing fasciitis	117	105	20,812	4,559	46,748	225
37.04	aseptic necrosis of bone	2,007	1,908	12,029	485	21,198	176
38.01	Behcet's syndrome	42	40	8,127	2,392	15,158	187
38.02	systemic lupus erythematosus/giant cell arteritis/oth connective tissue disease	12,485	11,924	9,098	172	18,747	206
38.03	rheumatoid arthritis and other inflammatory polyarthropathy	31,026	29,696	8,476	103	17,779	210
38.04	inflammatory spondylopathies	5,427	5,211	8,037	236	17,052	212
38.05	polymyalgia rheumatica	8,442	8,071	7,828	170	15,270	195
39.01	spondylosis and allied disorders (osteoarthritis of spine)	53,138	51,018	8,003	73	16,484	206
39.02	intervertebral disc disorders (herniated, prolapsed, degenerated disc)	73,700	71,004	7,454	59	15,630	210
39.03	spinal stenosis	26,079	25,067	9,291	110	17,376	187
39.04	curvature/deformity of the spine	11,380	10,821	8,390	164	17,103	204
39.05	spondylolisthesis/spondylolysis, congenital or acquired	7,561	7,289	8,271	184	15,731	190
39.06	congenital anomalies of spine, except spondylolisthesis/spondylolysis	1,597	1,535	8,321	484	18,947	228
40.01	osteoarthritis of pelvic region and thigh (hip)	25,365	24,389	8,570	110	17,132	200
40.02	osteoarthritis of lower leg (knee)	58,561	56,657	7,822	66	15,737	201
41.01	osteomalacia/rickets, except vitamin D-resistant	362	346	10,012	1,130	21,015	210
41.02	other bone/cartilage disorders (e.g,.Paget's disease)	36,666	34,704	9,142	100	18,539	203
41.03	osteoporosis	65,030	61,773	8,031	68	16,788	209
42.01	juvenile osteochondrosis spine/pelvis, slipped capital femoral epiphysis	228	222	7,183	932	13,878	193
42.02	congenital hip dislocation/dysplasia	263	252	8,809	1,201	19,071	216
42.03	osteogenesis imperfecta and other osteodystrophies	571	548	8,226	693	16,232	197
42.04	Marfan and Ehlers-Danlos syndromes	106	101	7,946	2,761	27,749	349
43.01	Reiter's syndrome	79	77	11,078	2,757	24,175	218
43.02	gout/crystal arthropathy	28,718	27,192	8,110	109	17,936	221
43.03	psoriatic arthopathy	1,102	1,060	7,228	441	14,344	198
43.04	arthropathy/joint disorders, derangements, joint pain/stiffness, excluding gout	267,503	255,243	7,717	32	16,367	212
43.05	osteoarthritis, not specified to be of spine, hip, or knee	223,468	213,912	7,187	33	15,368	214
43.06	difficulty walking due to pelvic/lower leg joint disorder/wheelchair	2,374	2,206	12,838	463	21,747	169
43.07	nonspecific backache and other back/neck pain/disorders	197,897	190,034	7,215	36	15,561	216
43.08	disorders of soft tissue (e.g., tendonitis, bursitis, muscle disorders)	274,777	263,008	7,475	32	16,435	220
43.09	flat foot, acquired deformities of toe	35,223	33,624	7,618	87	16,005	210
43.1	acquired limb deformities, except toe, flat foot	8,933	8,543	8,906	197	18,231	205
43.11	cleft lip/cleft palate	123	115	10,371	1,914	20,508	198
43.12	other congenital musculoskeletal abnormalities	5,172	4,947	7,368	241	16,935	230

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
43.13	chondrodystrophy	89	86	5,069	917	8,487	167
43.14	dislocation (displacement/subluxation) of vertebra	31,112	30,160	5,274	72	12,559	238
44.01	myelodysplastic syndrome	2,467	2,140	16,123	651	30,127	187
44.02	other/unspecified sickle cell anemia	311	296	16,999	1,907	32,808	193
44.03	sickle cell Hb-S disease	205	199	19,856	2,639	37,186	187
44.04	acquired hemolytic anemia	1,035	914	15,860	1,109	33,532	211
44.05	aplastic anemia	4,174	3,461	19,688	510	30,013	152
44.06	hemophilia (congenital factors VIII and IX coagulation defects)	373	346	16,670	2,392	44,499	267
45.01	immune disorders, age 18+	1,696	1,588	13,886	620	24,711	178
45.02	agranulocytosis, chr granulomatous dis, oth spec white blood cell dis, age 18+	6,155	5,395	15,525	399	29,278	189
45.03	immune/white blood cell disorders, age < 18	6	5	24,279	14,065	30,111	124
46.01	polycythemia vera	2,211	2,074	9,384	463	21,068	225
46.02	thalassemias and other hereditary hemolytic anemias	1,831	1,702	11,928	588	24,256	203
46.03	sideroblastic anemia	1,646	1,494	13,007	563	21,759	167
46.04	coagulation defects, except congenital factors VIII and IX	17,618	16,411	11,395	169	21,627	190
46.05	purpura/thrombocytopathy/hemorrhagic conditions	12,093	11,013	12,671	265	27,821	220
46.06	myelofibrosis and other specified blood diseases	2,306	2,132	11,800	460	21,247	180
47.01	iron deficiency and other/unspecified anemias	121,866	111,908	11,038	64	21,348	193
47.02	megaloblastic and other deficiency anemias (pernicious/folic acid)	27,371	25,523	9,589	117	18,618	194
47.03	other and unspecified white blood cell disease	7,315	6,603	14,300	362	29,412	206
47.04	other and unspecified blood disease	9,859	9,174	10,567	231	22,095	209
48.01	transient organic psychosis (delirium/delusions/hallucinations)	11,646	10,444	13,671	233	23,824	174
48.02	toxic/unspecified encephalopathy	5,976	5,347	16,895	418	30,568	181
48.03	visual agnosia/disorientation/hallucinations	507	476	13,406	933	20,360	152
48.04	hallucinations, nos	1,889	1,744	13,317	509	21,256	160
49.01	slow viral central nervous system infection	45	40	18,727	19,106	120,710	645
49.02	uncomplicated/unspecified dementia	37,055	32,470	10,691	104	18,761	175
49.03	dementia with delirium	4,596	3,994	12,774	323	20,403	160
49.04	dementia with delusions	4,694	4,128	11,382	302	19,413	171
49.05	dementia with depression	5,356	4,697	12,376	306	20,951	169
49.06	dementia in other disorders and other chronic organic psychotic conditions	23,661	20,733	11,947	141	20,259	170
49.07	cerebral degeneration/Alzheimer's disease	34,844	31,072	11,095	113	19,938	180
49.08	hydrocephalus, acquired	2,186	1,994	13,247	538	24,043	181
50.01	nonpsychotic organic brain syndrome	12,104	10,701	11,839	204	21,058	178
50.02	other/unspecified brain/central nervous system conditions	7,680	7,061	11,938	267	22,421	188
50.03	senility without psychosis	2,154	1,912	9,123	355	15,521	170
51.01	alcoholic psychoses	2,751	2,554	13,424	480	24,249	181

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
51.02	drug psychoses	2,761	2,561	14,344	424	21,449	150
52.01	alcohol dependence	9,045	8,508	11,571	235	21,644	187
52.02	drug dependence	3,440	3,302	13,603	377	21,644	159
53.01	nondependent drug abuse, except alcohol and tobacco	3,000	2,881	14,008	462	24,806	177
53.02	nondependent abuse of alcohol	5,430	5,148	11,727	297	21,325	182
53.03	tobacco use disorder	18,411	17,369	9,869	157	20,726	210
54.01	schizophrenic disorders	21,615	21,038	7,942	113	16,360	206
55.01	manic and depressive (bipolar) disorders	12,638	12,198	9,793	163	17,971	184
55.02	major depressive disorders	34,162	32,390	10,864	113	20,411	188
55.03	paranoid disorders and states	2,299	2,141	11,549	404	18,699	162
55.04	attempted suicide/self-inflicted injury	636	617	12,451	726	18,049	145
56.01	reactive and other/unspecified nonorganic psychoses	24,345	21,966	11,561	139	20,606	178
57.01	personality disorders and dissociative identity disorder	5,876	5,651	11,219	260	19,523	174
58.01	depression, excluding major depressive and bipolar disorders	65,788	62,109	9,430	72	17,942	190
59.01	panic disorders/attacks	4,525	4,350	7,947	255	16,822	212
59.02	generalized anxiety disorder	7,750	7,424	7,754	177	15,255	197
59.03	somatoform/dissociative disorders	1,849	1,770	11,227	492	20,692	184
59.04	phobic disorders	760	727	7,085	472	12,728	180
59.05	obsessive-compulsive disorders	1,287	1,241	7,493	395	13,920	186
59.06	anorexia nervosa/bulimia	400	381	12,652	1,208	23,583	186
59.07	prolonged posttraumatic stress disorder	1,159	1,136	9,417	469	15,790	168
60.01	other and unspecified neurotic disorders	5,966	5,653	12,046	279	20,993	174
60.02	other and unspecified anxiety states	42,478	40,527	8,008	81	16,315	204
60.03	sexual deviations and disorders	3,669	3,554	5,505	214	12,738	231
60.04	psychosomatic illness	1,700	1,611	9,986	485	19,475	195
60.05	other mental disorders	5,789	5,393	10,276	247	18,165	177
60.06	Tourette's disorder	89	85	4,749	1,058	9,771	206
60.07	acute reaction to stress	3,667	3,534	7,645	274	16,290	213
60.08	adjustment reaction, excluding prolonged depressive	13,774	12,969	10,640	179	20,414	192
60.09	behavior disorder	2,429	2,319	7,973	320	15,408	193
61.01	profound mental retardation	1,122	1,108	4,330	433	14,419	333
61.02	Edwards/Patau/deletion/autosomal anomaly syndromes	48	44	6,089	2,462	16,330	268
62.01	severe mental retardation	1,088	1,063	4,335	349	11,381	263
63.01	moderate mental retardation	1,324	1,300	4,449	347	12,514	281
64.01	autism/pervasive developmental disorders, other childhood psychoses	405	393	4,367	546	10,825	248
64.02	mild/unspecified mental retardation	7,145	6,994	4,940	157	13,165	266
64.03	Down's syndrome	1,487	1,449	3,815	375	14,258	374

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
64.04	Prader-Willi/Fragile X syndromes	72	70	7,582	1,748	14,595	192
65.01	emotional disorders of childhood/adolescence	118	112	8,827	1,657	17,562	199
65.02	learning/development disorders	723	703	6,234	532	14,117	226
65.03	unspecified chromosomal anomalies and congenital malformation syndromes, nec	279	261	7,142	931	15,040	211
65.04	sex chromosome abnormalities (e.g., Klinefelter's/Turner syndromes)	61	60	4,372	1,066	8,262	189
66.01	attention deficit disorder, other hyperkinetic syndrome	505	494	7,866	866	19,255	245
67.01	motor neuron disease (including ALS) and spinal muscular atrophy	753	649	13,149	907	23,097	176
67.02	congenital/infantile quadriplegia (cerebral palsy)	274	267	9,261	1,337	21,839	236
67.03	quadriplegia, incomplete or unspecified	1,603	1,499	19,667	824	31,913	162
67.04	quadriplegia (C1-C7), complete	204	197	21,415	2,943	41,277	193
67.05	locked-in state	15	12	18,212	8,504	29,967	165
67.06	traumatic complete lesion cervical (C1-C7) spinal cord	40	38	20,426	6,779	41,649	204
68.01	congenital/infantile diplegia/paraplegia (cerebral palsy)	150	147	9,460	1,327	16,095	170
68.02	paraplegia	2,046	1,937	18,398	656	28,855	157
68.03	traumatic complete lesion dorsal (T1-T12) spinal cord	31	30	23,074	6,142	33,780	146
69.01	spinocerebellar disease, including Friedreich's ataxia	1,400	1,313	10,905	562	20,366	187
69.02	syringomyelia, vascular, other/unspecified spinal cord disease	2,201	2,021	13,560	564	25,338	187
69.03	cauda equina syndrome	4,693	4,395	13,628	349	23,121	170
69.04	spina bifida, hydrocephalus, other congenital nervous system anomalies	2,312	2,122	12,660	538	24,781	196
69.05	fracture lumbar, sacral, coccygeal or unspecified vertebrae with spinal cord injury	535	496	13,863	1,122	24,994	180
69.06	fracture cervical vertebrae (C1-C7) with spinal cord injury, exc complete lesion	291	271	12,749	1,553	25,550	200
69.07	fracture dorsal vertebrae (T1-T12) with spinal cord injury, exc complete lesion	548	504	13,176	1,088	24,420	185
69.08	late effect of spinal cord injury	425	409	21,973	1,561	31,564	144
69.09	spinal cord injury w/o vertebral fracture, except severe cervical/dorsal	1,605	1,501	13,090	644	24,948	191
69.1	severe cervical/dorsal spinal cord injury w/o vertebral fracture, exc compl lesion	71	65	24,585	5,236	42,189	172
70.01	muscular dystrophy, age 18+	566	530	10,455	891	20,508	196
70.02	muscular dystrophy, age < 18	.	.	.	.	.	.
71.01	autonomic nerve disorder	4,258	3,978	13,208	387	24,438	185
71.02	peripheral neuropathy/myopathy	18,376	17,387	11,184	169	22,278	199
71.03	inflammatory/toxic neuropathy, except diabetic	3,614	3,399	12,119	446	26,003	215
71.04	diabetic neuropathy	6,777	6,230	17,231	347	27,409	159
71.05	myoneural disorders/myasthenia gravis	1,513	1,421	10,728	814	30,696	286
72.01	multiple sclerosis, other central nervous system dymelination	4,198	4,004	10,163	305	19,280	190
73.01	Parkinson's disease	19,375	17,766	10,750	143	19,086	178
73.02	Huntington's and degenerative disease of basal ganglia	956	876	12,219	725	21,472	176
74.01	epilepsy, age 18+	11,451	10,883	9,029	182	18,942	210
74.02	convulsions, except febrile	32,401	30,352	10,342	123	21,426	207

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
74.03	epilepsy, age < 18	.	.	.	.	.	.
75.01	brain anoxic damage, edema, and compression (nontraumatic)	1,172	1,014	19,090	1,124	35,789	187
75.02	coma, nontraumatic	751	614	21,673	1,631	40,408	186
75.03	persistent vegetative state	162	134	17,165	2,050	23,699	138
76.01	postherpetic neuralgia/other neurological complications of herpes zoster	2,824	2,678	7,683	307	15,873	207
76.02	essential tremor and other abnormal movement disorders	10,454	9,939	8,359	170	16,959	203
76.03	migraine headaches	12,532	12,166	6,861	134	14,756	215
76.04	trigeminal nerve disorders	3,377	3,244	7,839	283	16,120	206
76.05	facial nerve disorders, including Bell's Palsy	3,782	3,603	7,765	274	16,452	212
76.06	other cranial nerve disorders	752	714	9,963	962	25,701	258
76.07	root/plexus disorders	1,121	1,068	8,324	497	16,231	195
76.08	other specified neuropathy	2,012	1,931	7,505	346	15,213	203
76.09	root/plexus lesions	1,458	1,410	7,868	448	16,837	214
76.1	neuropathy of upper limb (e.g., carpal tunnel syndrome)	17,684	17,068	7,191	119	15,518	216
76.11	neuropathy of leg	18,127	17,434	8,846	137	18,035	204
76.12	abnormal involuntary movements nec (e.g. spasms/tremor nos)	7,627	7,253	9,251	227	19,313	209
76.13	nerve injury, excluding spinal cord and brain	2,515	2,394	9,717	453	22,159	228
77.01	tracheostomy status/complications	1,155	1,010	23,718	1,516	48,205	203
77.02	respirator dependence	521	428	29,205	2,874	59,425	203
77.03	tracheostomy (procedure)	875	662	48,600	3,814	98,164	202
77.04	ventilator (DME)	628	562	26,033	1,424	33,748	130
78.01	respiratory arrest	2,514	2,106	25,774	1,151	52,824	205
79.01	cardiac arrest/shock	4,988	4,467	15,512	496	33,132	214
79.02	acute lung edema nos	4,627	3,931	19,949	637	39,911	200
79.03	post trauma/surgery pulmonary insufficiency, incl adult respir distress syndr	2,961	2,683	17,381	866	44,869	258
79.04	respiratory failure	25,728	22,292	19,254	251	37,412	194
80.01	hypertensive heart disease, with heart failure	12,388	11,267	13,982	254	26,914	192
80.02	hypertensive heart/renal disease, with heart failure	541	475	15,295	1,095	23,872	156
80.03	pulmonary vascular disease, except pulmonary embolism	14,497	13,003	15,258	242	27,609	181
80.04	cardiomyopathy/myocarditis	28,710	26,051	13,061	151	24,304	186
80.05	heart failure	142,362	128,378	12,953	65	23,267	180
81.01	acute myocardial infarction, initial episode of care	15,543	14,138	12,800	211	25,107	196
82.01	myocardial infarction, subsequent episode of care, or unspecified	20,126	18,564	11,902	175	23,781	200
82.02	unstable angina and other acute ischemic heart disease	48,488	45,648	11,306	102	21,740	192
82.03	postmyocardial infarction syndrome	1,199	1,132	11,877	858	28,880	243
83.01	old myocardial infarction	34,860	32,493	11,157	114	20,492	184
83.02	angina pectoris	84,010	79,451	9,867	68	19,304	196

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
84.01	coronary atherosclerosis and other chronic ischemic heart disease	267,166	251,609	9,154	37	18,731	205
84.02	aneurysm and other congenital abnormalities of coronary artery	6,445	6,041	10,435	260	20,202	194
85.01	acute endo/myocarditis	1,214	1,097	16,515	1,011	33,489	203
85.02	pericarditis and other diseases of pericardium	3,985	3,648	13,388	491	29,672	222
85.03	cardiovascular syphilis	448	413	12,433	1,198	24,341	196
86.01	rheumatic fever/heart disease	10,672	9,790	12,016	228	22,534	188
86.02	mitral or aortic valve/endocardia disease	89,028	83,116	10,581	75	21,681	205
86.03	mitral/aortic valve disorders	18,365	16,911	12,286	181	23,485	191
86.04	rheumatic heart failure	487	422	18,899	1,765	36,259	192
86.05	congenital abnormalities of heart valves	3,506	3,280	10,460	396	22,658	217
86.06	aortic atresia/stenosis and other congenital aortic abnormalities	2,684	2,488	11,945	492	24,551	206
87.01	major congenital cardiac/circulatory system abnormality, age 18+	386	366	11,863	1,088	20,825	176
87.02	major congenital cardiac/circulatory defect, age < 18	.	.	.	.	.	.
88.01	other and unspecified congenital cardiac/circulatory system abnormality	6,994	6,519	11,000	274	22,087	201
88.02	ventricular septal defect	450	427	9,244	773	15,973	173
88.03	atrial septal defect	486	459	8,783	840	17,994	205
88.04	situs inversus/Kartagener's syndrome	216	207	8,063	1,199	17,245	214
89.01	hypertensive renal disease, without renal failure	3,275	2,907	12,903	492	26,537	206
89.02	hypertensive heart and renal disease, w/o heart or renal failure	2,252	2,116	8,710	412	18,969	218
89.03	hypertension encephalopathy	1,506	1,416	11,250	553	20,817	185
90.01	hypertensive heart disease, without heart failure	59,580	56,785	8,170	74	17,556	215
90.02	malignant hypertensive heart disease, without heart failure	6,201	5,925	7,952	226	17,368	218
91.01	essential hypertension	582,025	556,785	6,659	21	15,620	235
91.02	malignant hypertension	33,972	32,345	7,905	103	18,471	234
91.03	secondary hypertension	1,775	1,663	10,878	542	22,114	203
92.01	artioventricular block, complete (complete/third degree heart block)	7,597	7,015	10,444	252	21,135	202
92.02	atrial arrhythmia	102,358	94,538	10,434	68	21,030	202
92.03	paroxysmal ventricular tachycardia	10,728	9,729	13,635	258	25,473	187
92.04	sinoatrial node dysfunction, including sick sinus syndrome	20,963	19,580	10,752	142	19,892	185
93.01	other conduction disorders/cardiac dysrhythmias	122,105	114,645	9,790	59	20,112	205
93.02	second degree heart block	2,634	2,434	10,745	404	19,921	185
94.01	premature heart beats	28,318	26,687	9,433	121	19,847	210
94.02	other and unspecified heart disease	27,474	25,706	10,542	134	21,471	204
94.03	cardiomegaly (enlarged heart)	55,632	50,832	12,727	107	24,154	190
95.01	cerebral hemorrhage	7,344	6,687	12,504	288	23,523	188
96.01	precerebral or cerebral arterial occulsion with infarction	19,799	18,023	13,486	177	23,782	176
96.02	cerebrovascular accident, unspecified	56,481	51,339	12,218	96	21,794	178

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
97.01	precerebral or cerebral arterial occlusion without infarction	55,954	52,779	10,175	88	20,153	198
97.02	transient cerebral ischemia	44,694	41,887	10,181	94	19,337	190
98.01	cerebral atherosclerosis, ischemic and other specified cerebrovascular disease	14,611	13,402	11,459	183	21,227	185
98.02	cerebral aneurysm/arteriovenous malformation, nonruptured	1,679	1,567	10,556	584	23,138	219
99.01	unspecified cerebrovascular disease	13,864	12,771	11,281	184	20,808	184
100.01	hemiplegia and hemiparesis	15,755	14,151	15,163	204	24,263	160
100.02	congenital/infantile hemiplegia (cerebral palsy)	147	143	9,107	1,707	20,448	225
100.03	hemiplegia/hemiparesis following stroke	10	9	14,858	5,112	15,548	105
101.01	monoplegic, other, and unspecified cerebral palsy	2,101	2,046	6,037	325	14,680	243
101.02	diplegia (upper), monoplegia, other, and unspecified paralytic syndromes	2,782	2,582	14,108	466	23,687	168
101.03	monoplegia and other paralysis following stroke, except hemiplegia	4	4	11,138	6,452	12,071	108
102.01	hemianopsia	1,363	1,280	10,900	587	21,020	193
102.02	cognitive deficits/apraxia following stroke	205	181	12,777	1,518	20,401	160
102.03	speech/language deficits following stroke	11	10	16,035	8,845	28,432	177
102.04	neurological neglect syndrome	139	125	13,117	2,382	26,640	203
102.05	aphasia (loss of language skills/comprehension)	5,785	5,153	13,964	325	23,314	167
103.01	cerebrovascular disease late effects, unspecified	29,579	26,733	13,061	132	21,632	166
103.02	dysphagia following stroke	.	.	.	.	.	.
104.01	gangrene, unspecified and gas	4,594	4,022	21,917	482	30,570	139
104.02	pulmonary embolism	5,892	5,399	14,286	366	26,929	189
104.03	atherosclerosis of the extemities with ulceration	2,366	2,106	22,497	697	32,005	142
104.04	atherosclerosis of the extemities with gangrene	2,132	1,838	25,050	764	32,775	131
104.05	aortic aneurysm, ruptured	1,937	1,789	12,971	748	31,626	244
104.06	arterial embolism and thrombosis	12,958	12,009	14,638	240	26,271	179
104.07	acute vascular insufficiency of intestine	1,362	1,248	14,095	865	30,549	217
104.08	vascular disorders of kidney (embolism, hemorrhage, thrombosis, infarction)	690	603	15,250	1,368	33,597	220
105.01	atherosclerosis/arteriosclerosis of major vessel	53,757	49,422	11,502	98	21,755	189
105.02	aortic aneurysm, without mention of rupture	14,692	13,592	11,107	200	23,299	210
105.03	arterial aneurysm, except aortic	3,878	3,646	12,218	427	25,756	211
105.04	specified peripheral vascular disease	7,175	6,563	14,739	315	25,491	173
105.05	unspecified peripheral vascular disease	74,693	68,900	11,421	81	21,393	187
105.06	stricture of artery and other/unspecified arterial disease	15,627	14,619	12,067	188	22,758	189
105.07	hereditary hemorrhagic telangiectasia	153	147	10,455	1,590	19,254	184
105.08	deep vein thrombosis	18,510	17,129	12,511	182	23,840	191
105.09	vascular insufficiency of intestines, chronic or unspecified	1,940	1,778	14,522	717	30,244	208
106.01	vascular atherosclerosis/arteriosclerotic cardiovascular disease	71,546	66,821	9,690	74	19,115	197
106.02	Raynaud's syndrome/other peripheral vascular disease	2,549	2,426	9,000	370	18,200	202

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
106.03	disease of capillaries, except hereditary hemorrhagic telangiectasia	2,383	2,310	5,230	255	12,238	234
106.04	thrombophlebitis, excluding deep vein and superficial leg	17,813	16,684	10,935	162	20,958	192
106.05	superficial phlebitis-leg	4,085	3,893	9,562	320	19,952	209
106.06	varicose veins	20,676	19,662	9,180	134	18,851	205
106.07	noninfectious lymphatic disorders	3,523	3,283	11,575	359	20,586	178
106.08	hypotension	19,170	17,539	12,765	181	23,996	188
106.09	other circulatory disease/postphlebitic syndrome	10,090	9,318	12,601	259	24,985	198
106.1	hemorrhage nos	1,909	1,747	12,549	636	26,580	212
106.11	compression of vein	2,192	2,006	12,784	696	31,184	244
106.12	other specified circulatory disorders	21,348	19,918	11,009	156	21,989	200
107.01	cystic fibrosis, age 18+	492	475	8,941	1,866	40,650	455
107.02	cystic fibrosis, age < 18	.	.	.	.	.	.
108.01	emphysema/chronic bronchitis	172,302	160,120	10,361	52	20,839	201
108.02	chronic obstructive asthma	11,608	10,726	13,666	241	24,926	182
109.01	sarcoidosis	1,064	1,019	9,204	703	22,433	244
109.02	bronchiectasis	3,174	2,956	11,310	431	23,427	207
109.03	pneumoconioses/lung disease due to specified external agents (e.g., black lung)	3,435	3,176	9,757	399	22,461	230
109.04	respiratory conditions due to other and unspecified external agents	523	455	13,511	1,151	24,555	182
109.05	postinflammatory and interstitial pulmonary fibrosis	17,230	15,733	12,131	195	24,428	201
109.06	pulmonary eosinophilia	18,108	16,036	15,272	236	29,897	196
110.01	asthma, except chronic obstructive	55,232	52,793	8,575	80	18,376	214
111.01	gram-negative/staphylococcus pneumonia	7,259	6,110	20,347	468	36,549	180
111.02	aspiration pneumonia	5,709	4,545	21,875	536	36,123	165
112.01	pneumococcal and other specific bacterial pneumonia	6,708	5,914	15,225	393	30,224	199
112.02	empyema, lung abcess	1,378	1,202	15,544	861	29,863	192
112.03	fungal and parasitic lung infections, except candida	262	240	10,783	1,309	20,279	188
113.01	viral pneumonia	4,029	3,628	12,804	415	24,976	195
113.02	other and unspecified pneumonia	74,318	66,599	12,895	99	25,620	199
113.03	influenza with pneumonia	3,219	2,895	13,735	550	29,582	215
113.04	pleurisy, excluding pleural effusion	7,602	7,016	11,482	292	24,499	213
113.05	pulmonary congestion/hypostasis	21,625	19,259	14,037	204	28,263	201
114.01	pleural effusion	25,126	21,611	16,240	213	31,269	193
114.02	pneumothorax (not tension)	4,093	3,571	16,236	593	35,415	218
114.03	tension pneumothorax (collapsed lung)	509	442	17,978	1,607	33,776	188
115.01	acute or unspecified bronchitis and bronchiolitis	167,390	159,623	7,475	42	16,583	222
115.02	influenza, except that with pneumonia	15,292	14,713	6,825	132	16,005	235
115.03	other and unspecified lung/respiratory system disease	45,634	42,025	11,235	114	23,455	209

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
115.04	atelectasis/pulmonary collapse	23,396	21,209	14,411	200	29,105	202
115.05	congenital lung/respiratory anomaly	665	607	11,816	880	21,692	184
115.06	foreign body trachea/bronchus/lung	827	701	19,956	1,335	35,332	177
116.01	blind, WHO or USA legal definition	3,780	3,433	10,686	341	19,985	187
117.01	endophthalmitis	1,023	951	8,090	478	14,736	182
117.02	corneal ulcer/abcess	1,985	1,878	7,728	418	18,110	234
117.03	acute inflammation of the orbit, including orbital cellulitis	429	405	9,566	931	18,723	196
118.01	retinal detachment	6,463	6,208	6,260	171	13,500	216
119.01	proliferative diabetic retinopathy	5,995	5,584	13,517	309	23,113	171
119.02	vitreous hemorrhage	3,458	3,267	10,041	352	20,117	200
120.01	diabetic retinopathy	21,559	20,300	11,730	159	22,705	194
120.02	vascular retinopathies, except diabetic	25,450	24,375	7,469	107	16,627	223
120.03	retinal hemorrhage, edema	10,652	10,148	8,950	184	18,517	207
121.01	retinal defects without detachment	3,554	3,460	5,055	229	13,465	266
121.02	other and unspecified retinal disorders	8,294	7,993	6,689	169	15,092	226
121.03	macular degeneration	99,542	95,228	6,612	48	14,701	222
121.04	retinitis pigmentosa, other hereditary retinal dystrophies	1,318	1,265	5,894	398	14,170	240
122.01	other and unspecified glaucoma	21,967	20,799	7,663	118	16,971	221
122.02	borderline glaucoma	50,751	49,151	5,328	59	13,054	245
122.03	open-angle glaucoma	85,849	82,532	6,272	51	14,607	233
122.04	primary angle-closure glaucoma, non-acute or unspecified	5,831	5,594	6,181	182	13,628	220
122.05	acute primary angle-closure glaucoma	1,768	1,694	6,544	361	14,842	227
123.01	cataract	376,571	363,028	5,723	23	13,758	240
123.02	diabetic cataract	367	345	11,318	1,257	23,362	206
124.01	disorders of the optic nerve and visual pathways, including optic neuritis	11,456	10,946	7,730	164	17,110	221
124.02	uveitis	7,447	7,177	6,926	173	14,653	212
124.03	other and unspecified eye disorders	258,671	249,013	6,122	29	14,368	235
124.04	disorders of refraction and accommodation (e.g., near-sightedness)	49,803	48,213	5,209	59	12,971	249
124.05	visual loss, one eye or unspecified	3,961	3,750	7,964	274	16,754	210
124.06	visual loss, both eyes	995	942	8,450	508	15,589	184
124.07	keratoconus	415	406	4,761	633	12,751	268
124.08	congenital anomalies of eye	3,751	3,605	5,873	223	13,399	228
124.09	open wound of ocular adnexa, foreign body on external eye, burn eye/adnexa	5,623	5,419	6,460	188	13,813	214
124.1	open wound of eyeball, including penetrating foreign body	626	589	8,653	784	19,040	220
125.01	perichondritis of pinna	957	914	7,143	532	16,090	225
125.02	malignant otitis externa	68	64	8,867	2,445	19,582	221
125.03	mastoiditis and related conditions	1,768	1,707	6,624	348	14,366	217

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
125.04	cholesteatoma of middle ear and mastoid	828	801	5,923	588	16,657	281
125.05	Meniere's Disease	2,917	2,826	5,964	241	12,799	215
125.06	larynx/vocal cord diseases	4,932	4,706	8,885	297	20,353	229
125.07	paralysis of vocal cords/larynx	1,117	1,004	12,730	732	23,190	182
126.01	hearing loss	45,857	43,915	6,719	71	14,835	221
127.01	other ear disorders	48,246	46,538	6,350	68	14,590	230
127.02	impacted earwax	67,199	64,471	6,282	57	14,451	230
127.03	otitis media, except chronic purulent	38,063	36,880	5,924	74	14,120	238
127.04	chronic purulent otitis media	1,733	1,678	6,779	343	14,069	208
127.05	vertiginous syndromes, except Meniere's disease	23,918	23,130	6,328	93	14,126	223
127.06	acute nose/throat infection (e.g., common cold)	187,645	180,987	6,048	34	14,675	243
127.07	other diseases of upper respiratory system	33,106	31,917	6,814	87	15,486	227
127.08	nasal polyps/allergic rhinitis (e.g., hay fever)	65,359	63,544	5,352	51	12,872	241
127.09	chronic sinusitis	48,811	47,280	6,225	67	14,611	235
127.1	disorders of teeth, gum, and jaw (e.g., gingivitis, periodontitis)	12,610	12,141	7,212	146	16,106	223
127.11	other oral soft tissue/tongue/jaw disorders	11,310	10,787	7,813	166	17,273	221
127.12	salivary gland diseases	4,212	4,022	7,529	266	16,848	224
127.13	congenital anomalies of ear, face, neck, nose, mouth, and pharynx	721	693	8,498	857	22,562	265
127.14	foreign body ear/nose/pharyx/larynx	2,959	2,729	10,301	459	23,960	233
128.01	kidney transplant status/complications	1,495	1,280	10,966	653	23,377	213
128.02	kidney transplant (procedure)	8	8	31,980	19,318	54,640	171
129.01	enrolled in Medicare End Stage Renal Disease (ESRD) program	.	.	.	.	.	.
130.01	dialysis status/complications	511	436	28,803	2,250	46,981	163
130.02	dialysis (procedure)	643	488	42,921	3,799	83,950	196
130.03	dialysis supplies and equipment (DME)	908	829	15,755	901	25,943	165
131.01	hypertensive renal disease, with renal failure	4,229	3,434	21,123	564	33,077	157
131.02	hypertensive heart/renal disease, with renal failure	401	342	16,095	1,307	24,185	150
131.03	hypertensive heart/renal disease, with heart/renal failure	810	603	26,181	1,532	37,625	144
131.04	acute renal failure	6,928	5,638	22,852	584	43,851	192
131.05	chronic renal failure	12,621	10,635	17,205	304	31,363	182
131.06	renal failure, unspecified	9,099	7,643	17,896	347	30,352	170
132.01	nephritis	6,522	5,705	16,965	392	29,629	175
133.01	hydronephrosis, bladder/ureter, other urinary tract obstruction	18,974	17,648	9,877	153	20,337	206
133.02	renal/ureteral/bladder calculus (e.g., kidney stones)	16,627	15,814	8,260	143	18,009	218
133.03	vesicoureteral reflux	214	198	10,517	1,422	20,004	190
133.04	neurogenic bladder	6,604	6,155	14,033	294	23,086	165
133.05	urethral stricture	10,411	9,918	8,334	167	16,597	199

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
133.06	retention of urine	22,862	21,059	11,406	145	21,084	185
134.01	fecal incontinence	2,444	2,265	10,984	459	21,839	199
134.02	incontinence/urethral discharge	26,446	24,855	10,146	118	18,567	183
135.01	cystitis, other urinary tract infections	166,111	155,783	9,203	47	18,490	201
135.02	kidney infection	6,704	6,273	11,408	265	20,995	184
136.01	impaired renal function	2,215	1,977	15,522	625	27,779	179
136.02	other urinary disorders	79,174	73,438	10,007	77	20,767	208
136.03	kidney cysts	11,983	11,122	10,515	207	21,842	208
136.04	congenital kidney/urinary abnormalities, exc obstruction/cysts	1,472	1,375	9,628	483	17,924	186
136.05	congenital polycystic/medullary kidney disease, except recessive	119	108	8,116	1,225	12,756	157
136.06	foreign body genitourinary tract	432	406	9,896	959	19,322	195
137.01	female infertility	133	132	4,627	708	8,129	176
138.01	pelvic inflammatory disease	2,451	2,346	8,220	362	17,545	213
138.02	diseases of female pelvic organs	8,031	7,768	6,440	167	14,676	228
138.03	endometriosis	4,499	4,365	6,644	224	14,803	223
138.04	genital prolapse	18,284	17,784	5,264	97	12,901	245
138.05	ovarian cyst	371	358	7,270	822	15,548	214
139.01	vaginal and cervical diseases	35,804	34,770	5,526	71	13,291	241
139.02	other diseases of female genital organs	26,023	25,080	6,909	97	15,319	222
139.03	female stress incontinence	11,334	10,988	6,672	137	14,394	216
139.04	menopausal and postmenopausal disorders	80,943	79,060	4,341	40	11,207	258
139.05	congenital anomalies of female or unspecified genital organs	529	509	6,681	708	15,970	239
140.01	hyperplasia of prostate	122,522	117,742	6,047	42	14,372	238
140.02	prostatic disorders, except enlarged prostate	29,022	27,895	6,419	92	15,301	238
140.03	penis/testis/male genital organs disorders	12,890	12,307	7,495	149	16,568	221
140.04	male infertility	116	112	6,030	1,141	12,048	200
140.05	impotence, organic	13,415	13,025	5,716	117	13,368	234
140.06	congenital anomalies of male genital organs	425	406	6,975	665	13,409	192
141.01	ectopic pregnancy	35	34	5,114	1,622	9,505	186
142.01	miscarriage/abortion	112	110	3,488	618	6,486	186
143.01	pregnancy with major renal/hypertension/eclampsia	5	4	3,781	2,058	4,072	108
143.02	shock/septicemia in pregnancy	9	9	2,974	1,071	3,213	108
143.03	premature delivery	49	47	4,509	1,411	9,645	214
143.04	major complications of labor/delivery	1	1	3,904	.	.	.
143.05	cesarean section	30	30	2,976	973	5,329	179
144.01	completed pregnancies with diagnosis in HCC 146	121	118	4,805	1,137	12,353	257
144.02	premature separation of placenta (abruptio placentae)	3	3	9,153	4,912	8,508	93

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
144.03	pregnancy with malposition	36	36	3,880	1,400	8,401	217
144.04	pregnancy with disproportion/obstruction	132	131	5,565	1,290	14,744	265
144.05	premature rupture of membranes/other amniotic cavity problem	66	65	2,697	496	3,987	148
144.06	minor complications of labor/delivery	131	129	5,128	1,382	15,721	307
144.07	trauma in labor/delivery	92	90	3,490	701	6,638	190
144.08	postpartum hemorrhage	20	20	2,001	911	4,075	204
144.09	multiple birth	7	7	11,708	7,025	18,586	159
145.01	completed pregnancies with diagnosis in HCC 147	202	199	4,021	916	12,941	322
145.02	normal delivery	288	283	3,320	626	10,525	317
145.03	routine postpartum care	80	78	3,192	758	6,706	210
146.01	other and unspecified antepartum hemorrhage	36	36	4,928	1,118	6,706	136
146.02	placenta previa	9	9	2,081	679	2,037	98
146.03	uncompleted pregnancies with diagnosis in HCC 143,144	111	109	3,672	520	5,435	148
146.04	pregnancy with other renal/hypertension/eclampsia	53	51	3,457	662	4,702	136
146.05	threatened labor/cervical incompetence	58	57	2,424	421	3,191	132
146.06	significant maternal diseases complicating pregnancy, except diabetes mellitus	43	42	4,114	1,024	6,635	161
146.07	diabetes mellitus complicating pregnancy	36	35	7,214	1,772	10,535	146
146.08	multiple gestation	9	9	2,519	1,001	3,003	119
146.09	pregnancy with deep vein thrombosis/embolism	19	18	24,169	13,090	55,149	228
147.01	hemorrhage in early pregnancy	94	93	4,653	685	6,595	142
147.02	minor complications of pregnancy	375	369	4,418	511	9,810	222
147.03	maternal diseases in pregnancy	163	161	4,880	720	9,141	187
147.04	pregnancy with fetal abnormality	183	181	4,507	977	13,127	291
147.05	routine antenatal care/normal pregnancy	510	503	4,438	480	10,770	243
147.06	miscellaneous other problems of pregnancy	157	155	3,950	610	7,595	192
148.01	decubitus ulcer of skin	15,928	13,640	17,655	235	27,491	156
149.01	chronic ulcer of skin, except decubitus	34,078	31,253	13,725	134	23,610	172
150.01	third degree burns, 10%+ of body surface	45	43	16,380	3,819	24,897	152
151.01	other/unspecified third degree burns (<10% of body surface)	478	454	12,434	1,066	22,732	183
151.02	burn, 10%+ of body surface, less than 10% third degree or unspecified	60	57	15,878	4,339	32,709	206
152.01	cellulitis/abcess/other local skin infection	99,305	93,393	9,890	66	20,162	204
153.01	other dermatological disorders	215,471	207,217	6,436	33	15,052	234
153.02	dermatitis from substances taken internally (e.g., food, drugs)	3,975	3,763	9,751	321	19,664	202
153.03	bullous dermatoses, except pemphigus/pemphigoid	657	624	7,798	783	19,559	251
153.04	pemphigus/pemphigoid	903	831	9,502	700	20,189	212
153.05	other specified erythematous conditions, except rosacea	3,904	3,730	7,974	282	17,201	216
153.06	erythema multiforme, including toxic epidermal necrolysis	424	405	9,072	1,012	20,362	224

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
153.07	discoid lupus erythematosus	1,219	1,164	8,890	497	16,974	191
153.08	psoriasis and parapsoriasis without arthopathy	11,438	11,002	6,605	150	15,699	238
153.09	other dermatosis	137,508	133,491	5,284	34	12,495	236
153.1	diseases of nail (e.g., ingrown toenail)	85,219	79,794	9,373	65	18,478	197
153.11	congenital anomalies of the integument	6,454	6,190	7,019	192	15,129	216
153.12	burns, except third degree or 10%+ body surface	4,253	4,068	8,702	259	16,523	190
154.01	fracture of skull/face with coma > 1 hour	50	48	18,118	5,974	41,174	227
154.02	cerebral laceration, contusion, hemorrhage following injury with coma > 1 hour	92	76	20,789	4,521	39,416	190
154.03	intracranial injury of other and unspecified nature w/ coma >1 hour	65	62	13,810	3,198	25,228	183
155.01	fracture of skull/face with coma < 1 hour or unspecified	2,222	2,083	9,971	499	22,797	229
155.02	concussion with loss of consciousness> 1 hour	78	72	10,613	1,995	16,927	159
155.03	cerebral laceration, contusion, hemorrhage foll injury w/ coma < 1 hour or unspec	2,733	2,491	12,470	490	24,475	196
155.04	intracranial injury of other and unspecified nature w/coma < 1 hour or unspec	10,095	9,332	10,944	209	20,184	184
155.05	late effects of skull/face fracture, intracranial injury	594	571	11,731	905	21,611	184
156.01	concussion, except with loss of consciousness > 1 hour	2,392	2,259	9,883	394	18,734	190
156.02	head injury, unspecified	5	5	11,374	6,456	14,437	127
157.01	pathological/compression fracture/collapse of vertebrae	7,535	6,856	13,649	267	22,100	162
157.02	vertebral fracture without spinal cord injury	11,641	10,770	11,326	186	19,306	170
158.01	pathological hip fracture	917	804	14,078	794	22,520	160
158.02	pelvic fracture	4,994	4,555	11,370	304	20,541	181
158.03	femoral (hip) fracture	21,688	19,714	11,241	140	19,639	175
158.04	dislocation of hip	1,152	1,082	12,106	609	20,046	166
159.01	pathological fracture of humerous	169	147	12,732	1,767	21,424	168
159.02	pathological fracture of tibia or fibula	267	250	11,590	1,578	24,952	215
159.03	open fracture of ribs, fracture of sternum, larynx, trachea, trunk bones	1,255	1,169	9,516	526	17,991	189
159.04	fracture of humerous, multiple upper limb bones	8,669	8,083	9,372	202	18,142	194
159.05	fractures of patella, tibia, fibula, multiple lower/upper limb bones	7,626	7,232	9,346	216	18,365	197
159.06	fractures of ankle	6,632	6,325	7,459	197	15,692	210
160.01	injury to heart/lung/intrathoracic organs/blood vessels of thorax	1,927	1,789	11,975	683	28,910	241
160.02	gastrointestinal/liver/kidney/spleen/pelvis injury	2,299	2,131	11,710	477	22,018	188
161.01	traumatic amputation of leg/arm/hand/foot/toe, compl reattached body part	2,273	2,020	19,371	653	29,346	151
162.01	unspecified pathological fractures	3,852	3,570	11,611	355	21,193	183
162.02	pathological fracture of distal radius and ulna	103	92	10,816	3,877	37,217	344
162.03	fractures of nasal bone	1,925	1,806	8,604	388	16,503	192
162.04	fracture of rib, closed	10,144	9,459	10,335	207	20,096	194
162.05	fracture of clavicle, scapula	2,256	2,088	9,844	401	18,343	186
162.06	fracture of hand/wrist/lower arm	17,744	16,885	7,342	118	15,310	209

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
162.07	fracture of foot	9,665	9,273	7,675	170	16,370	213
162.08	fractures of unspecified bones	3,098	2,890	10,655	379	20,392	191
162.09	traumatic dislocations, except knee, shoulder, and vertebrae	3,339	3,202	7,450	320	18,125	243
162.1	shoulder dislocation	2,001	1,882	8,722	422	18,309	210
162.11	dislocation of knee, including cartilage/meniscus tear	7,768	7,580	6,276	152	13,201	210
162.12	sprains	93,504	90,188	6,617	49	14,641	221
162.13	open wound, except eye and lower arm	38,706	36,035	9,861	104	19,682	200
162.14	open wound/injury of lower arm	33,276	31,679	7,232	91	16,159	223
162.15	injury late effects, except spinal cord, skull/face fracture, and intracranial	3,921	3,723	10,568	322	19,677	186
162.16	contusion/superficial injury	119,465	112,795	8,657	53	17,757	205
162.17	crushing injury	1,154	1,102	7,381	469	15,583	211
162.18	other accidents	34,313	32,513	8,036	93	16,749	208
162.19	accidental falls	34,219	31,737	9,764	98	17,418	178
163.01	poisoning by (unintentional) provider or patient medication error	7,642	7,052	13,857	279	23,414	169
163.02	poisoning by specified nonmedicinal substances, injury external causes	5,877	5,542	9,618	280	20,814	216
163.03	poisoning by other and unspecified nonmedical substances	3,962	3,856	5,435	202	12,521	230
163.04	anaphylactic shock	431	412	7,141	704	14,277	200
163.05	adverse effects of correctly prescribed and administered drugs	27,102	25,346	10,504	128	20,343	194
163.06	unspecified allergic reaction	12,090	11,663	6,463	139	15,048	233
164.01	mechanical/other complications of internal device/implant/graft, exc orthopedic	15,823	14,530	14,514	220	26,565	183
164.02	early complications of trauma	2,691	2,510	13,282	516	25,829	194
164.03	mechanical complication of internal orthopedic device/implant/graft	4,681	4,483	10,648	286	19,118	180
164.04	infection/inflammation from internal device/implant/graft	4,302	3,803	20,599	532	32,786	159
164.05	cerebral/cardiac/respiratory/hepatic/renal/other complications of procedures	15,581	14,352	12,466	211	25,289	203
165.01	other and unspecified complications of procedures and medical care	11,349	10,676	11,340	234	24,146	213
165.02	hemorrhage/hematoma/seroma complicating a procedure	6,506	6,112	11,901	352	27,552	232
165.03	misadventure to patient during surgery or medical care	5,835	5,463	11,115	279	20,625	186
165.04	postoperative infection	5,125	4,795	14,339	381	26,403	184
166.01	stupor/altered consciousness/trans global amnesia/febrile convulsions	10,719	9,496	15,102	258	25,129	166
166.02	unspecified congenital anomalies	206	196	9,760	1,269	17,745	182
166.03	syncope and collapse	46,950	44,029	10,470	94	19,746	189
166.04	fever	32,291	29,338	13,127	149	25,570	195
166.05	other and unspecified nervous/musculoskeletal symptoms	3,784	3,463	9,021	293	17,255	191
166.06	abnormality of gait (ataxic, paralytic, spastic, staggering)	17,555	16,171	12,818	181	23,038	180
166.07	ataxia (muscular incoordination), transient limb paralysis	7,873	7,338	11,479	247	21,198	185
166.08	anorexia	6,801	6,024	12,351	287	22,252	180
166.09	abnormal weight loss	29,485	27,044	9,414	117	19,210	204

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
166.1	feeding difficulties	3,144	2,529	21,291	815	40,994	193
166.11	lack of expected normal physiological development	1,115	943	13,901	892	27,396	197
166.12	respiratory/other chest symptoms	61,806	57,113	10,244	90	21,416	209
166.13	speech disturbance nec (e.g., dysarthria/dysphasia/slurred speech)	7,197	6,547	12,963	289	23,369	180
166.14	symbolic dysfunction (e.g., apraxia/alexia/dyslexia/agraphia/amnesia)	1,169	1,039	13,000	621	20,019	154
166.15	dyspnea (labored breathing)/other respiratory abnormalities	20,594	19,028	11,777	178	24,531	208
166.16	respiratory distress/insufficiency	134,411	124,317	11,477	64	22,559	197
166.17	hemoptysis (coughing up blood)	5,586	5,010	12,672	370	26,205	207
166.18	chest pain	250,544	236,966	9,051	39	19,191	212
166.19	dysphagia	33,540	30,059	11,823	133	22,975	194
166.2	abdominal/pelvis symptoms	186,255	175,981	8,931	46	19,246	215
166.21	ascites	3,906	3,271	18,196	540	30,884	170
166.22	debility, nos	7,029	6,170	14,757	333	26,173	177
167.01	headache excluding migraine	60,724	58,226	7,892	69	16,629	211
167.02	other general symptoms	311,719	294,899	8,133	33	17,841	219
167.03	somatic/segmental dysfunction	38,759	37,727	5,224	64	12,391	237
167.04	dizziness and giddiness	84,880	81,418	7,730	57	16,260	210
167.05	malaise and fatigue, including chronic fatigue syndrome	101,388	95,692	8,770	59	18,102	206
167.06	cardiovascular symptoms, except chest pain	74,913	71,329	8,301	70	18,593	224
167.07	cough	74,615	70,509	8,287	67	17,850	215
167.08	urinary system symptoms, except incontinence and retention of urine	58,018	55,071	8,198	76	17,934	219
167.09	unhealthy lifestyle/abused person/psychological, behavioral problems	2,475	2,347	9,842	365	17,686	180
167.1	infectious disease contact/carrier	2,125	2,032	7,451	399	18,006	242
167.11	problems of internal organs/external sites	3,563	3,335	9,192	317	18,322	199
167.12	care not delivered	4,802	4,475	12,265	334	22,320	182
168.01	extremely low birthweight neonates	6	5	12,019	17,091	39,470	328
169.01	very low birthweight neonates	3	3	6,552	4,592	7,953	121
170.01	respiratory distress syndrome/other serious perinatal respiratory complication	451	399	16,199	1,675	33,457	207
170.02	necrotizing enterocolitis and other major gastrointestinal disorders of infant	467	426	11,867	973	20,076	169
170.03	drug/alcohol affected newborn, including Fetal Alcohol Syndrome	63	58	11,100	2,483	18,855	170
170.04	low birthweight, weight not given	1,002	949	11,696	785	24,202	207
170.05	somewhat low birthweight neonates	1	1	1,527	.	.	.
170.06	convulsions, cerebral hemorrhage, and other perinatal neurologic disorders	283	262	13,173	1,397	22,592	171
170.07	esophageal atresia/stenosis, oth cong gastrointestinal anomalies, age < 2	.	.	.	.	.	.
171.01	newborn infections	188	175	7,444	1,453	19,233	258
171.02	perinatal disorders of digestive system	504	474	8,903	1,059	23,057	259
171.03	other perinatal problem	723	672	9,335	696	18,035	193

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
171.04	fetal distress/asphyxia	112	105	10,880	2,039	20,861	192
171.05	fetal death	8	6	5,062	1,900	4,814	95
171.06	neonatal hemorrhage	58	56	8,382	2,134	15,959	190
171.07	perinatal hemolytic disorders	152	142	9,803	1,501	17,887	182
171.08	perinatal jaundice	56	53	9,704	2,704	19,762	204
171.09	endocrine disorder of newborn	67	62	11,415	2,817	22,154	194
171.1	newborn skin/temperature problem	54	50	8,567	2,204	15,555	182
171.11	multiple birth	13	13	10,143	5,232	18,865	186
172.01	single birth	23	22	10,967	2,983	14,099	129
173.01	lung transplant (procedure)	2	2	14,248	14,212	20,099	141
173.02	heart transplant (procedure)	24	24	26,334	8,125	39,386	150
173.03	bone marrow transplant (procedure)	11	9	31,604	11,501	34,822	110
173.04	liver transplant (procedure)	16	14	17,379	9,413	35,532	204
173.05	pancreas transplant (procedure)	.	.	.	.	.	.
174.01	liver transplant status/complications	240	223	15,493	1,746	26,092	168
174.02	heart transplant status/complications	478	448	13,887	1,655	35,016	252
174.03	lung transplant status/complications	104	97	17,558	8,830	86,850	495
174.04	bone marrow transplant status/complications	29	27	13,135	4,553	23,549	179
174.05	pancreas transplant status/complications	18	15	24,422	8,135	31,592	129
175.01	other organ transplant status/complications	2,381	2,258	7,735	379	18,030	233
175.02	other organ replacement	1,231	1,156	12,696	920	31,272	246
176.01	artificial opening of gastrointestinal tract status/complications	6,411	5,553	17,474	376	28,055	161
176.02	other and unspecified artficial opening status	1,083	945	20,121	1,039	31,942	159
176.03	artificial opening of urinary tract status	830	725	17,396	1,010	27,188	156
176.04	gastrostomy (procedure)	3,040	2,417	24,034	793	38,974	162
176.05	enterostomy (procedure)	645	557	20,096	1,585	37,398	186
176.06	enteral nutrition (DME)	2,986	2,408	24,225	589	28,877	119
176.07	parenteral nutrition (DME)	82	68	37,550	4,948	40,752	109
177.01	amputation status (lower limb), amputation complications	3,109	2,767	20,212	524	27,571	136
177.02	amputation, lower limb (procedure)	1,553	1,315	24,782	904	32,762	132
177.03	lower limb prostheses (DME)	2,906	2,689	15,451	493	25,541	165
178.01	amputation status, upper limb	188	172	14,745	1,796	23,545	160
178.02	amputation, upper limb (procedure)	12	10	11,153	4,938	15,419	138
178.03	upper limb prostheses (DME)	115	110	6,889	1,212	12,702	184
179.01	heart valve replacement status	7,834	7,365	10,728	273	23,398	218
179.02	postsurgical states, eye	81,804	78,439	6,615	53	14,809	224
179.03	joint replacement	20,690	19,869	8,813	117	16,510	187

Table A-2 (continued)

Descriptive Statistics on Prospective DXGs

DXG	Label	Frequency	1997 Person Years	1997 Mean Expenditures	Std. Err. of the Mean	Std. Dev.	Coefficient of Variation
179.04	other postsurgical states	59,129	56,014	10,116	84	19,812	196
179.05	status cardiac pacemaker, other, and unspecified cardiac device	18,501	17,098	11,523	151	19,699	171
179.06	status automatic implantable cardiac defibrillator	1,010	934	15,501	774	23,646	153
179.07	status cerebrospinal fluid drainage device/shunt	450	413	15,188	1,248	25,364	167
179.08	elective surgery	822	790	7,107	656	18,453	260
179.09	prothesis/other device fitting, adjustment	1,772	1,630	13,522	664	26,824	198
179.1	other orthopedic aftercare	5,590	5,310	8,418	225	16,387	195
179.11	aftercare	31,075	29,200	9,512	114	19,467	205
179.12	donor	416	396	9,543	2,109	41,987	440
180.01	radiation therapy	5,756	5,057	11,141	285	20,247	182
180.02	radiation therapy (procedure)	10,729	9,073	12,668	234	22,273	176
181.01	chemotherapy	6,513	5,415	17,644	346	25,434	144
181.02	chemotherapy (procedure)	12,129	10,509	16,237	223	22,907	141
182.01	rehabilitation procedures	30,658	29,051	10,631	120	20,444	192
183.01	screening/observation/special exams	467,751	446,877	6,914	24	15,943	231
183.02	vaccination, medical exam, other preventive	555,635	534,841	5,628	19	13,628	242
183.03	administrative/consultation	9,388	8,954	7,992	179	16,915	212
183.04	screening for malignant neoplasm	85,962	83,824	4,328	40	11,707	270
184.01	history of malignant neoplasm	73,041	68,706	8,152	65	16,999	209
184.02	history of mental disorder/other disease	32,853	30,948	9,731	109	19,114	196
184.03	history of drug allergy/other health hazard	29,467	28,040	8,416	108	18,042	214
184.04	family history of disease	17,524	17,041	4,692	91	11,829	252
185.01	oxygen supplies/equipment (DME)	26,577	23,249	18,910	177	26,945	142
186.01	nebulizers and related drugs (DME)	23,185	20,998	16,555	176	25,568	154
186.02	continuous positive airway pressure system (DME)	3,683	3,515	10,471	372	22,057	211
186.03	intermittent positive pressure breathing system (DME)	171	159	22,319	2,302	29,026	130
187.01	hospital beds (DME)	21,571	18,858	19,895	191	26,279	132
187.02	patient lifts (DME)	2,370	2,052	26,501	606	27,453	104
187.03	power operated vehicles (DME)	505	472	17,215	1,294	28,107	163
188.01	wheelchairs (DME)	37,573	33,734	17,258	137	25,160	146
188.02	commodes (DME)	18,608	16,831	16,017	191	24,723	154
189.01	walkers (DME)	28,579	26,352	13,327	140	22,759	171

OUTPUT: D9pr03cd.out, D9pr04aa.out, D9pr03cd.ou2, and D9pr04aa.ou2.

SOURCE: Health Economics Research, Inc. analysis of 1996 and 1997 Medicare data.

Table A-3

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
	Full sample	1,479,288	5,157	13,535	11	262%
-1.00	Invalid diagnosis	166,356	7,221	16,474	40	228
0.00	No diagnoses	122,248	87	1,243	4	1,427
1.01	HIV/AIDS	2,254	13,828	26,454	557	191
1.02	HIV positive	830	15,261	23,448	814	154
2.01	septicemia (blood poisoning)/shock	22,864	42,164	45,549	301	108
3.01	bacterial/fungal/nonviral meningitis, brain/spinal abcess	1,138	28,738	44,417	1,316	155
3.02	non-viral encephalitis, meningoencephalitis, other CNS infection	1,110	24,628	33,455	1,004	136
3.03	viral encephalitis, including acute poliomyelitis, excluding slow virus infection	535	15,000	26,014	1,124	173
3.04	viral meningitis	564	15,197	26,257	1,106	173
3.05	late effects of central nervous system infection	1,264	15,282	23,524	662	154
3.06	meningitis of unspecified cause	1,142	22,744	32,672	967	144
4.01	tuberculosis, except central nervous system	2,939	16,187	30,007	553	185
5.01	pulmonary mycobacteria/cryptosporidiosis/spec toxoplasmosis/zygomycosis	395	20,835	26,182	1,318	126
5.02	cytomegaloviral disease, including pneumonia	286	39,448	55,142	3,263	140
5.03	candidasis of lung, esophagus, or disseminated	1,874	40,294	50,663	1,170	126
5.04	aspergillosis/cryptococcosis	329	40,632	59,823	3,296	147
5.05	pneumocystis (carinii) pneumonia	346	35,137	46,680	2,510	133
6.01	other intestinal infections	5,325	13,024	23,158	317	178
6.02	other bacterial infections	7,115	14,097	22,175	263	157
6.03	viral enteritis (intestinal infections)	5,590	10,596	17,879	239	169
6.04	strep throat/scarlet fever	2,092	6,512	15,563	340	239
6.05	bacterial infection in other diseases	35,213	29,734	32,912	175	111
6.06	other viral infections	34,203	6,559	14,139	76	216
6.07	herpes zoster (shingles), excluding neurological complications	15,456	7,772	16,701	134	215
6.08	herpes simplex	5,695	10,028	22,678	301	226
6.09	viral hepatitis A and unspecified, without hepatic coma	729	14,462	26,602	985	184
6.10	other infections	20,514	19,636	34,655	242	176
6.11	Lyme disease	960	5,794	13,983	451	241
6.12	veneral diseases, except neuro-and cardiovascular syphilis	1,549	12,380	21,431	545	173
6.13	dermatophytosis (fungal skin infections, e.g., athlete's foot)	153,516	9,681	18,214	46	188
6.14	oral candidiasis (thrush)	5,185	24,531	34,032	473	139
6.15	histoplasmosis/coccidioidomycosis/blastomycosis	807	7,835	16,401	577	209
6.16	infection late effects, excluding central nervous system	308	19,839	33,866	1,931	171
6.17	bacteremia	3,190	43,407	52,040	921	120
7.01	secondary cancer of lymph node	5,911	28,025	27,043	352	97
7.02	secondary cancer of respiratory and digestive systems	9,960	30,723	27,367	274	89
7.03	secondary cancer of other site	12,892	26,203	27,001	238	103
7.04	disseminated cancer	2,044	25,070	27,282	603	109
7.05	acute lymphoid and other acute leukemias, except myeloid	791	34,714	41,595	1,479	120
7.06	acute myeloid leukemia	638	39,746	44,572	1,765	112
8.01	cancer of esophagus	1,211	26,888	34,077	979	127
8.02	cancer of stomach	1,818	24,648	29,512	692	120
8.03	cancer of small bowel/peritoneum/gallbladder/bile ducts	1,545	27,539	30,444	774	111
8.04	cancer of liver	1,829	25,668	24,726	578	96
8.05	cancer of pancreas	1,629	25,954	27,585	683	106
8.06	cancer of trachea, bronchus, lung, and pleura	14,325	22,219	27,038	226	122
8.07	multiple myeloma	2,487	18,732	27,739	556	148
8.08	chronic myeloid and other specific non-acute leukemias, except lymphoid	908	24,710	35,726	1,186	145
9.01	cancer of mouth/tongue	2,248	15,778	24,679	521	156
9.02	cancer of pharynx	1,500	20,036	29,183	753	146
9.03	other respiratory/intrathoracic cancer	1,011	21,245	29,898	940	141
9.04	cancer of larynx	2,215	15,344	25,093	533	164
9.05	cancer of bone and articular cartilage	2,309	22,194	26,914	560	121
9.06	cancer of connective and other soft tissue	2,422	16,017	24,628	500	154
9.07	Kaposi's sarcoma	241	22,268	44,455	2,866	200
9.08	cancer of ovaries/placenta/uterine adnexia	2,775	19,201	23,991	455	125
9.09	cancer of the brain/nervous system/pituitary, pineal glands	3,566	22,941	27,430	459	120
9.10	adrenal gland cancer	182	20,351	26,695	1,980	131
9.11	non-Hodgkin's lymphomas	7,766	15,860	24,757	281	156
9.12	Hodgkin's disease	1,001	17,753	29,529	933	166
9.13	chronic lymphoid and unspecified cell leukemias, not specified as acute	4,493	15,844	27,730	414	175

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
10.01	colon cancer	14,691	16,473	22,914	189	139
10.02	rectal cancer	10,600	17,297	23,294	226	135
10.03	other, unspecified cancer of digestive organs/peritoneum	947	22,159	26,507	861	120
10.04	melanoma	4,715	7,880	14,491	211	184
10.05	breast cancer, age 45+	32,382	7,429	14,217	79	191
10.06	cancer of uterus	3,896	10,984	19,268	309	175
10.07	cancer of cervix/female genital organs	2,317	13,984	21,849	454	156
10.08	prostate cancer	42,530	8,566	15,318	74	179
10.09	cancer of testis/male genital organs	645	12,539	21,226	836	169
10.10	cancer of bladder, ureter, urethra and other urinary tract	11,142	11,607	19,507	185	168
10.11	cancer of kidney and renal pelvis	3,497	14,964	21,951	371	147
10.12	cancer of the eye	780	8,552	13,352	478	156
10.13	thyroid/endocrine cancer, except adrenal, pituitary, pineal	1,454	11,834	20,340	533	172
10.14	other/ill-defined site cancer	14,001	19,887	25,838	218	130
10.15	benign neoplasm of brain/nervous system/pituitary, pineal glands	4,300	14,456	22,776	347	158
10.16	uncertain/unspecified neoplasm of brain/nervous system/pituitary, pineal glands	4,105	20,380	27,322	426	134
10.17	neurofibromatosis	334	9,543	20,309	1,112	213
10.18	tuberous sclerosis and other hamartoses (Peutz-Jeghers/Sturge-Weber, etc)	224	14,455	28,214	1,884	195
10.19	breast cancer, age < 45	159	13,402	19,543	1,549	146
11.01	benign neoplasm of respiratory system	3,006	22,123	31,576	576	143
11.02	benign neoplasm of heart	101	33,867	41,964	4,183	124
11.03	carcinoma in situ of respiratory system	1,667	25,319	28,131	689	111
11.04	uncertain/unspecified neoplasm of respiratory system	5,884	23,036	28,965	378	126
12.01	benign neoplasm of digestive system	51,430	9,919	18,058	80	182
12.02	benign neoplasm of urinary tract	2,173	13,183	20,608	442	156
12.03	carcinoma in situ of digestive organs	3,192	22,072	26,862	475	122
12.04	carcinoma in situ of urinary organs	1,369	15,466	20,705	560	134
12.05	uncertain/unspecified neoplasm of digestive organs	11,451	17,162	24,027	225	140
12.06	uncertain/unspecified neoplasm of urinary organs	4,714	14,426	21,521	313	149
13.01	skin cancer, except melanoma, including lip	65,646	6,066	12,252	48	202
13.02	benign neoplasms, exc respiratory, digestive, urinary, skin, breast, eye, cns	34,384	8,488	16,487	89	194
13.03	carcinoma in situ, except respiratory, digestive, urinary, skin	8,473	11,485	18,466	201	161
13.04	uncertain neoplasm, exc respiratory, digestive, urinary, skin, cns	17,427	8,276	15,663	119	189
13.05	unspecified neoplasm, exc respiratory, digestive, bladder, brain	27,162	10,723	18,674	113	174
14.01	benign neoplasm of skin	48,524	4,929	10,656	48	216
14.02	benign neoplasm of breast/other breast disorders	126,020	4,411	9,940	28	225
14.03	benign neoplasm of eye	4,043	4,799	12,120	191	253
14.04	uncertain neoplasm, skin	34,549	5,299	11,045	59	208
15.01	type II diabetes with renal manifestation	5,408	22,371	31,140	423	139
15.02	type I diabetes with renal manifestation	3,292	29,260	34,683	605	119
16.01	type II diabetes with neurological manifestations	17,445	15,530	23,521	178	151
16.02	type I diabetes with neurological manifestations	8,638	21,605	28,360	305	131
16.03	type II diabetes with peripheral circulatory disorders	13,756	18,182	27,144	231	149
16.04	type I diabetes with peripheral circulatory disorders	6,698	24,531	31,739	388	129
17.01	type II diabetes with ketoacidosis or coma	4,882	18,408	28,164	403	153
17.02	type I diabetes with ketoacidosis or coma	1,957	24,934	34,235	774	137
17.03	type II diabetes with other specified manifestations, incl hypoglycemic shock	8,296	22,146	28,141	309	127
17.04	type I diabetes with other specified manifestations, incl hypoglycemic shock	5,145	25,968	30,792	429	119
18.01	type II diabetes with ophthalmologic manifestations	13,089	10,737	19,260	168	179
18.02	type I diabetes with ophthalmologic manifestations	5,950	16,630	24,701	320	149
19.01	type II diabetes without complications	215,367	9,612	19,253	41	200
19.02	type I diabetes without complications	66,433	14,967	25,008	97	167
19.03	type II diabetes with unspecified complication	14,652	14,030	23,954	198	171
19.04	type I diabetes with unspecified complication	5,262	19,281	29,312	404	152
21.01	protein-calorie malnutrition/wasting disease (cachexia)	19,571	40,109	42,897	307	107
22.01	adrenal gland disorders e.g., Cushing's syndrome	4,177	21,157	31,658	490	150
22.02	nondiabetic hypoglycemic coma	595	21,496	28,212	1,157	131
22.03	pituitary/parathyroid/thymus/polyglandular disorders, except pituitary dwarfism	7,117	15,272	25,110	298	164
22.04	pituitary dwarfism	58	14,787	22,798	2,983	154
22.05	inborn errors of metabolism	2,122	9,926	21,869	475	220
22.06	macroglobulinemia and paraproteinemias, except monoclonal	471	14,786	23,363	1,077	158
22.07	hemochromatosis, other disorders of iron, copper, and phosphorus metabolism	2,372	18,828	32,949	677	175
22.08	porphyria, histiocytosis, other specified metabolic disorders	429	14,392	24,914	1,202	173
22.09	amyloidosis/familial Mediterranean fever	317	17,821	22,260	1,250	125

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
22.10	alpha 1-antitrypsin deficiency/hereditary angioedema	121	20,251	33,233	3,017	164
23.01	disorders of fluid/electrolyte/acid-base balance, e.g., dehydration	119,712	22,879	29,219	84	128
24.01	goiter	11,781	7,231	15,245	140	211
24.02	thyrotoxicosis, including Graves' disease	15,223	8,214	16,079	130	196
24.03	congenital hypothyroidism (cretinism)	763	7,045	16,111	583	229
24.04	thyroid disorders, except goiter and thyrotoxicosis	132,390	7,737	15,989	44	207
24.05	other hypoglycemia	9,420	16,399	25,978	268	158
24.06	ovarian dysfunction	7,273	3,797	8,218	96	216
24.07	testicular dysfunction	2,263	7,069	18,346	386	260
24.08	other endocrine disorders	5,885	5,325	13,118	171	246
24.09	vitamin B/other nutritional deficiencies	12,308	12,228	23,195	209	190
24.10	lactose intolerance, other/unspecified disorders of carbohydrate metabolism	4,144	8,177	16,379	254	200
24.11	disorders of lipoid metabolism (high cholesterol), except lipidoses	310,070	5,310	12,180	22	229
24.12	other and unspecified disorders of plasma protein metabolism	4,206	22,590	33,129	511	147
24.13	disorders of magnesium, calcium, and unspecified mineral metabolism	11,265	19,265	28,409	268	147
24.14	disorders of bilirubin excretion and unspecified metabolism disorders	1,520	11,534	23,809	611	206
24.15	other hyperalimentation	546	17,470	31,981	1,369	183
24.16	obesity/localized adiposity	30,185	11,583	19,993	115	173
24.17	congenital anomalies of endocrine glands	526	7,912	14,438	630	182
25.01	esophageal varices	1,377	24,082	32,039	863	133
25.02	end stage liver disorders, including hepatic coma and liver failure	2,477	30,977	38,162	767	123
26.01	cirrhosis of liver	6,545	19,240	28,746	355	149
27.01	chronic viral hepatitis	1,525	17,395	26,660	683	153
27.02	chronic hepatitis, except viral	1,729	14,561	28,482	685	196
28.01	acute liver disease, including acute liver necrosis/failure, abcess, infarction	1,761	26,516	36,863	878	139
28.02	viral hepatitis, acute or unspecified, with hepatic coma	138	17,192	23,487	2,002	137
29.01	viral hepatitis, except type A or unspec, acute or unspec w/o hepatic coma	2,231	14,847	25,879	548	174
29.02	toxic and other/unspecified non-viral hepatitis/other liver disorders	18,299	15,679	26,507	196	169
30.01	gallstones with gallbladder inflammation and other gallbladder disease	21,618	17,563	27,771	189	158
30.02	specified biliary tract disease (e.g., cholangitis, obstruction, perforation)	4,379	25,499	33,613	508	132
31.01	peritonitis, excluding appendicitis and female pelvic	2,729	45,750	50,444	966	110
31.02	perforated peptic ulcer or intestines	2,930	31,986	44,805	828	140
31.03	intestinal obstruction	29,024	26,695	34,099	200	128
32.01	chronic pancreatitis/ other pancreatic diseases/intestinal malabsorption	7,417	19,856	30,244	351	152
32.02	acute pancreatitis	6,382	21,885	30,956	388	141
33.01	regional enteritis (Crohn's disease), age 18+	3,645	12,565	24,209	401	193
33.02	ulcerative colitis, age 18+	5,033	12,124	23,978	338	198
33.03	inflammatory bowel disease, age < 18	1	588	.	.	.
34.01	bacterial enteritis (intestinal infections)	4,237	38,774	44,822	689	116
34.02	peptic ulcer not specified as with perforation, hemorrhage, or obstruction	44,949	14,293	24,395	115	171
34.03	gastrointestinal hemorrhage, except peptic ulcer and anal/rectal	58,308	17,842	29,129	121	163
34.04	peptic ulcer with hemorrhage, without perforation	7,805	23,209	34,484	390	149
34.05	peptic ulcer with obstruction, without perforation or hemorrhage	1,063	19,149	34,651	1,063	181
34.06	pyloric/duodenal obstruction	1,824	24,108	30,946	725	128
34.07	intestinal abcess, fistula, and other specified disorders	8,245	21,421	33,014	364	154
34.08	abdominal hernia, complicated	3,720	18,589	26,175	429	141
34.09	peritoneal disorders, except peritonitis	4,620	26,762	33,146	488	124
35.01	appendicitis, including with perforation and peritonitis	1,668	21,501	27,919	684	130
36.01	hemorrhoids	43,589	7,473	15,083	72	202
36.02	disease of esophagus, except ulcer and hemorrhage	110,415	10,148	19,182	58	189
36.03	stomach/intestinal disorders/symptoms, except obstruction, ulcer, and hemorrhage	224,336	11,922	21,316	45	179
36.04	abdominal hernia/uncomplicated	71,224	11,355	18,632	70	164
36.05	other and unspecified intestinal disorders	52,465	12,329	22,113	97	179
36.06	divercula of intestine, without hemorrhage	83,030	9,642	17,847	62	185
36.07	anal/rectal disorders	44,743	10,164	19,464	92	192
36.08	gallstones without gallbladder inflammation	20,637	16,762	24,997	174	149
36.09	esophageal atresia/stenosis, oth cong gastrointestinal anomalies, age 2+	4,125	14,560	25,768	401	177
36.10	foreign body gastrointestinal tract	2,558	14,906	26,478	524	178
37.01	arthopathy with infection	2,605	20,398	28,331	555	139
37.02	osteomyelitis	8,808	26,382	34,079	363	129
37.03	necrotizing fasciitis	140	53,533	63,388	5,365	118
37.04	aseptic necrosis of bone	2,197	19,251	24,921	532	129
38.01	Behcet's syndrome	44	9,667	20,866	3,161	216
38.02	systemic lupus erythematosus/giant cell arteritis/oth connective tissue disease	13,771	10,343	19,602	167	190

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
38.03	rheumatoid arthritis and other inflammatory polyarthropathy	33,460	8,885	16,514	90	186
38.04	inflammatory spondylopathies	5,881	8,334	15,891	207	191
38.05	polymyalgia rheumatica	9,223	8,313	15,321	160	184
39.01	spondylosis and allied disorders (osteoarthritis of spine)	58,054	9,128	16,122	67	177
39.02	intervertebral disc disorders (herniated, prolapsed, degenerated disc)	85,258	8,472	15,442	53	182
39.03	spinal stenosis	30,842	10,825	16,919	96	156
39.04	curvature/deformity of the spine	13,171	10,466	18,731	163	179
39.05	spondylolisthesis/spondylolysis, congenital or acquired	8,241	9,778	15,744	173	161
39.06	congenital anomalies of spine, except spondylolisthesis/spondylolysis	1,665	10,517	19,631	481	187
40.01	osteoarthritis of pelvic region and thigh (hip)	28,768	11,409	17,539	103	154
40.02	osteoarthritis of lower leg (knee)	67,856	8,870	14,967	57	169
41.01	osteomalacia/rickets, except vitamin D-resistant	408	11,073	21,037	1,041	190
41.02	other bone/cartilage disorders (e.g,.Paget's disease)	42,451	11,621	19,774	96	170
41.03	osteoporosis	89,343	8,746	16,110	54	184
42.01	juvenile osteochondrosis spine/pelvis, slipped capital femoral epiphysis	239	12,240	19,946	1,292	163
42.02	congenital hip dislocation/dysplasia	248	18,253	23,892	1,516	131
42.03	osteogenesis imperfecta and other osteodystrophies	624	12,155	23,567	943	194
42.04	Marfan and Ehlers-Danlos syndromes	118	10,078	26,039	2,402	258
43.01	Reiter's syndrome	96	10,397	16,576	1,693	159
43.02	gout/crystal arthropathy	31,147	9,233	17,517	99	190
43.03	psoriatic arthopathy	1,204	7,188	12,817	369	178
43.04	arthropathy/joint disorders, derangements, joint pain/stiffness, excluding gout	294,661	9,094	16,803	31	185
43.05	osteoarthritis, not specified to be of spine, hip, or knee	232,149	7,867	14,785	31	188
43.06	difficulty walking due to pelvic/lower leg joint disorder/wheelchair	2,982	28,069	26,263	481	94
43.07	nonspecific backache and other back/neck pain/disorders	218,493	7,783	15,308	33	197
43.08	disorders of soft tissue (e.g., tendonitis, bursitis, muscle disorders)	303,014	8,760	17,419	32	199
43.09	flat foot, acquired deformities of toe	37,906	7,563	14,979	77	198
43.10	acquired limb deformities, except toe, flat foot	9,480	12,713	21,944	225	173
43.11	cleft lip/cleft palate	80	12,943	21,190	2,364	164
43.12	other congenital musculoskeletal abnormalities	5,384	9,201	17,332	236	188
43.13	chondrodystrophy	122	7,945	20,300	1,837	256
43.14	dislocation (displacement/subluxation) of vertebra	26,945	4,771	10,753	66	225
44.01	myelodysplastic syndrome	3,206	19,938	27,771	490	139
44.02	other/unspecified sickle cell anemia	362	20,067	34,092	1,791	170
44.03	sickle cell Hb-S disease	244	20,788	35,668	2,286	172
44.04	acquired hemolytic anemia	1,438	24,990	32,753	864	131
44.05	aplastic anemia	6,113	30,617	35,655	456	116
44.06	hemophilia (congenital factors VIII and IX coagulation defects)	749	19,020	37,243	1,361	196
45.01	immune disorders, age 18+	1,889	18,871	29,092	669	154
45.02	agranulocytosis, chr granulomatous dis, oth spec white blood cell dis, age 18+	8,046	25,478	32,593	363	128
45.03	immune/white blood cell disorders, age < 18	2	5,800	166	118	3
46.01	polycythemia vera	2,469	9,167	16,924	341	185
46.02	thalassemias and other hereditary hemolytic anemias	2,157	16,466	26,442	569	161
46.03	sideroblastic anemia	2,314	17,832	25,414	528	143
46.04	coagulation defects, except congenital factors VIII and IX	23,111	18,496	28,289	186	153
46.05	purpura/thrombocytopathy/hemorrhagic conditions	16,406	21,889	34,857	272	159
46.06	myelofibrosis and other specified blood diseases	2,748	15,110	23,728	453	157
47.01	iron deficiency and other/unspecified anemias	146,987	18,141	26,109	68	144
47.02	megaloblastic and other deficiency anemias (pernicious/folic acid)	31,323	11,988	20,491	116	171
47.03	other and unspecified white blood cell disease	9,174	26,831	40,038	418	149
47.04	other and unspecified blood disease	9,796	15,265	25,299	256	166
48.01	transient organic psychosis (delirium/delusions/hallucinations)	13,621	25,999	31,178	267	120
48.02	toxic/unspecified encephalopathy	7,900	36,493	46,158	519	126
48.03	visual agnosia/disorientation/hallucinations	685	15,529	20,118	769	130
48.04	hallucinations, nos	2,374	19,696	25,715	528	131
49.01	slow viral central nervous system infection	82	27,097	36,959	4,077	136
49.02	uncomplicated/unspecified dementia	40,987	15,318	21,917	108	143
49.03	dementia with delirium	5,051	22,392	25,803	363	115
49.04	dementia with delusions	5,771	17,793	22,813	300	128
49.05	dementia with depression	6,396	18,626	23,271	291	125
49.06	dementia in other disorders and other chronic organic psychotic conditions	36,256	18,340	23,377	123	127
49.07	cerebral degeneration/Alzheimer's disease	46,104	16,016	23,636	110	148
49.08	hydrocephalus, acquired	2,740	24,513	34,763	664	142
50.01	nonpsychotic organic brain syndrome	12,755	18,162	25,936	230	143

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
50.02	other/unspecified brain/central nervous system conditions	9,120	21,217	31,509	330	149
50.03	senility without psychosis	2,200	14,590	20,977	447	144
51.01	alcoholic psychoses	3,022	20,757	26,713	486	129
51.02	drug psychoses	3,216	25,532	28,023	494	110
52.01	alcohol dependence	9,825	17,346	24,609	248	142
52.02	drug dependence	3,618	18,531	23,247	387	125
53.01	nondependent drug abuse, except alcohol and tobacco	3,382	18,413	22,653	390	123
53.02	nondependent abuse of alcohol	6,310	17,297	23,845	300	138
53.03	tobacco use disorder	24,330	14,847	20,555	132	138
54.01	schizophrenic disorders	23,024	9,488	17,637	116	186
55.01	manic and depressive (bipolar) disorders	14,543	12,176	19,852	165	163
55.02	major depressive disorders	38,814	14,906	23,911	121	160
55.03	paranoid disorders and states	2,519	16,269	21,222	423	130
55.04	attempted suicide/self-inflicted injury	703	21,099	26,013	981	123
56.01	reactive and other/unspecified nonorganic psychoses	26,517	17,908	24,083	148	134
57.01	personality disorders and dissociative identity disorder	5,870	15,845	21,274	278	134
58.01	depression, excluding major depressive and bipolar disorders	75,129	12,908	21,266	78	165
59.01	panic disorders/attacks	5,323	10,079	19,786	271	196
59.02	generalized anxiety disorder	8,946	9,704	18,203	192	188
59.03	somatoform/dissociative disorders	1,900	15,395	22,466	515	146
59.04	phobic disorders	796	9,406	16,507	585	175
59.05	obsessive-compulsive disorders	1,445	9,656	16,735	440	173
59.06	anorexia nervosa/bulimia	423	16,100	22,893	1,113	142
59.07	prolonged posttraumatic stress disorder	1,405	12,756	18,910	505	148
60.01	other and unspecified neurotic disorders	5,772	18,354	26,128	344	142
60.02	other and unspecified anxiety states	46,157	10,115	18,411	86	182
60.03	sexual deviations and disorders	4,085	4,950	11,464	179	232
60.04	psychosomatic illness	1,829	14,598	24,795	580	170
60.05	other mental disorders	6,461	14,731	22,648	282	154
60.06	Tourette's disorder	113	6,182	14,661	1,379	237
60.07	acute reaction to stress	3,864	8,804	17,465	281	198
60.08	adjustment reaction, excluding prolonged depressive	12,343	16,602	26,954	243	162
60.09	behavior disorder	2,782	12,570	21,401	406	170
61.01	profound mental retardation	1,182	5,520	15,439	449	280
61.02	Edwards/Patau/deletion/autosomal anomaly syndromes	57	9,982	20,924	2,767	210
62.01	severe mental retardation	1,211	6,901	18,003	517	261
63.01	moderate mental retardation	1,355	6,122	13,839	376	226
64.01	autism/pervasive developmental disorders, other childhood psychoses	443	7,397	17,860	848	241
64.02	mild/unspecified mental retardation	7,510	6,854	15,675	181	229
64.03	Down's syndrome	1,633	4,857	16,725	414	344
64.04	Prader-Willi/Fragile X syndromes	92	9,642	17,026	1,775	177
65.01	emotional disorders of childhood/adolescence	129	11,620	18,856	1,663	162
65.02	learning/development disorders	817	10,752	22,193	776	206
65.03	unspecified chromosomal anomalies and congenital malformation syndromes, nec	239	11,841	22,392	1,449	189
65.04	sex chromosome abnormalities (e.g., Klinefelter's/Turner syndromes)	59	8,311	12,233	1,590	147
66.01	attention deficit disorder, other hyperkinetic syndrome	633	10,543	25,636	1,019	243
67.01	motor neuron disease (including ALS) and spinal muscular atrophy	896	19,350	32,328	1,080	167
67.02	congenital/infantile quadriplegia (cerebral palsy)	323	13,091	24,203	1,347	185
67.03	quadriplegia, incomplete or unspecified	1,955	30,296	40,753	922	135
67.04	quadriplegia (C1-C7), complete	235	36,848	47,925	3,126	130
67.05	locked-in state	28	35,022	55,322	10,439	158
67.06	traumatic complete lesion cervical (C1-C7) spinal cord	59	29,307	35,498	4,635	121
68.01	congenital/infantile diplegia/paraplegia (cerebral palsy)	162	12,054	22,229	1,747	184
68.02	paraplegia	2,320	25,986	34,080	708	131
68.03	traumatic complete lesion dorsal (T1-T12) spinal cord	39	41,858	56,749	9,107	136
69.01	spinocerebellar disease, including Friedreich's ataxia	1,505	15,462	24,965	644	161
69.02	syringomyelia, vascular, other/unspecified spinal cord disease	2,458	22,418	32,483	655	145
69.03	cauda equina syndrome	4,433	18,771	27,159	408	145
69.04	spina bifida, hydrocephalus, other congenital nervous system anomalies	2,552	19,926	30,110	596	151
69.05	fracture lumbar, sacral, coccygeal or unspecified vertebrae with spinal cord injury	538	20,062	26,033	1,123	130
69.06	fracture cervical vertebrae (C1-C7) with spinal cord injury, exc complete lesion	308	32,158	42,354	2,415	132
69.07	fracture dorsal vertebrae (T1-T12) with spinal cord injury, exc complete lesion	567	19,163	26,154	1,098	136
69.08	late effect of spinal cord injury	454	31,005	36,509	1,713	118
69.09	spinal cord injury w/o vertebral fracture, except severe cervical/dorsal	1,500	19,070	29,022	749	152

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
69.10	severe cervical/dorsal spinal cord injury w/o vertebral fracture, exc compl lesion	101	28,552	38,148	3,799	134
70.01	muscular dystrophy, age 18+	608	13,321	24,347	987	183
70.02	muscular dystrophy, age < 18	.	.	.	.	.
71.01	autonomic nerve disorder	4,892	17,871	25,169	360	141
71.02	peripheral neuropathy/myopathy	21,519	12,968	23,315	159	180
71.03	inflammatory/toxic neuropathy, except diabetic	4,078	15,931	29,269	458	184
71.04	diabetic neuropathy	8,355	22,160	27,177	297	123
71.05	myoneural disorders/myasthenia gravis	1,634	15,010	35,603	881	237
72.01	multiple sclerosis, other central nervous system dymelination	4,774	12,315	22,354	324	182
73.01	Parkinson's disease	21,717	12,626	20,636	140	163
73.02	Huntington's and degenerative disease of basal ganglia	1,133	15,174	22,724	675	150
74.01	epilepsy, age 18+	13,076	14,171	26,194	229	185
74.02	convulsions, except febrile	36,555	15,646	27,226	142	174
74.03	epilepsy, age < 18	2	40,595	57,344	40,549	141
75.01	brain anoxic damage, edema, and compression (nontraumatic)	2,120	45,772	51,437	1,117	112
75.02	coma, nontraumatic	1,960	44,935	54,391	1,229	121
75.03	persistent vegetative state	290	40,308	54,913	3,224	136
76.01	postherpetic neuralgia/other neurological complications of herpes zoster	3,217	9,157	16,295	287	178
76.02	essential tremor and other abnormal movement disorders	12,230	11,026	21,051	190	191
76.03	migraine headaches	14,091	7,986	15,720	132	197
76.04	trigeminal nerve disorders	3,656	8,033	14,953	247	186
76.05	facial nerve disorders, including Bell's Palsy	4,149	10,514	18,703	290	178
76.06	other cranial nerve disorders	783	14,795	24,135	863	163
76.07	root/plexus disorders	1,098	9,806	17,444	526	178
76.08	other specified neuropathy	2,301	9,384	18,094	377	193
76.09	root/plexus lesions	1,777	9,044	19,781	469	219
76.10	neuropathy of upper limb (e.g., carpal tunnel syndrome)	19,099	7,552	14,685	106	194
76.11	neuropathy of leg	20,036	10,058	19,010	134	189
76.12	abnormal involuntary movements nec (e.g. spasms/tremor nos)	8,887	11,812	21,353	227	181
76.13	nerve injury, excluding spinal cord and brain	2,666	12,398	19,307	374	156
77.01	tracheostomy status/complications	1,729	72,503	82,426	1,982	114
77.02	respirator dependence	957	106,648	91,600	2,961	86
77.03	tracheostomy (procedure)	.	.	.	.	.
77.04	ventilator (DME)	.	.	.	.	.
78.01	respiratory arrest	3,860	55,383	58,753	946	106
79.01	cardiac arrest/shock	11,538	34,488	39,189	365	114
79.02	acute lung edema nos	6,330	40,861	44,275	556	108
79.03	post trauma/surgery pulmonary insufficiency, incl adult respir distress syndr	4,153	60,514	62,214	965	103
79.04	respiratory failure	37,972	36,042	44,011	226	122
80.01	hypertensive heart disease, with heart failure	15,662	19,843	29,044	232	146
80.02	hypertensive heart/renal disease, with heart failure	773	22,017	26,738	961	121
80.03	pulmonary vascular disease, except pulmonary embolism	18,120	23,468	31,639	235	135
80.04	cardiomyopathy/myocarditis	35,182	19,022	27,630	147	145
80.05	heart failure	167,393	17,594	26,598	65	151
81.01	acute myocardial infarction, initial episode of care	19,736	29,955	31,194	222	104
82.01	myocardial infarction, subsequent episode of care, or unspecified	22,331	25,140	30,201	202	120
82.02	unstable angina and other acute ischemic heart disease	53,162	20,132	25,037	109	124
82.03	postmyocardial infarction syndrome	1,312	24,473	28,836	796	118
83.01	old myocardial infarction	40,182	18,720	23,918	119	128
83.02	angina pectoris	88,318	13,804	20,792	70	151
84.01	coronary atherosclerosis and other chronic ischemic heart disease	291,691	11,823	20,533	38	174
84.02	aneurysm and other congenital abnormalities of coronary artery	6,805	15,714	25,045	304	159
85.01	acute endo/myocarditis	1,398	36,996	50,545	1,352	137
85.02	pericarditis and other diseases of pericardium	4,894	29,188	38,793	555	133
85.03	cardiovascular syphilis	480	18,026	29,173	1,332	162
86.01	rheumatic fever/heart disease	13,306	19,691	25,881	224	131
86.02	mitral or aortic valve/endocardia disease	106,610	15,421	24,554	75	159
86.03	mitral/aortic valve disorders	21,810	18,815	26,507	179	141
86.04	rheumatic heart failure	1,106	34,298	36,170	1,088	105
86.05	congenital abnormalities of heart valves	4,648	16,826	27,051	397	161
86.06	aortic atresia/stenosis and other congenital aortic abnormalities	3,350	18,818	28,155	486	150
87.01	major congenital cardiac/circulatory system abnormality, age 18+	326	23,105	36,800	2,038	159
87.02	major congenital cardiac/circulatory defect, age < 18	.	.	.	.	.
88.01	other and unspecified congenital cardiac/circulatory system abnormality	7,506	18,133	28,036	324	155

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
88.02	ventricular septal defect	520	16,797	32,064	1,406	191
88.03	atrial septal defect	648	19,906	34,431	1,353	173
88.04	situs inversus/Kartagener's syndrome	218	9,475	18,646	1,263	197
89.01	hypertensive renal disease, without renal failure	4,063	19,543	29,268	459	150
89.02	hypertensive heart and renal disease, w/o heart or renal failure	2,575	11,653	20,701	408	178
89.03	hypertension encephalopathy	1,313	18,858	28,948	799	154
90.01	hypertensive heart disease, without heart failure	66,393	10,035	18,879	73	188
90.02	malignant hypertensive heart disease, without heart failure	6,958	9,780	19,993	240	204
91.01	essential hypertension	631,468	7,490	15,920	20	213
91.02	malignant hypertension	35,387	9,845	18,947	101	192
91.03	secondary hypertension	2,163	14,759	22,879	492	155
92.01	artioventricular block, complete (complete/third degree heart block)	8,929	18,389	25,578	271	139
92.02	atrial arrhythmia	122,485	15,792	25,996	74	165
92.03	paroxysmal ventricular tachycardia	12,974	26,596	34,247	301	129
92.04	sinoatrial node dysfunction, including sick sinus syndrome	24,877	16,180	23,842	151	147
93.01	other conduction disorders/cardiac dysrhythmias	131,807	14,705	23,380	64	159
93.02	second degree heart block	3,154	21,504	26,369	470	123
94.01	premature heart beats	30,086	14,540	23,584	136	162
94.02	other and unspecified heart disease	28,297	17,374	25,702	153	148
94.03	cardiomegaly (enlarged heart)	71,383	20,519	28,242	106	138
95.01	cerebral hemorrhage	8,980	26,716	34,107	360	128
96.01	precerebral or cerebral arterial occulsion with infarction	25,780	23,805	28,799	179	121
96.02	cerebrovascular accident, unspecified	65,176	18,663	26,520	104	142
97.01	precerebral or cerebral arterial occlusion without infarction	61,521	14,232	22,140	89	156
97.02	transient cerebral ischemia	49,180	13,816	21,073	95	153
98.01	cerebral atherosclerosis, ischemic and other specified cerebrovascular disease	17,974	17,896	25,062	187	140
98.02	cerebral aneurysm/arteriovenous malformation, nonruptured	2,038	18,924	30,296	671	160
99.01	unspecified cerebrovascular disease	14,946	16,275	23,598	193	145
100.01	hemiplegia and hemiparesis	17,940	27,517	29,882	223	109
100.02	congenital/infantile hemiplegia (cerebral palsy)	144	11,528	17,596	1,468	153
100.03	hemiplegia/hemiparesis following stroke	2,977	30,321	28,509	522	94
101.01	monoplegic, other, and unspecified cerebral palsy	2,314	7,168	15,283	318	213
101.02	diplegia (upper), monoplegia, other, and unspecified paralytic syndromes	3,044	23,831	30,367	550	127
101.03	monoplegia and other paralysis following stroke, except hemiplegia	222	29,519	31,394	2,107	106
102.01	hemianopsia	1,547	18,367	24,591	625	134
102.02	cognitive deficits/apraxia following stroke	1,781	19,341	23,158	549	120
102.03	speech/language deficits following stroke	1,180	29,872	29,734	866	100
102.04	neurological neglect syndrome	224	35,308	30,324	2,026	86
102.05	aphasia (loss of language skills/comprehension)	6,793	26,143	27,706	336	106
103.01	cerebrovascular disease late effects, unspecified	33,181	20,647	26,792	147	130
103.02	dysphagia following stroke	500	37,159	32,713	1,463	88
104.01	gangrene, unspecified and gas	5,364	43,769	40,862	558	93
104.02	pulmonary embolism	7,219	28,121	36,465	429	130
104.03	artherosclerosis of the extemities with ulceration	3,326	34,890	36,030	625	103
104.04	artherosclerosis of the extemities with gangrene	2,754	49,985	40,390	770	81
104.05	aortic aneurysm, ruptured	2,665	26,343	36,130	700	137
104.06	arterial embolism and thrombosis	13,795	24,914	33,140	282	133
104.07	acute vascular insufficiency of intestine	1,890	37,468	46,971	1,080	125
104.08	vascular disorders of kidney (embolism, hemorrhage, thrombosis, infarction)	880	26,861	38,447	1,296	143
105.01	atherosclerosis/arteriosclerosis of major vessel	62,551	15,536	24,424	98	157
105.02	aortic aneurysm, without mention of rupture	16,818	16,086	25,752	199	160
105.03	arterial aneurysm, except aortic	4,234	22,899	30,566	470	133
105.04	specified peripheral vascular disease	8,403	21,983	30,382	331	138
105.05	unspecified peripheral vascular disease	82,354	14,416	23,497	82	163
105.06	stricture of artery and other/unspecified arterial disease	15,725	17,771	26,409	211	149
105.07	hereditary hemorrhagic telangiectasia	200	13,468	19,214	1,359	143
105.08	deep vein thrombosis	22,017	22,647	31,922	215	141
105.09	vascular insufficiency of intestines, chronic or unspecified	2,215	27,930	39,190	833	140
106.01	vascular atherosclerosis/arteriosclerotic cardiovascular disease	72,006	13,436	21,706	81	162
106.02	Raynaud's syndrome/other peripheral vascular disease	2,642	11,040	21,161	412	192
106.03	disease of capillaries, except hereditary hemorrhagic telangiectasia	2,653	5,453	12,321	239	226
106.04	thrombophlebitis, excluding deep vein and superficial leg	19,628	18,220	28,331	202	156
106.05	superficial phlebitis-leg	4,322	14,895	25,283	385	170
106.06	varicose veins	21,349	10,185	18,722	128	184

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
106.07	noninfectious lymphatic disorders	4,069	14,933	23,346	366	156
106.08	hypotension	23,553	25,075	33,977	221	136
106.09	other circulatory disease/postphlebitic syndrome	10,600	20,276	29,846	290	147
106.10	hemorrhage nos	2,275	24,656	37,231	781	151
106.11	compression of vein	2,560	21,786	31,456	622	144
106.12	other specified circulatory disorders	25,075	15,912	27,017	171	170
107.01	cystic fibrosis, age 18+	457	8,159	40,606	1,899	498
107.02	cystic fibrosis, age < 18	.	.	.	.	.
108.01	emphysema/chronic bronchitis	192,897	13,327	23,451	53	176
108.02	chronic obstructive asthma	13,782	17,952	26,538	226	148
109.01	sarcoidosis	1,274	11,130	20,358	570	183
109.02	bronchiectasis	3,720	14,069	26,389	433	188
109.03	pneumoconioses/lung disease due to specified external agents (e.g., black lung)	3,687	14,862	25,796	425	174
109.04	respiratory conditions due to other and unspecified external agents	657	21,470	29,011	1,132	135
109.05	postinflammatory and interstitial pulmonary fibrosis	21,401	18,075	27,830	190	154
109.06	pulmonary eosinophilia	23,361	30,849	38,698	253	125
110.01	asthma, except chronic obstructive	61,420	9,368	17,947	72	192
111.01	gram-negative/staphylococcus pneumonia	9,866	43,080	51,465	518	119
111.02	aspiration pneumonia	9,464	44,859	44,844	461	100
112.01	pneumococcal and other specific bacterial pneumonia	8,560	27,711	36,888	399	133
112.02	empyema, lung abcess	1,643	33,698	44,999	1,110	134
112.03	fungal and parasitic lung infections, except candida	343	27,431	38,770	2,095	141
113.01	viral pneumonia	4,690	23,206	33,325	487	144
113.02	other and unspecified pneumonia	88,794	21,929	32,023	107	146
113.03	influenza with pneumonia	3,997	22,933	35,220	557	154
113.04	pleurisy, excluding pleural effusion	8,772	18,813	29,872	319	159
113.05	pulmonary congestion/hypostasis	27,491	25,963	36,487	220	141
114.01	pleural effusion	34,761	34,323	38,181	205	111
114.02	pneumothorax (not tension)	5,360	42,137	47,554	650	113
114.03	tension pneumothorax (collapsed lung)	647	45,759	50,679	1,992	111
115.01	acute or unspecified bronchitis and bronchiolitis	176,402	7,930	16,649	40	210
115.02	influenza, except that with pneumonia	13,906	7,013	15,557	132	222
115.03	other and unspecified lung/respiratory system disease	53,494	18,952	30,564	132	161
115.04	atelectasis/pulmonary collapse	30,139	33,773	38,517	222	114
115.05	congenital lung/respiratory anomaly	930	22,333	33,825	1,109	151
115.06	foreign body trachea/bronchus/lung	1,167	43,390	52,387	1,534	121
116.01	blind, WHO or USA legal definition	4,268	16,031	21,857	335	136
117.01	endophthalmitis	1,137	11,252	18,920	561	168
117.02	corneal ulcer/abcess	2,120	7,921	17,257	375	218
117.03	acute inflammation of the orbit, including orbital cellulitis	464	11,903	24,275	1,127	204
118.01	retinal detachment	6,630	7,030	13,104	161	186
119.01	proliferative diabetic retinopathy	6,815	12,109	19,085	231	158
119.02	vitreous hemorrhage	3,842	10,499	16,770	271	160
120.01	diabetic retinopathy	24,588	10,917	18,733	119	172
120.02	vascular retinopathies, except diabetic	27,353	7,324	14,188	86	194
120.03	retinal hemorrhage, edema	11,924	8,061	14,824	136	184
121.01	retinal defects without detachment	3,836	5,368	11,673	188	217
121.02	other and unspecified retinal disorders	8,960	6,139	12,670	134	206
121.03	macular degeneration	108,571	6,051	12,261	37	203
121.04	retinitis pigmentosa, other hereditary retinal dystrophies	1,358	5,925	12,638	343	213
122.01	other and unspecified glaucoma	21,774	10,438	17,398	118	167
122.02	borderline glaucoma	55,208	4,740	10,930	47	231
122.03	open-angle glaucoma	91,866	5,585	12,111	40	217
122.04	primary angle-closure glaucoma, non-acute or unspecified	5,720	5,836	11,817	156	202
122.05	acute primary angle-closure glaucoma	1,732	6,959	15,004	360	216
123.01	cataract	396,623	5,264	11,579	18	220
123.02	diabetic cataract	485	9,814	17,138	778	175
124.01	disorders of the optic nerve and visual pathways, including optic neuritis	12,494	7,819	16,257	145	208
124.02	uveitis	7,814	6,865	13,414	152	195
124.03	other and unspecified eye disorders	277,293	5,870	12,843	24	219
124.04	disorders of refraction and accommodation (e.g., near-sightedness)	51,811	4,536	10,580	46	233
124.05	visual loss, one eye or unspecified	3,888	9,285	18,515	297	199
124.06	visual loss, both eyes	1,144	9,331	16,301	482	175
124.07	keratoconus	461	4,870	12,003	559	246

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
124.08	congenital anomalies of eye	3,622	6,040	13,163	219	218
124.09	open wound of ocular adnexa, foreign body on external eye, burn eye/adnexa	5,827	6,680	13,830	181	207
124.10	open wound of eyeball, including penetrating foreign body	708	9,812	15,702	590	160
125.01	perichondritis of pinna	1,098	6,549	13,202	398	202
125.02	malignant otitis externa	84	10,252	19,748	2,150	193
125.03	mastoiditis and related conditions	1,915	8,216	18,033	412	219
125.04	cholesteatoma of middle ear and mastoid	982	6,208	11,173	357	180
125.05	Meniere's Disease	3,173	6,122	10,742	191	175
125.06	larynx/vocal cord diseases	5,500	11,641	23,288	314	200
125.07	paralysis of vocal cords/larynx	1,323	25,250	38,803	1,067	154
126.01	hearing loss	46,842	7,116	14,576	67	205
127.01	other ear disorders	51,519	6,164	13,448	59	218
127.02	impacted earwax	70,847	5,866	12,727	48	217
127.03	otitis media, except chronic purulent	40,133	5,615	12,459	62	222
127.04	chronic purulent otitis media	1,851	6,487	13,514	314	208
127.05	vertiginous syndromes, except Meniere's disease	24,832	6,653	13,269	84	199
127.06	acute nose/throat infection (e.g., common cold)	199,979	5,858	13,356	30	228
127.07	other diseases of upper respiratory system	36,676	7,300	15,822	83	217
127.08	nasal polyps/allergic rhinitis (e.g., hay fever)	75,069	4,877	10,656	39	218
127.09	chronic sinusitis	50,871	6,698	15,925	71	238
127.10	disorders of teeth, gum, and jaw (e.g., gingivitis, periodontitis)	13,105	8,669	17,773	155	205
127.11	other oral soft tissue/tongue/jaw disorders	12,047	9,353	19,650	179	210
127.12	salivary gland diseases	4,700	8,855	18,793	274	212
127.13	congenital anomalies of ear, face, neck, nose, mouth, and pharynx	712	10,300	24,967	936	242
127.14	foreign body ear/nose/pharyx/larynx	3,453	19,185	36,494	621	190
128.01	kidney transplant status/complications	1,421	14,258	28,991	769	203
128.02	kidney transplant (procedure)	.	.	.	.	.
129.01	enrolled in Medicare End Stage Renal Disease (ESRD) program	.	.	.	.	.
130.01	dialysis status/complications	1,281	38,334	38,562	1,077	101
130.02	dialysis (procedure)	.	.	.	.	.
130.03	dialysis supplies and equipment (DME)	.	.	.	.	.
131.01	hypertensive renal disease, with renal failure	6,823	32,722	35,669	432	109
131.02	hypertensive heart/renal disease, with renal failure	622	28,090	33,060	1,325	118
131.03	hypertensive heart/renal disease, with heart/renal failure	1,388	38,223	37,337	1,002	98
131.04	acute renal failure	12,305	43,944	48,448	437	110
131.05	chronic renal failure	17,873	25,877	36,955	276	143
131.06	renal failure, unspecified	13,120	28,591	37,792	330	132
132.01	nephritis	7,968	24,169	32,301	362	134
133.01	hydronephrosis, bladder/ureter, other urinary tract obstruction	22,397	14,791	23,789	159	161
133.02	renal/ureteral/bladder calculus (e.g., kidney stones)	18,288	11,028	19,327	143	175
133.03	vesicoureteral reflux	260	17,899	24,517	1,522	137
133.04	neurogenic bladder	7,945	19,150	26,135	293	136
133.05	urethral stricture	10,511	10,518	17,564	171	167
133.06	retention of urine	26,856	19,040	25,284	154	133
134.01	fecal incontinence	2,940	15,327	24,291	448	158
134.02	incontinence/urethral discharge	31,863	12,543	19,707	110	157
135.01	cystitis, other urinary tract infections	182,719	13,196	22,970	54	174
135.02	kidney infection	7,357	18,059	27,074	316	150
136.01	impaired renal function	2,884	23,554	33,443	623	142
136.02	other urinary disorders	92,236	14,505	24,249	80	167
136.03	kidney cysts	14,416	15,477	24,107	201	156
136.04	congenital kidney/urinary abnormalities, exc obstruction/cysts	1,560	13,731	22,767	576	166
136.05	congenital polycystic/medullary kidney disease, except recessive	145	14,038	24,547	2,038	175
136.06	foreign body genitourinary tract	470	14,840	21,682	1,000	146
137.01	female infertility	113	9,305	23,473	2,204	252
138.01	pelvic inflammatory disease	2,620	15,665	23,687	463	151
138.02	diseases of female pelvic organs	8,870	9,130	16,800	178	184
138.03	endometriosis	4,945	10,015	17,729	252	177
138.04	genital prolapse	19,459	5,571	10,880	78	195
138.05	ovarian cyst	444	10,060	15,229	722	151
139.01	vaginal and cervical diseases	37,140	5,815	12,193	63	210
139.02	other diseases of female genital organs	28,073	8,298	16,356	98	197
139.03	female stress incontinence	12,799	7,420	13,833	122	186
139.04	menopausal and postmenopausal disorders	88,899	3,970	9,262	31	233

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
139.05	congenital anomalies of female or unspecified genital organs	512	9,976	16,582	733	166
140.01	hyperplasia of prostate	128,467	6,291	13,802	39	219
140.02	prostatic disorders, except enlarged prostate	29,460	6,538	13,044	76	200
140.03	penis/testis/male genital organs disorders	14,098	9,608	20,458	172	213
140.04	male infertility	126	6,831	13,207	1,178	193
140.05	impotence, organic	18,066	4,973	10,421	78	210
140.06	congenital anomalies of male genital organs	425	8,992	15,827	768	176
141.01	ectopic pregnancy	37	4,909	6,115	1,006	125
142.01	miscarriage/abortion	139	5,691	10,223	867	180
143.01	pregnancy with major renal/hypertension/eclampsia	7	22,142	23,912	9,038	108
143.02	shock/septicemia in pregnancy	19	19,959	29,087	6,630	146
143.03	premature delivery	61	9,369	11,665	1,497	125
143.04	major complications of labor/delivery	6	37,104	41,194	17,305	111
143.05	cesarean section	33	14,540	15,650	2,731	108
144.01	completed pregnancies with diagnosis in HCC 146	127	11,418	13,692	1,215	120
144.02	premature separation of placenta (abruptio placentae)	1	20,124	.	.	.
144.03	pregnancy with malposition	51	14,675	25,210	3,527	172
144.04	pregnancy with disproportion/obstruction	135	7,418	8,345	717	113
144.05	premature rupture of membranes/other amniotic cavity problem	61	9,896	11,058	1,419	112
144.06	minor complications of labor/delivery	155	9,362	18,409	1,481	197
144.07	trauma in labor/delivery	96	5,382	5,974	611	111
144.08	postpartum hemorrhage	16	7,256	8,340	2,085	115
144.09	multiple birth	3	27,327	29,738	17,169	109
145.01	completed pregnancies with diagnosis in HCC 147	221	7,747	9,700	653	125
145.02	normal delivery	341	6,613	8,488	459	128
145.03	routine postpartum care	88	6,488	8,121	867	125
146.01	other and unspecified antepartum hemorrhage	37	6,169	9,576	1,583	155
146.02	placenta previa	16	9,001	6,753	1,697	75
146.03	uncompleted pregnancies with diagnosis in HCC 143,144	143	9,344	12,708	1,064	136
146.04	pregnancy with other renal/hypertension/eclampsia	47	9,342	9,077	1,319	97
146.05	threatened labor/cervical incompetence	67	11,061	13,558	1,651	123
146.06	significant maternal diseases complicating pregnancy, except diabetes mellitus	60	15,411	16,098	2,077	104
146.07	diabetes mellitus complicating pregnancy	36	9,826	8,541	1,420	87
146.08	multiple gestation	7	16,463	19,965	7,373	121
146.09	pregnancy with deep vein thrombosis/embolism	20	28,436	51,020	11,432	179
147.01	hemorrhage in early pregnancy	84	4,593	6,429	701	140
147.02	minor complications of pregnancy	399	6,760	10,474	525	155
147.03	maternal diseases in pregnancy	178	9,566	11,700	876	122
147.04	pregnancy with fetal abnormality	221	7,658	10,321	694	135
147.05	routine antenatal care/normal pregnancy	569	6,469	10,052	421	155
147.06	miscellaneous other problems of pregnancy	165	7,386	8,961	697	121
148.01	decubitus ulcer of skin	20,733	30,313	37,309	259	123
149.01	chronic ulcer of skin, except decubitus	38,545	17,555	26,993	137	154
150.01	third degree burns, 10%+ of body surface	59	59,748	72,694	9,451	122
151.01	other/unspecified third degree burns (<10% of body surface)	494	24,684	41,019	1,845	166
151.02	burn, 10%+ of body surface, less than 10% third degree or unspecified	73	41,170	59,263	6,948	144
152.01	cellulitis/abcess/other local skin infection	109,235	12,238	22,114	67	181
153.01	other dermatological disorders	229,287	6,426	14,112	29	220
153.02	dermatitis from substances taken internally (e.g., food, drugs)	4,363	15,007	27,213	412	181
153.03	bullous dermatoses, except pemphigus/pemphigoid	691	8,341	17,455	664	209
153.04	pemphigus/pemphigoid	1,033	11,433	20,294	631	178
153.05	other specified erythematous conditions, except rosacea	4,334	8,196	16,539	251	202
153.06	erythema multiforme, including toxic epidermal necrolysis	501	12,867	26,002	1,161	202
153.07	discoid lupus erythematosus	1,388	9,935	17,951	482	181
153.08	psoriasis and parapsoriasis without arthopathy	12,062	6,245	13,337	121	214
153.09	other dermatosis	149,528	4,450	9,650	25	217
153.10	diseases of nail (e.g., ingrown toenail)	91,867	10,373	18,904	62	182
153.11	congenital anomalies of the integument	6,570	7,004	14,592	180	208
153.12	burns, except third degree or 10%+ body surface	4,342	10,484	21,917	333	209
154.01	fracture of skull/face with coma > 1 hour	64	40,321	57,055	7,137	142
154.02	cerebral laceration, contusion, hemorrhage following injury with coma > 1 hour	198	46,372	47,689	3,388	103
154.03	intracranial injury of other and unspecified nature w/ coma >1 hour	89	32,154	47,190	4,990	147
155.01	fracture of skull/face with coma < 1 hour or unspecified	2,197	17,457	27,079	578	155
155.02	concussion with loss of consciousness> 1 hour	86	23,302	32,825	3,534	141

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
155.03	cerebral laceration, contusion, hemorrhage foll injury w/ coma < 1 hour or unspec	3,221	28,682	35,917	633	125
155.04	intracranial injury of other and unspecified nature w/coma < 1 hour or unspec	11,540	16,564	24,896	232	150
155.05	late effects of skull/face fracture, intracranial injury	687	20,940	28,778	1,098	137
156.01	concussion, except with loss of consciousness > 1 hour	2,426	15,165	23,728	482	156
156.02	head injury, unspecified	1,197	13,749	19,210	555	140
157.01	pathological/compression fracture/collapse of vertebrae	9,003	19,841	24,084	254	121
157.02	vertebral fracture without spinal cord injury	12,552	16,508	22,603	202	137
158.01	pathological hip fracture	1,169	31,581	26,655	780	84
158.02	pelvic fracture	5,409	19,910	23,007	313	116
158.03	femoral (hip) fracture	24,088	23,056	23,781	153	103
158.04	dislocation of hip	1,174	27,048	29,646	865	110
159.01	pathological fracture of humerous	237	26,077	28,418	1,847	109
159.02	pathological fracture of tibia or fibula	355	16,039	23,632	1,255	147
159.03	open fracture of ribs, fracture of sternum, larynx, trachea, trunk bones	1,250	16,356	30,607	866	187
159.04	fracture of humerous, multiple upper limb bones	9,286	14,313	21,184	220	148
159.05	fractures of patella, tibia, fibula, multiple lower/upper limb bones	7,769	14,576	21,566	245	148
159.06	fractures of ankle	6,868	11,295	18,346	221	162
160.01	injury to heart/lung/intrathoracic organs/blood vessels of thorax	2,254	25,792	36,345	765	141
160.02	gastrointestinal/liver/kidney/spleen/pelvis injury	2,321	27,463	35,687	741	130
161.01	traumatic amputation of leg/arm/hand/foot/toe, compl reattached body part	2,619	37,344	38,673	756	104
162.01	unspecified pathological fractures	3,550	16,148	22,325	375	138
162.02	pathological fracture of distal radius and ulna	173	11,274	19,268	1,465	171
162.03	fractures of nasal bone	1,999	11,310	19,247	431	170
162.04	fracture of rib, closed	10,694	14,311	22,654	219	158
162.05	fracture of clavicle, scapula	2,420	14,589	22,619	460	155
162.06	fracture of hand/wrist/lower arm	18,228	9,425	16,722	124	177
162.07	fracture of foot	10,437	8,451	16,355	160	194
162.08	fractures of unspecified bones	2,971	18,151	24,217	444	133
162.09	traumatic dislocations, except knee, shoulder, and vertebrae	3,639	9,400	17,050	283	181
162.10	shoulder dislocation	2,127	12,078	21,611	469	179
162.11	dislocation of knee, including cartilage/meniscus tear	8,897	6,688	11,553	122	173
162.12	sprains	99,730	6,742	13,305	42	197
162.13	open wound, except eye and lower arm	42,644	14,196	24,867	120	175
162.14	open wound/injury of lower arm	36,598	8,226	15,749	82	191
162.15	injury late effects, except spinal cord, skull/face fracture, and intracranial	4,365	20,170	27,661	419	137
162.16	contusion/superficial injury	129,050	10,664	18,485	51	173
162.17	crushing injury	1,187	8,979	16,790	487	187
162.18	other accidents	40,677	11,852	19,753	98	167
162.19	accidental falls	39,251	14,952	20,186	102	135
163.01	poisoning by (unintentional) provider or patient medication error	8,852	21,375	26,865	286	126
163.02	poisoning by specified nonmedicinal substances, injury external causes	6,579	14,688	25,831	318	176
163.03	poisoning by other and unspecified nonmedical substances	4,014	5,284	11,833	187	224
163.04	anaphylactic shock	549	12,614	21,471	917	170
163.05	adverse effects of correctly prescribed and administered drugs	31,417	14,928	22,531	127	151
163.06	unspecified allergic reaction	12,909	6,547	13,183	116	201
164.01	mechanical/other complications of internal device/implant/graft, exc orthopedic	18,413	28,569	35,229	260	123
164.02	early complications of trauma	3,112	29,042	41,969	752	145
164.03	mechanical complication of internal orthopedic device/implant/graft	5,247	22,211	24,491	338	110
164.04	infection/inflammation from internal device/implant/graft	5,549	45,098	46,318	622	103
164.05	cerebral/cardiac/respiratory/hepatic/renal/other complications of procedures	17,908	37,052	38,850	290	105
165.01	other and unspecified complications of procedures and medical care	12,574	26,910	37,584	335	140
165.02	hemorrhage/hematoma/seroma complicating a procedure	7,724	31,299	37,367	425	119
165.03	misadventure to patient during surgery or medical care	6,321	27,096	33,050	416	122
165.04	postoperative infection	5,946	42,304	45,925	596	109
166.01	stupor/altered consciousness/trans global amnesia/febrile convulsions	16,588	25,946	31,570	245	122
166.02	unspecified congenital anomalies	227	13,887	23,397	1,554	168
166.03	syncope and collapse	52,797	14,720	21,725	95	148
166.04	fever	40,130	23,861	33,114	165	139
166.05	other and unspecified nervous/musculoskeletal symptoms	4,634	14,620	23,197	341	159
166.06	abnormality of gait (ataxic, paralytic, spastic, staggering)	22,280	20,850	26,147	175	125
166.07	ataxia (muscular incoordination), transient limb paralysis	9,698	16,751	23,311	237	139
166.08	anorexia	8,347	19,884	27,807	304	140
166.09	abnormal weight loss	35,031	11,287	19,524	104	173
166.10	feeding difficulties	4,993	45,527	53,248	754	117

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
166.11	lack of expected normal physiological development	1,754	27,488	33,721	805	123
166.12	respiratory/other chest symptoms	68,746	15,443	25,214	96	163
166.13	speech disturbance nec (e.g., dysarthria/dysphasia/slurred speech)	8,637	24,199	28,378	305	117
166.14	symbolic dysfunction (e.g., apraxia/alexia/dyslexia/agraphia/amnesia)	1,528	21,472	24,632	630	115
166.15	dyspnea (labored breathing)/other respiratory abnormalities	23,750	18,954	29,043	188	153
166.16	respiratory distress/insufficiency	164,308	16,626	26,151	65	157
166.17	hemoptysis (coughing up blood)	6,937	20,126	32,101	385	160
166.18	chest pain	273,684	12,831	21,525	41	168
166.19	dysphagia	43,310	20,698	31,909	153	154
166.20	abdominal/pelvis symptoms	204,229	12,769	22,847	51	179
166.21	ascites	6,220	31,884	39,516	501	124
166.22	debility, nos	9,578	28,292	33,682	344	119
167.01	headache excluding migraine	66,543	9,610	18,181	70	189
167.02	other general symptoms	352,318	10,514	19,853	33	189
167.03	somatic/segmental dysfunction	45,912	4,787	10,689	50	223
167.04	dizziness and giddiness	91,637	8,474	15,504	51	183
167.05	malaise and fatigue, including chronic fatigue syndrome	127,734	10,782	19,157	54	178
167.06	cardiovascular symptoms, except chest pain	85,485	11,171	20,598	70	184
167.07	cough	87,443	10,189	19,507	66	191
167.08	urinary system symptoms, except incontinence and retention of urine	72,250	9,580	18,493	69	193
167.09	unhealthy lifestyle/abused person/psychological, behavioral problems	2,801	15,847	22,050	417	139
167.10	infectious disease contact/carrier	2,401	11,053	25,412	519	230
167.11	problems of internal organs/external sites	4,148	12,921	23,955	372	185
167.12	care not delivered	5,508	18,313	24,336	328	133
168.01	extremely low birthweight neonates	8	9,264	14,352	5,074	155
169.01	very low birthweight neonates	3	895	723	417	81
170.01	respiratory distress syndrome/other serious perinatal respiratory complication	545	35,539	50,233	2,152	141
170.02	necrotizing enterocolitis and other major gastrointestinal disorders of infant	543	20,102	25,722	1,104	128
170.03	drug/alcohol affected newborn, including Fetal Alcohol Syndrome	79	12,512	20,507	2,306	164
170.04	low birthweight, weight not given	1,088	18,539	29,125	883	157
170.05	somewhat low birthweight neonates	3	10,117	15,448	8,919	153
170.06	convulsions, cerebral hemorrhage, and other perinatal neurologic disorders	258	23,025	34,096	2,122	148
170.07	esophageal atresia/stenosis, oth cong gastrointestinal anomalies, age < 2	.	.	.	.	.
171.01	newborn infections	158	17,399	31,822	2,532	183
171.02	perinatal disorders of digestive system	523	11,963	19,750	863	165
171.03	other perinatal problem	677	15,009	30,209	1,161	201
171.04	fetal distress/asphyxia	63	18,057	34,293	4,309	190
171.05	fetal death	15	9,854	17,278	4,412	175
171.06	neonatal hemorrhage	50	6,459	7,925	1,121	123
171.07	perinatal hemolytic disorders	161	12,466	21,072	1,659	169
171.08	perinatal jaundice	61	15,784	27,527	3,532	174
171.09	endocrine disorder of newborn	87	16,029	22,032	2,364	137
171.10	newborn skin/temperature problem	53	15,349	21,108	2,899	138
171.11	multiple birth	17	27,407	42,690	10,431	156
172.01	single birth	12	5,725	9,700	2,800	169
173.01	lung transplant (procedure)	.	.	.	.	.
173.02	heart transplant (procedure)	.	.	.	.	.
173.03	bone marrow transplant (procedure)	.	.	.	.	.
173.04	liver transplant (procedure)	.	.	.	.	.
173.05	pancreas transplant (procedure)	.	.	.	.	.
174.01	liver transplant status/complications	339	27,867	49,580	2,692	178
174.02	heart transplant status/complications	581	24,718	48,916	2,029	198
174.03	lung transplant status/complications	110	31,067	84,140	8,032	271
174.04	bone marrow transplant status/complications	65	33,021	43,460	5,373	132
174.05	pancreas transplant status/complications	32	29,031	57,496	10,138	198
175.01	other organ transplant status/complications	2,543	10,312	23,189	460	225
175.02	other organ replacement	1,368	24,395	41,569	1,124	170
176.01	artificial opening of gastrointestinal tract status/complications	8,311	37,049	41,472	455	112
176.02	other and unspecified artficial opening status	1,271	42,573	48,080	1,348	113
176.03	artificial opening of urinary tract status	933	27,519	29,222	957	106
176.04	gastrostomy (procedure)	.	.	.	.	.
176.05	enterostomy (procedure)	.	.	.	.	.
176.06	enteral nutrition (DME)	.	.	.	.	.
176.07	parenteral nutrition (DME)	.	.	.	.	.

Table A-3 (continued)

Medicare Concurrent Sample Statistics, 1997, by All Diagnosis Diagnostic Groups (DXG)

DXG	DXG Label	Number of Person-Years	1997 Medicare Payments Mean	Standard Deviation	Standard Error	CV
177.01	amputation status (lower limb), amputation complications	3,910	37,667	36,602	585	97
177.02	amputation, lower limb (procedure)	.	.	.	.	.
177.03	lower limb prostheses (DME)	.	.	.	.	.
178.01	amputation status, upper limb	204	24,536	29,499	2,064	120
178.02	amputation, upper limb (procedure)	.	.	.	.	.
178.03	upper limb prostheses (DME)	.	.	.	.	.
179.01	heart valve replacement status	9,303	18,862	28,138	292	149
179.02	postsurgical states, eye	89,223	6,284	12,409	42	197
179.03	joint replacement	23,939	18,551	20,062	130	108
179.04	other postsurgical states	70,973	18,900	25,127	94	133
179.05	status cardiac pacemaker, other, and unspecified cardiac device	22,053	17,024	23,132	156	136
179.06	status automatic implantable cardiac defibrillator	1,497	27,601	29,665	767	107
179.07	status cerebrospinal fluid drainage device/shunt	566	30,454	37,403	1,572	123
179.08	elective surgery	950	8,713	17,467	567	200
179.09	prothesis/other device fitting, adjustment	2,237	23,184	33,982	718	147
179.10	other orthopedic aftercare	6,958	16,940	22,776	273	134
179.11	aftercare	60,303	14,112	22,857	93	162
179.12	donor	387	20,856	43,944	2,233	211
180.01	radiation therapy	6,520	18,037	23,070	286	128
180.02	radiation therapy (procedure)	.	.	.	.	.
181.01	chemotherapy	8,851	25,538	27,131	288	106
181.02	chemotherapy (procedure)	.	.	.	.	.
182.01	rehabilitation procedures	35,251	22,152	27,987	149	126
183.01	screening/observation/special exams	375,441	9,607	18,174	30	189
183.02	vaccination, medical exam, other preventive	574,115	4,863	10,598	14	218
183.03	administrative/consultation	10,388	10,277	19,365	190	188
183.04	screening for malignant neoplasm	152,340	3,693	8,938	23	242
184.01	history of malignant neoplasm	87,256	11,337	18,867	64	166
184.02	history of mental disorder/other disease	42,061	14,997	21,338	104	142
184.03	history of drug allergy/other health hazard	36,601	13,908	21,447	112	154
184.04	family history of disease	20,482	5,710	12,209	85	214
185.01	oxygen supplies/equipment (DME)	.	.	.	.	.
186.01	nebulizers and related drugs (DME)	.	.	.	.	.
186.02	continuous positive airway pressure system (DME)	.	.	.	.	.
186.03	intermittent positive pressure breathing system (DME)	.	.	.	.	.
187.01	hospital beds (DME)	.	.	.	.	.
187.02	patient lifts (DME)	.	.	.	.	.
187.03	power operated vehicles (DME)	.	.	.	.	.
188.01	wheelchairs (DME)	.	.	.	.	.
188.02	commodes (DME)	.	.	.	.	.
189.01	walkers (DME)	.	.	.	.	.

NOTE: Based on program d9cn03cd.

SOURCE: Health Economics Research, Inc.