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# research REPORT

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## AN INTRODUCTION TO DIAGNOSIS-BASED RISK ADJUSTERS

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## THE MOTIVATION FOR DIAGNOSIS-BASED RISK ADJUSTERS

One of the risks assumed by capitated health plans and providers is the risk of selection. Selection is said to have taken place if the membership of a particular health plan is either more healthy or less healthy when compared with the average of the total eligible population. A health plan has experienced positive selection if the composite health status of its membership is better than average and adverse selection if the health status is worse than average. Selection, whether positive or adverse, can play a significant role in the equity between payment rates and health plan costs.

The process of selection that results in a biased enrollment for a particular health plan can be a result of randomness, which is frequently the case for small health plans, but more often is explainable. When members are given choices, it is natural for them to select the option that is most economically advantageous to them. As such, healthy people tend to make choices similar to other healthy people, and less healthy people generally make choices similar to other less healthy people. Thus, the eligible population is often not evenly or randomly distributed, but is instead made up of subgroups with health statuses above or below average.

The actions and decisions of health plans can drive the process of member choice. Plan *benefit decisions* can attract individuals with specific health concerns; for example, including a rich prescription drug benefit will be attractive to members with chronic conditions requiring a regular drug program. Alternatively, a medical spending account will be attractive to a healthier population expecting to have few medical claims. *Network features*, such as the inclusion of a provider group with a reputation for excellence in cardiac care or a partnership with a children's hospital, can skew the average health status of the membership. *Marketing efforts*, such as advertising a Medicare risk product at events attended by more active seniors or emphasizing well-child and preventive care as network priorities, can also produce biased membership.

Health plans and providers accepting capitation (a predetermined reimbursement that is independent of actual utilization) are exposed to the risk of adverse selection. If the population they enroll is significantly less healthy than average, the revenue received may be inadequate. At the same time, payers for programs such as Medicare and Medicaid suffer when health plans receive an average capitation and experience positive selection because of the adverse selection in the remaining fee-for-service population. In this case, payment rates calculated based on an average population are being paid to cover a relatively healthier subgroup. Studies indicate that many Medicare risk contractors are attracting a healthier-than-average portion of the aged population, leaving a less healthy fee-for-service population. As a result, the Medicare risk payment rates for risk contractors are based on the higher average costs of the adverse population.

The primary objective of diagnosis-based risk adjusters is to reduce the effect of risk selection on payers, health plans, providers and enrolled members. A better match between payments and expected costs will result in a more equitable use of funds by payers, will reduce the financial risk for health plans and providers, and can increase the choices available to enrolled members, especially those in poor health. Essentially, the intent is to create a "level playing field" for payers, health plans and providers.



## TRADITIONAL VERSUS DIAGNOSIS-BASED RISK ADJUSTMENT

Appropriate adjustments to premium payments and capitation rates to reflect the risk being assumed have long been recognized as important for financial stability and market competitiveness. Traditional risk adjustment methodologies in the commercial market include adjustments for age, gender, industry, geographic area and family size. Since 1985, payment rates to Medicare risk contractors have been based on the Health Care Financing Administration’s calculation of the Adjusted Average Per Capita Cost (AAPCC), with adjustments for the age, gender, county, and the institutional, disability, working and welfare status of the member.

Traditional approaches to risk adjustment fall short, however, because they do not account for the differences in health status among demographically similar members of a population. Medicaid programs in several states have recognized this difference in a small way by creating separate payment rates for enrollees with the AIDS diagnosis. The result is that health plans with a higher-than-average percentage of members with AIDS will receive a higher-than-average payment rate, with the opposite being true for plans with a lower-than-average percentage of members with AIDS. The intent is also to remove any disincentives for enrolling members with AIDS, thereby expanding patient choice. Table 1 illustrates the impact on the composite payment rate for health plans experiencing varying selection relative to members with AIDS, using AIDS-specific rates.

Table 1 illustrates that all three health plans receive the same average payment rate when no risk adjustment mechanism is in place. However, with adjustments for the members with the AIDS diagnosis, Plan 2 has its average annual payment rate reduced from \$1,500 to \$1,350 per member as a result of the positive selection. Plan 3 has its average annual payment rate increased from \$1,500 to \$1,700 per member because of the adverse selection.

Diagnosis-based risk adjusters are based on the concept demonstrated in Table 1, expanded to include many more diseases and diagnoses. The process is complex and requires many decisions, such as what data to use and how the program will be implemented. This report describes some of the more common risk

assessment methodologies along with the criteria for a successful risk adjuster. Also discussed are both actuarial and nonactuarial considerations in risk adjuster development and implementation. Finally, the level of enhanced predictability is summarized for various approaches to diagnosis-based risk adjustment.

Table 1

SAMPLE IMPACT OF SELECTION ON AVERAGE PAYMENT RATES WITH AND WITHOUT RISK ADJUSTMENT				
Health Plan	Selection	Population Allocation	Annual Payment Rate	
			No Risk Adjustment	With Risk Adjustment
Plan 1	Average			
	AIDS	2%	\$1,500	\$11,300
	Other	98%	\$1,500	\$ 1,300
	Average	100%	\$1,500	\$ 1,500
Plan 2	Positive Selection			
	AIDS	0.5%	\$1,500	\$11,300
	Other	99.5%	\$1,500	\$ 1,300
	Average	100%	\$1,500	\$ 1,350
Plan 3	Adverse Selection			
	AIDS	4%	\$1,500	\$11,300
	Other	96%	\$1,500	\$ 1,300
	Average	100%	\$1,500	\$ 1,700



## DIAGNOSIS-BASED RISK ASSESSMENT METHODOLOGIES (GROUPERS)

The diagnosis-based risk assessment methodologies discussed in this paper use ICD-9 diagnosis codes as the basis for health status identification and corresponding risk classification. While not discussed here, other models exist that use alternative sources of data to assess health status. The process of diagnosis-based risk assessment is much more complicated than traditional approaches to calculating risk factors because there is not a unique one-to-one relationship between members and ICD-9 codes. With traditional risk adjustment factors, each person has only one identifier per demographic adjustment factor (i.e., age, gender, industry, and geographic area). With ICD-9 codes, a member may have none or many diagnosis codes during the time period over which the data is gathered. Another complexity, and again not the case with traditional factors, is that diagnoses and the associated ICD-9 codes can change unexpectedly over time for each member, creating a moving target.

Because there are over 11,000 ICD-9 diagnosis codes, those with similar risk characteristics are grouped together for rating purposes. This grouping process is often done with traditional factors (e.g., ages banded together or areas rated by three-digit zip code), however the process of deciding how to group diagnosis codes is much more difficult. Complex algorithms, often referred to as groupers, have been developed for this specific purpose.

Four broad categories of groupers described in this report include:

- Ambulatory Care Group (ACG) models
- Diagnostic Cost Group (DCG) models
- Disability Payment System (DPS) model
- Hierarchical Coexisting Conditions (HCC) models



### Ambulatory Care Group Models

A research team at Johns Hopkins produced an early version of the ACG risk assessment method in 1993. As the name implies, the original design was a cost predictor for ambulatory care only, but it has been expanded to predict total medical expenditures. The Johns Hopkins' grouper clusters ICD-9 codes into 34 diagnostic groups. Every ICD-9 code is individually mapped into a particular diagnosis group, so a person with multiple diagnoses could be assigned to multiple diagnostic groups.

For each person, the resulting diagnostic group assignment(s) is combined with age and gender to assign a single ACG. This early version of the model includes a total of 52 possible ACG classifications, with category 52 for those with no diagnosis information. Table 2 gives a brief description of these ACG categories, which correspond to the measures of predictive accuracy discussed later in this paper. More current versions of the ACG model have been expanded to approximately 100 ACG categories.

### Diagnostic Cost Group Models

DCGs were developed in large part at the Boston University Department of Economics, using the Medicare Standard Analytical File - 5% Sample data extract. This approach begins by mapping each ICD-9 code to a unique DCG diagnosis group. These groups, called DxGroups, are developed based on clinical coherence and require a meaningful sample of data. As with ACGs, those patients with multiple ICD-9 codes may be assigned to multiple DxGroups. The DxGroups are then ranked in average cost order from lowest to highest. Each member is then assigned to the single, highest cost DxGroup to which he or she belongs. The DxGroups are then collapsed into DCGs by grouping those with similar costs.

Many DCG models exist; they vary in how ICD-9 codes are mapped to DCG diagnoses and how these diagnoses are mapped to DCGs. Examples of these variations are the inclusion of only inpatient diagnoses, the addition of ambulatory diagnoses, distinguishing between primary and secondary diagnoses, and efforts to isolate individuals with particular high-cost conditions.

Table 3 summarizes the PIP-DCG (Primary In-Patient DCG) categories (proposed by HCFA in the Federal Register, September 8, 1998) that gen-

Table 2

SAMPLE ACG CATEGORIES	
ACG	Description
1	Acute Minor, Age <1
2	Acute Minor, Age 2-5
3	Acute Minor, Age 6+
4	Acute: Major
5	Likely to Recur, without Allergies
6	Likely to Recur, with Allergies
7	Asthma
8	Chronic Medical, Unstable
9	Chronic Medical, Stable
10	Chronic Specialty
11	Ophthalmological/Dental
12	Chronic Specialty, Unstable
13	Psychosocial, without Psychosocial Major
14	Psychosocial, with Psychosocial Major, without Psychosocial Minor
15	Psychosocial, with Psychosocial Major, with Psychosocial Minor
16	Preventive/Administrative
17	Pregnancy
18	Acute Minor and Acute Major
19	Acute Minor and Likely to Recur Discrete, Age <1
20	Acute Minor and Likely to Recur Discrete, Age <2-5
21	Acute Minor and Likely to Recur Discrete, Age >5, Without Allergy
22	Acute Minor and Likely to Recur Discrete, Age >5, With Allergy
23	Acute Minor and Chronic Medical: Stable
24	Acute Minor and Eye/Dental
25	Acute Minor and Psychosocial Without Psychosocial Major
26	Acute Minor and Psychosocial With Psychosocial Major, without Psychosocial Minor
27	Acute Minor and Psychosocial with Psychosocial Major and Minor
28	Acute Major and Likely to Recur Discrete
29	Acute Minor/Acute Major/Likely to Recur Discrete, Age <2
30	Acute Minor/Acute Major/Likely to Recur Discrete, Age 2-5
31	Acute Minor/Acute Major/Likely to Recur Discrete, Age 6-11
32	Acute Minor/Acute Major/Likely to Recur Discrete, Age >5, Without Allergy
33	Acute Minor/Acute Major/Likely to Recur Discrete, Age >5, With Allergy
34	Acute Minor/Likely to Recur Discrete/Eye & Dental
35	Acute Minor/Likely to Recur Discrete/Psychosocial
36	Acute Minor/Acute Major/Likely to Recur Discrete/Eye & Dental
37	Acute Minor/Acute Major/Likely to Recur Discrete/Psychosocial
38	2-3 Other ADG Combinations, Age <17
39	2-3 Other ADG Combinations, Males Age 17-34
40	2-3 Other ADG Combinations, Females Age 17-34
41	2-3 Other ADG Combinations, Age >34
42	4-5 Other ADG Combinations, Age <17
43	4-5 Other ADG Combinations, Age 17-44
44	4-5 Other ADG Combinations, Age >44
45	6-9 Other ADG Combinations, Age <6
46	6-9 Other ADG Combinations, Age 6-16
47	6-9 Other ADG Combinations, Males Age 17-34
48	6-9 Other ADG Combinations, Females Age 17-34
49	6-9 Other ADG Combinations, Age >34
50	10+ Other ADG Combinations
51	Visits with No ADGs Recorded
52	No Visits, No Diagnoses Recorded

Source: Society of Actuaries Monograph M-H896-1

erate additional payments to Medicare risk contractors. Under this Medicare proposal, base payments determined by age, gender, disability and county of residence are supplemented by the PIP-DCG payments and also by additional payments if dually eligible for Medicaid. Appendix A on page 15 contains a more complete summary of the risk adjuster proposed for Medicare.

Table 3

PROPOSED MEDICARE PIP-DCG CATEGORIES					
PIP- DCG Group	Dx Description	PIP- DCG Group	Dx Description	PIP- DCG Group	Dx Description
6	18 Cancer of Prostate/Testis/Male Genital Organs	14	66 Personality Disorders		
	14 Breast Cancer		29 Adrenal Gland, Metabolic Disorders		
8	82 Acute Myocardial Infarction		70 Degenerative Neurologic Disorders		
	146 Pelvic Fracture		2 Septicemia/Shock		
	145 Fractures of Skull/Face	144	Spinal Cord Injury		
	77 Valvular and Rheumatic Heart Disease		58 Delirium/Hallucinations		
	86 Atrial Arrhythmia		61 Paranoia and Other Psychoses		
	84 Angina Pectoris		63 Anxiety Disorders		
	80 Coronary Atherosclerosis		73 Epilepsy and Other Seizure Disorders		
	92 Precerebral Arterial Occlusion		10 Stomach, Small Bowel, Other Digestive Cancer		
	16 Cancer of Uterus/Cervix/Female Genital Organs		12 Rectal Cancer		
	79 Hypertension, Complicated		26 Diabetes with Acute Complications/Hypoglycemic Coma		
	36 Peptic Ulcer	113	Pleural Effusion/Pneumothorax/Empyema		
	110 Asthma		60 Major Depression		
	96 Aortic and Other Arterial Aneurysm	18	34 Cirrhosis, Other Liver Disorders		
	153 Brain Injury		72 Paralytic and Other Neurologic Disorders		
	1 Central Nervous System Infections		108 Gram-Negative /Staphylococcus Pneumonia		
	39 Abdominal Hernia, Complicated		111 Pulmonary Fibrosis and Bronchiectasis		
	64 Alcohol/Drug Dependence		89 Congestive Heart Failure		
10	109 Bacterial Pneumonia		105 Chronic Obstructive Pulmonary Disease		
	42 Gastrointestinal Obstruction/Perforation		95 Atherosclerosis of Major Vessel		
	143 Vertebral Fracture Without Spinal Cord Injury		13 Lung Cancer		
	21 Other Cancers		8 Mouth/Pharynx/Larynx/Other Respiratory Cancer		
	4 Tuberculosis	20	112 Aspiration Pneumonia		
	97 Thromboembolic Vascular Disease		76 Coma and Encephalopathy		
	59 Schizophrenic Disorders		75 Polyneuropathy		
	11 Colon Cancer		17 Cancer of Placenta/Ovary/Uterine Adnexa		
	116 Kidney Infection		55 Blood/Immune Disorders		
	83 Unstable Angina	23	134 Decubitus and Chronic Skin Ulcers		
	94 Transient Cerebral Ischemia		33 End-stage Liver Disorders		
	81 Post-Myocardia Infarction		9 Liver/Pancreas/Esohagus Cancer		
	150 Internal Injuries/Traumatic Amputations/Third Degree Burns		88 Cardio-Respiratory Failure and Shock		
	32 Pancreatitis/Other Pancreatic Disorders		27 Diabetes with Chronic Complications		
	147 Hip Fracture		115 Renal Failure/Nephritis		
	158 Artificial Opening of Gastrointestinal Tract Status				
12	91 Cerebral Hemorrhage	26	7 Metastatic Cancer		
	93 Stroke				
	56 Dementia	29	3 HIV/AIDS		
	98 Peripheral Vascular Disease		15 Blood, Lymphatic Cancers/Neoplasms		
	41 Inflammatory Bowel Disease		20 Brain/Nervous System Cancers		
	22 Benign Brain/Nervous System Neoplasm				
	48 Rheumatoid Arthritis and Connective Tissue Disease				
	49 Bone/Joint Infections/Necrosis				
	19 Cancer of Bladder, Kidney, Urinary Organs				
	45 Gastrointestinal Hemorrhage				
	87 Paroxysmal Ventricular Tachycardia				
	133 Cellulitis and Bullous Skin Disorders				
	57 Drug/Alcohol Psychoses				

Source: Federal Register, Volume 63, Number 173. 47506-47513



### Disability Payment System Model

The DPS model was created at the University of California at San Diego, using claim data from the Medicaid programs of seven states. The DPS model groups diagnoses into 18 major diagnostic categories, some of which can be further subdivided by cost (very high, high, medium or low), for a total of 43 categories. Table 4 summarizes these groupings and gives a sample diagnosis for each.

As with the ACGs and DCGs, the initial mapping of ICD-9 codes to DPS categories can result in a single patient being mapped into multiple buckets. However, unlike ACGs and DCGs, the cost associated with each of the 18 major categories to which a patient belongs are added together to determine the payment rate. The cost of a single major category is calculated one of two ways. Eight of the 18 categories are fully counted, which means that costs are added together for a person who has been mapped to multiple levels in the same major category (i.e., low-cost and high-cost). Ten of the 18 are hierarchical in that costs are only counted for the highest cost subgroup, or most severe condition, within each major category.

The DPS model was designed for use with a disabled population, but work is being done to extend the model to the Aid to Families with Dependent Children (AFDC) population as well.

Table 4

DPS MODEL CATEGORIES			
Fully Counted Categories	Sample Diagnoses	Hierarchic Categories	Sample Diagnoses
Central Nervous System		Psychiatric	
High-Cost	Quadriplegia	High-Cost	Schizophrenia
Medium-Cost	Muscular Dystrophy	Medium-Cost	Manic Depressive
Low-Cost	Cerebral Palsy	Low-Cost	Hysteria
Skeletal and Connective		Pulmonary	
High-Cost	Juvenile Arthritis	Very High-Cost	Congenital Pneumonia
Medium-Cost	Osteoporosis	High-Cost	Congenital Lung Anomalies
Low-Cost	Disc Disorders	Medium-Cost	Chronic Obstructive Pulmonary Disease
Gastrointestinal		Low-Cost	Simple Asthma
High-Cost	Liver Disease	Cardiovascular	
Low-Cost	Intestinal Obstruction	High-Cost	Heart Transplant Status
Metabolic		Medium-Cost	Congestive Heart Failure
High-Cost	Pituitary Dwarfism	Low-Cost	Acute Myocardial Infarction
Medium-Cost	Malnutrition	Diabetes	
Low-Cost	Adrenal Disorders	High-Cost	Adult-onset with Complications
Cancer		Low-Cost	Adult-onset without Complications
High-Cost	Nervous System Cancers	Hematologic	
Medium-Cost	Lymphomas	Very High-Cost	Hemophilia (clotting factors VIII and IX)
Low-Cost	Melanoma	High-Cost	Hemophilia (other clotting factors)
Eye and Ear	Cataracts	Medium-Cost	Hemoglobin C Sickle Cell Disease
Skin		Low-Cost	White Blood Cell Disorders
High-Cost	Decubitus Ulcers	Substance Abuse	
Low-Cost	Other Chronic Skin Ulcers	High-Cost	Drug dependence or abuse
Gynecologic	Ovarian Cysts	Low-Cost	Alcohol dependence or abuse
		Mental Retardation	
		High-Cost	Profound Mental Retardation
		Medium-Cost	Severe Mental Retardation
		Low-Cost	Mild and Moderate Mental Retardation
		Renal	
		High-Cost	Renal Failure
		Low-Cost	Nephritis
		Cerebrovascular	Cerebral Thrombosis
		AIDS	Kaposi's Sarcoma

Source: Richard Kronick et al.



## *Hierarchical Coexisting Condition Models*

The HCC models are an extension of the DCG risk adjustment methodology developed at Boston University, with the primary intent of improving the model in two areas. The first improvement is to recognize ambulatory diagnosis information in addition to the inpatient diagnosis data of the early DCG models. This is particularly critical to managed care plans that have shifted care from an inpatient setting to an ambulatory setting. Without the ambulatory diagnosis data, managed care plans would likely have an overly optimistic projection of the health status of their membership. The second significant addition in the HCC model is the ability to recognize multiple conditions for a single person, as opposed to the DCG model that adjusts the payment according to the condition with the highest average cost only. The restriction to a single diagnosis can be significant for groups with a large proportion of elderly or disabled enrollees, where it is relatively common for a person to have multiple chronic conditions.

Based on the inpatient and ambulatory ICD-9 diagnosis information, conditions that are clinically closely related are assigned into hierarchies. Within each hierarchy, a person is assigned to the most serious condition to which he or she belongs, similar to the DPS model. Across hierarchies, a person can be assigned to multiple conditions. The HCC model sums the payment rate for each condition to calculate the total for each member.

To improve the predictive accuracy, the HCC model has been expanded from its 66 diagnosis categories to include 16 categories based on procedure codes and five groupings based on principal inpatient diagnosis. However, the model developers have expressed concern about using this full model as a basis for payment because of the incentives it may contain. In particular, they are concerned about the model sensitivity to variations in provider practice patterns and coding methodologies, imprecise coding, provider manipulation of coding, and incentives for increased testing to identify members in high diagnosis categories. For these reasons, they suggest using a reduced subset of categories that includes only 40 of the 66 diagnosis categories, 11 of the 16 procedure categories, and 3 of the 5 hospital inpatient diagnosis categories. In addition, they suggest that the exclusion of all hospital inpatient categories may be appropriate because of the potential unfairness to managed care plans. Table 5 (page 8) contains the HCC model categories, both for maximum predictive accuracy (all categories) and for suggested use as a payment basis (labeled HCCPH).



Table 5

HIERARCHICAL COEXISTING CONDITIONS MODELS			
HCC	HCCPH	Description	HCC HCCPH Description
<b>Hierarchical Coexisting Conditions</b>			
1	X	High Cost Infectious Disease	50 X Lower Cost Pneumonia
2	X	Moderate Cost Infectious Diseases	51 X Pleurisy/Fibrosis of Lungs
3		Other Infectious Disease	52 Other Lung Disease
4	X	Metastatic Cancer	53 Eye, Ear, Nose and Throat Disorders
5	X	High Cost Cancers	54 X Renal Failure
6	X	Moderate Cost Cancers	55 Other Urinary Track Disorders
7	X	Lower Cost Cancers	56 Genital Disorders
8	X	Carcinoma in situ	57 Pregnancy/Perinatal Conditions
9		Uncertain Neoplasm	58 X Chronic Ulcer of Skin
10		Skin Cancer, except Melanoma	59 Other Dermatological Disorders
11		Benign Neoplasm	60 X Hip and Vertebral Fractures
12	X	High Cost Diabetes	61 X Higher Cost Injuries and Poisonings
13	X	Lower Cost Diabetes	62 Lower Cost Injuries and Poisonings
14	X	Protein-Calorie Malnutrition	63 X Complications of Medical and Surgical Care
15		Other Higher Cost Endocrine, Metabolic, Nutritional Disorders	64 X Coma
16		Other Lower Cost Endocrine, Metabolic, Nutritional Disorders	65 Major Symptoms
17	X	Liver Disease	66 Minor Symptoms, Signs, Findings
18	X	High Cost Gastrointestinal Disorders	
19	X	Moderate Cost Gastrointestinal Disorders	<b>Procedure-Based Hierarchical Coexisting Conditions</b>
20		Lower Cost Gastrointestinal Disorders	67 X Heart, Lung, Kidney, Liver Transplant
21	X	Bone and Joint Infections	68 X Heart, Heart Valve, Kidney, Lung, Liver Transplant (status/history)
22	X	Rheumatoid Arthritis and Connective Tissue Disease	69 Other Organ Transplant/Replacement
23		Other Musculoskeletal and Connective Tissue Disorders	70 X Tracheostomy
24	X	Aplastic and Acquired Hemolytic Anemias	71 X Gastrostomy
25	X	Blood/Immune Disorders	72 X Enterostomy
26		Iron Deficiency and Other/Unspecified Anemias	73 X Artificial Opening Status/Attention
27		Dementia	74 X Machine Dependence
28	X	Drug/Alcohol Dependence/Psychoses	75 Post-Surgical States/Aftercare/Rehabilitation Procedures
29	X	Higher Cost Mental Disorders	76 Radiation Therapy
30		Lower Cost Mental Disorders	77 X Venous Access Port
31	X	Quadriplegia/Paraplegia	78 X Chemotherapy
32	X	Higher Cost Neurological Disorders	79 X Dialysis
33		Lower Cost Neurological Disorders	80 X Major Surgical Amputations
34	X	Respiratory Arrest	81 Preventive/Screening/Observation/Special Exams
35	X	Heart Arrest/Shock	82 History of Disease
36	X	Respiratory Failure	
37	X	Congestive Heart Failure	<b>Principal Inpatient Hierarchical Coexisting Conditions</b>
38	X	Heart Arrhythmia	83 X Very High Incremental Cost Principal Inpatient Diagnoses
39	X	Valvular and Rheumatic Heart Disease	84 X High Incremental Cost Principal Inpatient Diagnoses
40	X	Coronary Artery Disease	85 Moderate Incremental Cost Principal Inpatient Diagnoses
41		Other Heart Disorders	86 X Principal Inpatient Diagnosis of Chemotherapy
42		Hypertensive Heart Disease	87 All Other Principal Inpatient Diagnoses
43		Heart Disease, Miscellaneous	
44		Hypertension (High Blood Pressure)	
45	X	Cerebrovascular Disease (Stroke)	
46	X	Vascular Disease	
47		Other Circulatory Disease	
48	X	Chronic Obstructive Pulmonary Disease	
49	X	Higher Cost Pneumonia	

Source: Health Economics Research, Inc.



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## CRITERIA FOR SUCCESS

To successfully implement a risk adjustment methodology, several objectives should be considered:

- **Predictive Accuracy**—As discussed with the HCC model, other goals must be balanced with maximizing predictive accuracy.
- **Administrative Practicality**—The data needs are high for both the development and ongoing evaluation of diagnosis-based risk assessment. The need for large amounts of data must be balanced with the time and expense associated with its accumulation. Currently, many managed care organizations and capitated providers do not capture the level of detailed data needed for risk adjuster development and implementation.
- **Timeliness**—Access to the most current diagnosis data possible will improve the predictive ability of the model. However, time must be allowed to accumulate and analyze the data and to implement the results. Additional timeliness issues come into play with respect to prospective versus concurrent approaches to risk adjusters, as discussed in more detail below.
- **Restrictions on Gaming**—Care should be taken in the development of the grouper to limit potential benefits of slight adjustments in ICD-9 coding, or “coding creep.” Consistent coding methodologies should be communicated to all participants to insure a fair allocation of funds. In addition, audits of claim coding should be a regular part of the ongoing operating procedure.
- **Proper Incentives**—Diagnosis-based risk adjusters have the potential to shift incentives from risk selection (healthy vs. sick) to efficient and effective delivery of care. Higher payment rates for the unhealthy should increase their choice of plans and providers. Incentives are a significant concern with the early approach suggested by HCFA for risk adjustments to Medicare risk payment rates. Through the use of the PIP-DCG model, health plans may be encouraged to admit patients who could receive care on an outpatient basis or to extend the length of stay to meet the minimum two-day requirement to boost revenue.



## OTHER ISSUES/CONSIDERATIONS

Several other issues complicate the development and implementation of a diagnosis-based risk assessment and payment adjustment methodology.

### *Prospective Versus Concurrent Payment*

A prospective approach is one where diagnosis data from a prior period is used to set the payment rate associated with each member for a future time period. This is often the preferred choice of payers because it promotes efficiency similar to the incentives associated with capitation payments.

A concurrent approach uses diagnosis data from the covered time period to risk adjust the payment rates. The primary advantage of the concurrent approach is a significant increase in the correlation between expenditures and reimbursement. However, the concurrent approach resembles fee-for-service reimbursement in that increases in current utilization can directly produce additional revenue.

It is important to note that for both approaches lag time exists between the data collection period and the implementation of risk-adjusted reimbursement. Similar to claim lag, lag time exists between the incurred date of a claim and the reporting of the diagnosis information. In addition, time is required to calculate the payment rates based on this most current data to maintain budget objectives.

An example of these timing issues is the collection of data three months after the end of the data collection period to allow for more complete diagnosis reporting, then using this data to calculate final rates for implementation three months later, resulting in a six-month lag between the data collection period and the implementation of risk-adjusted payment rates. The downside to this approach is that the most current diagnosis data is not being used. The upside is that the final payment rates are set at the beginning of the contract period, so no retroactive rate adjustment is needed. Retroactive rate adjustments are required with any concurrent approach, and they complicate plan administration and contracting. Retroactive adjustments also add to the financial uncertainty of the health plans and providers.

One alternative being explored by HCFA for the year 2000 Medicare risk adjuster is to collect 12 months of diagnosis data as of June 30, 1999, and use this as a basis for initial payment rates as of January 1, 2000. Then, to collect an updated 12 months of diagnosis data through December 31, 1999, and use it to make a retroactive adjustment to payment rates in mid-2000. This approach offers the possibility of minimizing the retroactive adjustment through use of preliminary data and also increasing the predictive accuracy by using data through the end of 1999 as the basis for final payment.

### *“Leavers” and “Joiners”*

With a prospective approach, Leavers, those exiting the system after the start of the data collection period but prior to the completion of the effective rating period, and Joiners, those entering the system without prior experience upon which risk-adjusted rates can be based, present a specific concern with respect to risk-adjusted reimbursement. This concern is that Leavers and Joiners may represent unique health statuses relative to the ongoing membership. For example, Leavers in a Medicare risk population include a disproportionate share of members who die after serious illness and significant expense. Because of their partial-year membership, the possibility exists that even with risk-adjusted rates, only partial compensation will be received. Unique Joiners include new eligibles in the Supplemental Security Income (SSI) program, where newly disabled members are likely to require more services than average, even when compared with those with similar diagnoses.

### *Neonates*

Neonates represent a particularly challenging group of Joiners in a prospective risk adjustment system. Plans and providers that receive a disproportionate share of neonates will be hurt by any prospective system that fails to make special accommodation for these high-cost claims. Carve-outs or additional concurrent reimbursement (as with an AFDC) are one possible solution, an age enhancement is another.



## *Reinsurance*

The basic need for reinsurance protection remains after the implementation of risk-adjusted payment rates. However, the structure of this protection may need to be revised. For example, many provider reinsurance contracts have deductibles of \$25,000 or less. For some diagnoses, the risk-adjusted payment rate may exceed these deductible levels. As a result, under the current contract structure, a reinsurance claim could be made for a member whose payment rate exceeded his or her claims. With such large payment rates for particular diagnoses, appropriate modifications to reinsurance contract reimbursement should be made. Also, corresponding modifications should occur to the rates charged for reinsurance coverage.

## *Revenue Neutrality*

Revenue neutrality is an important consideration from the perspective of the payer when developing a risk adjustment mechanism. Actuarial adjustments to payment rates will be required to balance budgets after the diagnosis data is evaluated. A typical approach to developing risk-adjusted payment rates includes the creation of preliminary rates based on data gathered before the final data collection period. When the final data is run through this preliminary risk adjuster, the overall expenditures will differ from projected budgets due to overall changes in health status. Therefore, adjustments to payment rates will be required to meet budget expectations. Unfortunately, this adds to the uncertainty for the contracting health plans and may require withholds to accommodate the transfer of funds between risk takers.

## *Provider Risk Sharing*

While risk-adjusted payment rates improve the correlation between the member cost and the payment rate received for each health plan member, significant questions remain as to the appropriate allocation of this revenue between risk-assuming providers. In other words, should enhanced payments for members in poor health be allocated between hospitals and physicians in the same proportion as baseline payment rates for those with no coded diagnosis in the data collection period? Unfortunately for health plans and providers, the answer is almost certainly no, and yet payers proposing risk-adjusted payment rates typically are not providing the necessary allocation detail.

## *Confidentiality*

Because diagnosis-based risk adjusters are dependent on detailed claim records for all eligible members, a large amount of data that has historically been held as confidential must now be transferred between providers, plans and payers. This exchange of data causes concern to many who may fear various degrees of discrimination are possible if this information becomes public. These concerns must be addressed as the procedural and administrative processes are established.

## *Communication/Implementation*

Given the level of uncertainty surrounding the implementation of risk adjusters, plans, providers, patients and patient advocacy groups need to be kept informed throughout the development of the program. The incorporation of feedback from each of these groups can greatly improve the likelihood of a successful final product. Payers may also choose to phase in risk adjusters to avoid large swings in payments and limit the exposure of participating plans and their beneficiaries to unanticipated budgetary shortfalls.



## CALCULATING COEFFICIENTS

As mentioned earlier, the risk assessment model, or grouper, defines the risk classification categories to be used. Payment rates or risk adjustment coefficients must be calculated and assigned to each category. This can be done with linear regression, using a method such as least squares to estimate the parameters, or with a more complicated numerical approximation methodology. Care must be taken when applying numerical approximation methods because of the special nature of health costs. For most populations, many people will not be mapped into any of the high-cost diagnostic groupings, creating a spike in the distribution for the lowest cost cell. This problem must be addressed. One approach would be to construct separate models for these two subsets of the population.

Coefficients can vary significantly between different populations because of differences in covered benefits, utilization patterns and provider reimbursement. For example, data from a commercial population would produce coefficients that differed greatly from, and would be inappropriate for use with, a Medicaid population. Another example of this concern exists with the initial Medicare proposal. The Medicare PIP-DCG coefficients have been calculated using the Medicare fee-for-service experience, but is intended for use with the HMO population. Because managed care organizations often reduce inpatient utilization through efficiencies in the delivery of care, they are likely to see the average health status of their membership inaccurately estimated as healthier than they truly are. This phenomenon would result in improperly reduced payment rates.

Additionally, inconsistencies can develop for nonrandom subgroups of a given population. For example, a network that attracts a particular population subgroup, because of a reputation for expertise in a high-cost area of care, could significantly benefit or be hurt by diagnosis-based risk adjusters if this area of care is not adequately identified in the model. Those developing the coefficients should anticipate and test reasonable nonrandom population subgroups.



## MODEL RESULTS, PREDICTABILITY

Several groups, including the Society of Actuaries (SOA), HCFA, Health Economics Research, Inc. (HER), and Richard Kronick et al., have analyzed the predictive accuracy of the various risk adjustment models. Keeping in mind that the different models were tested on very different populations, Table 6 lists the R<sup>2</sup> statistics for various tests as an indication of predictive accuracy. The R<sup>2</sup> variable quantifies the proportion of the variation in results explained by the model.

Table 6

PREDICTIVE ACCURACY				
Model	Concurrent or Prospective	Tester	Population	R <sup>2</sup>
Age/Gender	Concurrent	SOA	Commercial	.032
Age/Gender	Prospective	SOA	Commercial	.039
ACG	Concurrent	SOA	Commercial	.286
ACG	Prospective	SOA	Commercial	.091
PIP-DCG	Concurrent	SOA	Commercial	.428
PIP-DCG	Prospective	HCFA	Medicare	.059
AAPCC	Prospective	HER	Medicare	.010
DPS	Prospective	Kronick	Medicaid AFDC, Adult, CO	.040
DPS	Prospective	Kronick	Medicaid Disabled, CO	.420
HCC	Prospective	HER	Medicare	.081
HCCPH	Prospective	HER	Medicare	.090

As the above table indicates, the concurrent models have significantly higher correlation between costs and payments than prospective models. However, it should also be noted that the prospective models show a meaningful improvement over simple age/gender adjustments.



## CONCLUSION

Diagnosis-based risk adjusters offer an opportunity to better account for a significant portion of the variation in costs between different subgroups of a covered population. Also, the payment of more appropriate rates to cover those with higher expected needs should result in more choice and better access for those individuals. At the same time, health plans and providers face serious financial issues with the implementation of risk-adjusted payment rates. Administrative systems must be in place to provide the necessary diagnosis data, and contracts between health plans and providers may need to be adjusted to properly pass the risk-adjusted payments through to those truly assuming the risk.

Of even more concern is the possibility that total revenue for a health plan or provider could drop significantly when risk-adjusted payments replace current payment rates that are adjusted only for demographics. This possibility exists with the recently proposed Medicare PIP-DCG risk adjustment approach. Medicare risk contractors may find that, because they have managed down the bed days in their network, their payment rates have been inappropriately reduced. In addition, because Adjusted Community Rate filings are submitted early in the prior year, benefits and supplemental premiums will be set for the year 2000 before risk-adjusted payment rates are determined for the year.

This illustrates the importance of assessing and quantifying the impact of a proposed risk adjustment methodology in advance of accepting risk or subcontracting that risk. Each health plan's own data should be run through the proposed grouper to quantify the financial impact and allow time for a well-planned management response. Responses may include reassessments of target markets, revisions to provider contracts and reviews of reinsurance protections, to name a few. Management decisions based on quality data analysis can produce positive results for all parties concerned under a diagnosis-based risk-adjusted payment system.



## APPENDIX A

### *Summary of the Proposed Medicare Risk Adjuster*

In the September 8, 1998 Federal Register, Health Care Financing Administration published the proposed rule for risk-adjusted payment rates to health plans participating in the Medicare+Choice program, effective January 1, 2000 as required by the Balanced Budget Act of 1997. The risk assessment methodology being proposed is the Principal Inpatient Diagnostic Cost Group model, or PIP-DCG. The grouping process of this model is based on ICD-9 codes associated with inpatient stays. A more comprehensive risk adjuster that incorporates outpatient hospital and physician encounters is expected to follow in approximately three years.

The new payment rates, which replace the AAPCC, begin with a base payment that varies by age, gender and county. Enhanced payments are provided if the member qualifies under one of three other demographic categories: previously disabled, Medicaid/Medicare aged, or Medicaid/Medicare disabled. Finally, a payment enhancement is made if the member belongs to one of the PIP-DCG groups as described in Table 3 of this report.

The concept of risk-adjusted payments that incorporate health status could improve the fairness of the reimbursement received by Medicare+Choice health plans. However, the proposed methodology has serious flaws and inequities. The following outlines some concerns.

### *Use of Inpatient Data Only*

By far the most serious flaw with the methodology is that the risk-adjusted payments rely on inpatient data only. As an example, suppose we have a member who has an illness that would be eligible for an enhanced payment. This member would almost always be hospitalized in the fee-for-service environment, resulting in an enhanced payment for that beneficiary in the following year. That same member might not be hospitalized in a managed care environment, resulting in only the base payment rate in the following year.

The primary objective of all managed care plans is to reduce the number of admissions. Data from the Milliman & Robertson *Healthcare Management Guidelines*<sup>™</sup> show that a well-managed Medicare population has 51% of the admits of a typical loosely managed fee-for-service population. This means that managed care plans that reduce the number of members hospitalized will have fewer members placed in a PIP-DCG that would be eligible for an enhanced payment. In effect, the base rate that they would receive for these patients would be insufficient. Many of these managed care plans spend substantial money in managed care activities and in outpatient care to avoid the inpatient stays. However, under this payment system, they will receive the low base rate that is typical for an individual with no serious diagnosis.

HIV/AIDS offers a good example of how a plan will be hurt. These members are eligible for a \$29,317 enhanced payment in the following year if they are hospitalized. However, if a managed care plan spends \$10,000 a year in prescription drugs to keep a member healthy and to avoid hospitalization, its reward will be a base payment of about \$3,000 in the following year.

In summary, a managed care plan that is able to reduce the number of admissions and has an overall population with a health status identical to the countywide average would nevertheless receive a reduced payment under this risk-adjustment methodology.

### *Institutional Eligibles*

The proposed methodology does not recognize the special status of institutional eligibles. While it is true that many institutional eligibles have low acute inpatient hospital care use rates, this is because they are already receiving intensive care from a nursing home. These individuals have excessive professional and hospital outpatient costs because of their impaired health. Under the proposed system, which will base reimbursement solely on the number of times they are hospitalized, the payment rate for these individuals will be inappropriately reduced. Furthermore, when these individuals are enrolled in a managed care plan that provides doctors and other professionals in a nursing home setting with the goal of avoiding hospitalization, their payment rate may be less than a typical-aged enrollee, with their costs



exceeding those of a typical Medicare eligible. While the method proposed by the government includes the cost of outpatient care, if institutionalized individuals are not handled separately, the method will not recognize that the noninpatient hospital care for institutionalized patients exceeds the nonhospital costs for noninstitutionalized patients with the same illness.

We would also expect the base cost for institutional patients to be significantly higher than for noninstitutional patients. It is not clear that HCFA has studied this issue.

### *One-Day Stay*

The proposed methodology excludes diagnosis information on individuals who have only a one-day stay. A one-day stay in a managed care organization is often a two-day or longer stay in the fee-for-service population. Therefore, managed care plans that are able to reduce two-day stays to one-day stays will have an individual payment rate for certain ICD-9s lowered from an enhanced rate to the lower base rate. This again is unfair, since it penalizes managed care plans for reducing the length of stay, just as the failure to use ambulatory data penalizes them for avoiding hospital admissions.

### *Retroactive Adjustment*

We understand the timing will require retroactive adjustment in the year 2000 payment rates for plans that submit 1999 data. This is unfair to these health plans. Many of the health plans will have a substantial reduction or retroactive take-away in the money received. These plans will be under tremendous pressure from their providers to spend the entire payment that they received. After the retroactive adjustment, it will be extremely difficult, if not impossible, for these plans to recoup the government take-away from their providers. Plans will not have adequate lead time to compensate for these losses by raising the supplemental premium. It is important that any risk adjustment methodology be prospective, so that the health plans can manage their costs and expenditures to match their revenue.

### *Conclusion*

If HCFA implements its proposed methodology, preliminary calculations show that the average managed care plan could receive as much as a 20% reduction in the payment rate, resulting in a financial crisis for Medicare managed care plans. Medicare+Choice providers will be forced to respond by withdrawing from counties with low payment rates or by increasing premiums to offset the lost revenue. As a result, it is possible that millions of Medicare recipients could lose their Medicare+Choice plan or be asked to pay a significant supplemental premium. We hope HCFA will perform a more careful review and seek the advice of outside actuaries with expertise relating to risk adjusters. HCFA may then decide that it is more appropriate to postpone the implementation of risk adjusters until it is able to capture the data that will enable the risk adjuster methodology to incorporate all ICD-9 claim data and not just data on those few individuals who are hospitalized for at least two days.



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