Klassifikationsmodelle für Versicherte im Risikostrukturausgleich

Untersuchung zur Auswahl geeigneter Gruppenbildungen,
Gewichtungsfaktoren und Klassifikationsmerkmale
für einen direkt morbiditätsorientierten Risikostrukturausgleich
in der gesetzlichen Krankenversicherung

im Auftrag des
Bundesministeriums für Gesundheit und Soziale Sicherung

Anhang 1

Befragung der Modellentwickler

von

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Vorbemerkung

Alle Entwickler / Hersteller der den Gutachtern bekannt gewordenen periodenbezogenen Klassifikationsmodelle (Stichtag: 11.7.2002) wurden nach erfolgter Kontaktaufnahme über den Untersuchungsauftrag gemäß § 268 Abs. 2 SGB V informiert und gebeten, in diesem Zusammenhang einen von den Gutachtern formulierten Fragebogen mit einem Katalog von insgesamt 81 Fragen, gegliedert nach 14 Fragenkomplexen, zu beantworten. Alle angeschriebenen Entwickler / Hersteller erhielten den Fragebogen als Datei in einem hinreichend verbreiteten Format zur Textverarbeitung und schickten den Gutachtern ihre Antworten ebenfalls in dieser Datei-Form bis zum 7.8.2002 zurück. In ihrer Originalform wurden die ausgefüllten Fragebögen in diesen Anhang übernommen. Angesichts der Verzögerungen bei der Lieferung der Versichertenstichprobe wurden die Hersteller aller Modelle im Frühjahr 2004 um eine Aktualisierung ihres Fragebogens gebeten. Die Entwickler der 4 Modellfamilien ACG/ADG/ACG-PM, CRG/CRxG, DCG/ HCC/RxGroups und ERGs haben ihre Antworten aktualisiert. Für die Modelle CD-Risc und Medicaid Rx wurde uns mitgeteilt, dass sich hier nichts geändert hat. Die Entwickler der Modelle CDPS, GRAM und PCG haben nicht reagiert. Leider wurde von dem niederländischen Entwicklerteam nicht auch ein Fragebogen für das neuere Modell PCG+DCG, welches seit diesem Jahr im niederländischen RSA angewendet wird, ausgefüllt. Den Gutachtern liegt damit nur der – mit Stand Sommer 2002 – ausgefüllte Fragebogen für das PCG-Modell vor.

Für das Klassifikationsmodell „Disease Staging" wurde der Kontakt über die zuständige deutsche Vertretung des Herstellers MEDSTAT abgewikkelt. MEDSTAT verzichtete auf eine eigenständige Beantwortung des Fragenkatalogs mit dem Hinweis auf die bestehende Kooperation mit DxCG, Inc.. Aus der den Gutachtern zugestellten gemeinsamen Erklärung von MEDSTAT und DxCG bezüglich ihrer Kooperation geht hervor, dass das von MEDSTAT – für Krankenhausfälle – entwickelte Klassifikationssystem kein eigenes periodenbezogenes Risikoklassifikationsmodell enthält bzw. darstellt.

Der Anhang enthält neben dem separat vorangestellten Fragebogen die jeweiligen Antworten der Entwickler/Hersteller folgender elf Modellfamilien: ACG/ADG/ACG-PM, CD-RISC, CDPS, CRG/CRxG, DCG/HCC und RxGroups, ERG, GRAM, Medicaid Rx, PCG sowie RxRisk.

Von DxCG, dem Hersteller der Modelle DCG/HCC und RxGroups, wurden die Fragen zu diesen beiden Modellen in einem Fragebogen beantwortet. Dasselbe gilt für die Modelle ACG/ADG/ADG+PM. Wegen der jeweils kenntlich gemachten Gemeinsamkeiten und Unterschiede zwischen den Modellfamilien verzichteten die Gutachter auf eine nachträgliche Auftrennung.

Inhaltsübersicht

Fragenkatalog

A Basics

A1	Name of the risk adjustment system
A2	Organization – Institution – Authors
A3	Support/marketing – Institution – Contact (person)
A4	First release / latest release
A5	Model type: categorial (cell approach) or additive (regression approach)
A6	Model variant(s) / distinguishable model developments

B Range of the model(s) according to the model variant

B1	For which type of population group are the models applicable? (e.g. age 65 and over, ...)
B2	Which type(s) (groups) of population are excluded?
B3	Which diseases/treatments are included/excluded? (e.g. psychiatric diseases) Is your (family of) model(s) based on the entire set of ICD-diagnoses-codes? If not, how did you select the "selected significant diseases"?

C Costs and cost weights (according to the model variant)

C1	Cost weights: included or excluded type of care **ambulatory/outpatient care**
C2	Cost weights: included or excluded type of care **pharmacy**
C3	Cost weights: included or excluded type of care **inpatient/hospital services**
C4	Cost weights: included or excluded type of care **other services**
C5	Are cost weights based on truncation? If yes, truncated at:
C6	Does the grouper always calculate the "total" expected expenditures (given the benefit package) of a (insured) person?

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Which risk adjusters have been included/are used? (e.g. diagnoses, age, sex, specific procedures, laboratory information ..)
D2	Which statistical classification system for input data is used? - **for diagnoses** (e.g. ICD-9, ICD-9-CM, ICD-10) Which codes are considered invalid by the grouper?

D3	In which way is a model outcome affected from incomplete conversion, for example due to neglecting additional information about a diagnosis like "rule-out" / "suspected" / "status after" / "left, right, or both"?
D4	Which statistical classification system for input data is used? - **for procedures/aids**
D5	Which statistical classification system for input data is used? - **for pharmaceuticals** (e.g. NDC, ATC)
D6	Which personal information are required from the individual? Which are optional? ID, age, sex etc.
D7	Which other information are required to run the grouper software and to achieve the output?

E On model development

E1	What was the institutional background for the development of your model/system?
E2	What was the reason for the development of your risk adjustment model/system?
E3	For which purpose do you have evaluated the risk adjuster? How would you describe the main and/or different purpose(s) of its use?
E4	What was the data base ("master sample") for the **development** of the model(s)? Are the selected sample(s) representative for the entire population or for specific parts of the population only (for instance elderly, non-elderly)?
E5	What sample size did you start with?
E6	Have beneficiaries been excluded in the sample construction (e.g. persons who died)? Why? What benefit-package(s) are included?
E7	Which net sample size did remain (approximately)?
E8	What is included in the payment variables (sickness funds expenditures include/exclude - coinsurance payments, - deductibles etc.) ?
E9	How are topics like "carve-outs" or "stop-loss" taken into account?

F Functioning of the Model(s)

F1	What are the components and the rules of the grouper kernel (for instance the assignment from diagnoses to conditions and the formation of risk groups or individual risk profiles)? Please specify all the mappings exactly.
F2	How do you exactly calculate the expected costs per person? What are the reasons for the method(s) you have chosen

	(either to determine the number of cells – in a categorial approach or to determine the number of coefficients – in regression approach)?
F3	Is it possible to build "own" model variants (e.g. changing the defaults on the number of risk subgroups by collapsing)?

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	To what extent can your risk adjusted payment model reduce risk **selection**? (compared to the German status quo situation with age, sex,... as risk adjusters)
G2	To what extent does your risk adjustment system give incentives to sickness funds/health plans to **manage costs** carefully (efficiency incentive)?
G3	Would you claim that your risk adjustment model can be characterized as "**site of service neutral**"? To what extent is the risk adjuster "site of service neutral"?
G4	How does your model take into account incentives to **upcoding** behavior?
G5	How does your model take into account incentives to **gaming** behavior?
G6	Is the explanatory power of your validation sample, i.e. the ability to predict variations in the expected cost of care to observable patient characteristics sufficient to provide sickness funds (insurance plans) with incentives to provide "good care", especially for chronically ill patients who tend to be more expensive? Does the risk adjuster affect the incentives to improve the **quality** of health care?
G7	To what extent can "**stinting on care**" be prevented?
G8	To what extent has the system the following properties that generates acceptance for insurer and provider: - simple, transparent, easy to understand - inexpensive (data collection and running and servicing the software) - easy to monitor (ease of audit)
G9	Do you claim that your risk adjustment is well suited to a **payment system** in general? What are the main differences between the prospective model and the concurrent model in your system with respect to the former question?
G10	Would you have any objection if a "sponsor/payer" uses a concurrent model of your risk adjustment system for a prospective payment? If yes, why?
G11	Do you have any empirical/statistical evidence about the effects of the non-recommended application compared to a recommended use of your models? Do you think such a difference can be measured? If not, why?

H Model properties (measures and measurement)

H1	Reliability: Which evidence do you have for the precision and reproducibility of your cost weights (risk scores)? Please specify the underlying model variant: R2 (please specify separately for all concurrent model variants that you have calibrated) R2 (please specify separately for all prospective model variants that you have calibrated)
H2	Validity: How do you account for validity of the model? Which methods did you use? Which evidence did you find?
H3	Robustness: Which methods did you use or know in order to account for it?
H4	Site of service neutrality: How do you account for the influence? Which methods did you use or know to evaluate the "non-neutrality"?
H5	Do you know of any study concerning the impact of risk adjustment model implementation on the quality of health care provision ? Which criteria have been used? Which results have been found?
H6	Did you make inquiries concerning the acceptance of your system among the users? If yes: Which criteria have used? Which results have been found?
H7	Do you know the cost of implementing (set up cost and running cost) your risk adjustment system in an organization (e.g. health plan)? Which methods did you use or know for calculating these cost?

J Model applications

J1	Is your risk adjuster implemented in practice? If yes, since when? What type of organizations are using your risk adjustment system and for which purpose are they using it?
J2	How many organizations/institutions are using your risk adjustment system for the purposes outlined above?
J3	How many "lives" are approximately grouped this year (or last year) with your risk adjustment system?
J4	For which OS or software platform (e.g. SAS 8x) is the grouper software implemented?
J5	Does the software include reporting tools? If yes: Please describe the tools (e.g. MS Excel macro)?

J6	Does the software include interfaces to other software packages? If yes, which software or export format is supported?

K Model / system updates

K1	How often would you suggest to update the risk adjustment method and/or the cost weights?
K2	How often do you supply an update?

L License policy

L1	Is the grouper software "public domain"? yes/no Is the "source code" of the risk adjustment software "public domain"? yes/no
L2	If it is not available as "public domain" or as "freeware", do you offer some "developer kit" for adaptation purposes?
L3	Does the manual of the grouper software or the software itself reveal (or allow to verify) all the information necessary to reduplicate the grouper algorithm? If not, would you consider to disclose a "German variant/version" of your model (model family)?
L4	If not, which information (assignments, algorithms or software code/interface) are proprietary?
L5	Are there any circumstances in which you would sublet the protected parts of the grouper to the German health care authorities (for example the Federal Insurance Office) in order – to develop some German-version of your system or – to prepare an approved certificate for Germany?

M Support / consultative services

M1	What kind of manuals and technical documentation is available for clients/customers (sponsor /payer)?
M2	What kind of support do you provide to **developers**? What are the conditions to get support?
M3	What kind of support do you provide to **clients**? (sponsor/payer) What are the conditions to get support?
M4	What kind of support do you provide to **users**? What are the conditions to get support?

N Pricing Policy

N1	Prices/Rates - for the software

N2	- for updates
N3	- for support (clients)
N4	- for support (user)
N5	- for consultative services (developer)

P Adaptability to Germany's health system and implementation as morbidity-based risk structure compensation scheme

P1	Let's assume for a moment that you would get a valid (i.e. error corrected) German data set and its file construction: What kind of conversions and transformations (for example - disease codes, - drug codes, - procedure codes, - information of site, - laboratory information) are necessary to meet the input requirements of your grouper?
P2	If your risk adjuster is not designed for statistical classification systems other than - ICD-10 SGB V (German version of ICD-10), - OPS301 (German procedure coding scheme) and - PZN (German drug coding scheme) - ATC (WHO classification of pharmaceutical substances) which problems do you expect to be critical for conversion?
P3	In which way is a model and the quality of the results affected from imperfect conversion, - for instance due to converting the diagnosis codes from ICD10 to the ICD9 at the three digit level only, - or from mapping NDC to ATC?
P4	If the input requirements can be met what kind of (re)calibration is included in the grouper software and which operations are necessary to achieve German cost weights?
P5	Given your experience in risk adjustment: Do you expect the underlying model itself has to redesigned to achieve results with German data comparable to the existing version?
P6	Given the German data set: Do you provide any tools to control for quality of input (input data)?
P7	In some countries (among them Switzerland and Germany) the application of risk adjustment becomes difficult due to concern for **data confidentiality**. To what extent does your risk adjuster respect data confidentiality (data protection) issues?

1 ACG / ADG / ACG-PM

Adjusted Clinical Groups / Aggregated Diagnosis Groups / ACG – Predictive Model

A Basics

A1	The Johns Hopkins ACG® Case-Mix System
A2	Johns Hopkins Bloomberg School of Public Health Barbara Starfield MD, MPH, Jonathan Weiner, DrPH., Christopher Forrest, MD, PhD
A3	Dr. Karen Kinder Director ACG European Operations Kleine Gasse 30 61130 Nidderau 06186-935961 kkinder@jhsph.edu
A4	1991 Version 1.0 / 2003 Version 6.0
A5	The ACG System is a highly flexible suite of tools designed to assist in population health assessment. The System includes mutually exclusive (actuarial cells) and linearly additive (regression) models.
A6	Components of the System include: mutually exclusive Adjusted Clinical Groups (ACGs), iso-resource markers called Aggregated Diagnosis Groups (ADGs, the building blocks of the mutually exclusive ACG model) and, Expanded Diagnosis Clusters (disease markers). With the new ACG Predictive Model (ACG-PM), a risk score is now available to assist in the identification of high risk patients who are likely to be high cost in the future. This model can be used for payment purposes and in case-management / disease management interventions.

B Model range according to the model variant

B1	Applicable to a population inclusive of all ages. In the United States, the ACG System is used for both general and specialized populations including Medicare (a federal program for the elderly and disabled) and Medicaid (state programs for the poor). It is also adaptable to disease-specific populations (e.g. for patient with diabetes, ischemic disease, asthma, etc.)
B2	All-inclusive population model without *a priori* exclusions (including non-users).
B3	ACGs are assigned by taking all diagnostic codes recorded for a patient over

	the time interval of interest, typically a year, from both ambulatory and inpatient settings to create the risk assessment variables. Because they are often considered to be rule-out or provisional, claims from clinical laboratory and diagnostic radiology are typically excluded. With the exception of E-codes, which are secondary codes that describe the mechanism or cause of an injury, all ICD-9 and ICD-9-CM codes are incorporated. A model incorporating ICD-10 codes has also been developed and is presently being testing by several users in Germany. All components of the System will be completely ICD-10 compatible according to World Health Organization standards (ICD-10-WHO). Further adjustments may be necessary for country-specific modifications of ICD-10-WHO.

C **Costs and cost weights** (according to the model variant)

C1	For the ACG model, weights are calculated separately for each cell as the average total costs of members within the group. More sophisticated regression-based techniques can be applied for other components of the ACG System. Costs from ambulatory/outpatient care would typically be included in the calculation of ACG cost weights. However, the System is often used to calculate specific weights by service category, such as inpatient, medication, and outpatient cost weights. Outpatient cost weights can be further sub-divided into surgery, a variety of invasive procedure categories, imaging studies, laboratory, GP visits, specialist visits, eye services, Emergency department visits, durable medical equipment costs, home health care, etc. NOTE: When implementing the ACG System, the calculation of cost weights is separated from the assignment of morbidity categories. We believe that weights should be scaled to the specific time, healthcare delivery context, and benefit package of a given population. The international work that has been done using ACGs suggests that the distribution of morbidity—the ACG taxonomy—is quite similar across countries; however, the cost weights differ in important and clinically meaningful ways. Health needs and resource use therefore is not constant across delivery systems, which means that using cost weights derived from US data would be inappropriate for the German context. The sample reports provided in the Software's print file incorporate weights from a nationally representative under-65 US reference population comprised of roughly two million members.
C2	Included (optional).
C3	Included.
C4	Included.
C5	Truncation is often used in setting weights. Healthcare systems select a truncation level that is consistent with either a re-insurance threshold or a stop-loss level. Truncation usually improves model performance.
C6	See C1.

D **Grouper input requirements, options, and the handling of additional information** (according to the model variant)

D1	Input requirements are limited to age, gender and string of diagnostic codes recorded in hospital and outpatient settings, but excluding those given for imaging and laboratory procedures Since ACGs are NOT disease, organ, or episode based there are no requirements for procedure codes, pharmaceutical codes, site of service or date information. Optionally, the predictive model incorporates pharmacy cost information for better identification of high risk individuals.
D2	ICD-9, ICD-9-CM or ICD-10 can be used. The ACG system is comprehensive and accepts all valid diagnostic codes for each of these classification systems (except codes for mechanism of injury, "E" codes in ICD-9-CM, and the V, W, X, and Y codes in ICD/10).
D3	According to the ICD coding rules, healthcare practitioners should not record "rule-out" or suspected diagnoses. Instead, they should record the problem to the highest level of specificity. In many cases, this will be a symptom or clinical sign. There are several ICD codes for signs and symptoms, and the ACG system explicitly assigns these codes to ADG categories that differ by severity level. Some signs and symptoms denote more complex problems and thus greater need for diagnostic interventions. This complexity and expected resource intensity is accounted for by the ADG classification. Suspected" or "rule-out" diagnoses are common for imaging and laboratory studies, which is why we require that these claims be excluded from ACG assignment. However, if these types of codes are corded by GPs or specialists, then the morbidity and risk levels of the patients will be falsely elevated, which will have a small impact on decreasing overall model performance.
D4	The ACG system does not make use of procedure coding systems.
D5	The current version of the ACG system does not make use of drug classification systems The Johns Hopkins team, however, is developing an NDC-based risk adjustment system, which will be released in 2005. This methodology will be used in case and disease management applications; it would be inappropriate for payment and financing applications, because of the inherent perverse incentives that a prior use such as medication codes introduces into the model.
D6	An (encrypted) person identifier, gender and age or dates of birth are required.
D7	None. NOTE: In addition to some measure of resource use, individuals must also be assigned to groups (primary care physicians, health plans, geographic regions or other similar unit of analyses) before any meaningful comparisons can be made. See *Chapter 7*, *Basic Data Requirements for ACG Categorization and Analysis*, of the Documentation and Application Manual for additional detail.

E	**On model development**
E1	The Johns Hopkins ACG Case-Mix System was developed and is maintained exclusively by academic health services researchers at the Johns Hopkins Bloomberg School of Public Health. Over 25 years ago, Dr. Barbara Starfield developed the conceptual foundations for classifying diagnostic codes into a parsimonious, clinically relevant set of morbidity groups. Her work also demonstrated that morbidity does not randomly distribute itself in a population, and these morbidity patterns are much better explanatory factors for resource use than single disease classes. Expansion of this work led to the first generation of the ACG risk adjustment system. ACGs were highly innovative new technology, as it was the first diagnosis-based classification system that could be used for risk adjustment for ALL outpatient services used by a population. Subsequent research and development has led to (1) further expansion of the classification system to account for very sick patients with large amounts of multi-morbidity, (2) optimization for inpatient services and thus total healthcare encounter histories, (3) addition of disease clusters, what we call "EDCs," and (4) creation of a model that is optimized for predicting future costs—the ACG-PM.
E2	Because of the long history of ACGs and development of several statistical models, there is no single reason for development. The multiple reasons that have driven our developmental efforts include: 1. To describe the **epidemiology** of morbidity and co-morbidity within and between populations. 2. To account for the healthcare needs of a population to make healthcare **rate setting and payments more equitable** across units, such as health plans and providers. 3. To **explain resource consumption** across units, such as providers or healthcare systems. 4. To **predict future healthcare needs**, and thus resource use, in order to identify patients who may benefit from intensive primary care, case management, and disease management. 5. To **adjust for disease burden** in quality of care assessments.
E3	The primary applications of the System include: assessing provider efficiency, evaluating access to care, resource planning, determining capitation or budgeted payments healthcare systems, financial exchange between health plans and providers, high risk case identification, quality improvement and monitoring health care outcomes. The system is used to exchange hundreds of millions of dollars on behalf of millions of covered enrollees in both private and public sector managed care programs. Public programs in the US include Alabama, Arkansas, Maryland, Minnesota, and Oklahoma

	State Medicaid programs. The System is also currently being used by the US Department of Veterans Affairs and has been adopted for province-wide physician profiling in British Columbia, Canada.
E4	The various components of the ACG system have been developed and validated over the past 25 years using data from several million patients. The current version of the ACG system was developed and tested on a population composed of 1.5 million enrollees; ACG-PM was developed and tested on a population composed of 2.0 million enrollees.
E5	see E4
E6	ACG Development: required members to be enrolled for 6 months. ACG-PM: Excluded deaths, because our focus was on predicting future costs.
E7	see E4
E8	The plan "allowed charge" is the preferred payment variable. It represents the charges for services rendered or supplies furnished by a provider that qualify as "covered expenses". These charges include both member and plan liability.
E9	Carve-outs: We recommend that use of carve-out categories be considered in a payment system. Patients who have a condition that is uniformly high cost (e.g., HIV/AIDS) are candidates for inclusion in a carve-out. Refer to Chapter 8 of our System Documentation and Application Manual for additional discussion on alternative ways carve-outs might be incorporated. Stop-loss: Whether to account for a stop-loss by truncating payments at that level is recommended but not required for ACG implementation.

F Functioning of the model(s) (according to the model variant)

F1	**ADGs**: The System assigns all ICD diagnostic codes to one of 32 diagnosis clusters known as Aggregated Diagnosis Groups. All common individual diseases, signs/symptoms or conditions are placed into a single ADG cluster based on five clinical dimensions: 1. Duration of the condition (acute, recurrent, or chronic), 2. Severity of the condition (e.g., minor and stable versus major and unstable), 3. Diagnostic certainty (symptoms versus documented disease), 4. Etiology of the condition (infectious, injury, or other), and 5. Specialty care involvement (medical, surgical, obstetric, hematology, etc.). All health problems in the ICD taxonomy can be classified along these dimensions and categorized into one of these 32 ADG clusters. Just as an individual may have multiple ICD diagnosis codes, they may have multiple ADGs (up to 32). Thus, ADGs are not mutually exclusive.

	ACGs: Because many risk adjustment applications are more appropriately performed with mutually-exclusive categories, as might be found in actuarial-cell tables, we constructed mutually exclusive "Adjusted Clinical Groups" which classify the morbidity pattern experiences over a time period for each member of a population can be assigned. ACGs therefore are a taxonomy of population morbidity. To arrive at the ACG cells, the 32 ADGs are first collapsed into 12 categories called Collapsed ADGs (CADGs). The 23 most frequently occurring combinations of CADGs (commonly referred to as MACs) form the main branches of the ACG decision tree. A last branch, called MAC 24, is reserved for those persons with uncommon morbidity patterns. MACs may form terminal nodes or they may be further subdivided using age, gender, or the presence of conditions (as indicated by the presence of specific ADGs). Terminal nodes of the tree, the ACGs, are formed by subdividing the MACs based on clinical and statistical criteria using a recursive partitioning methodology. **EDC**s: ICD diagnostic codes are assigned to 230 Expanded Diagnosis Clusters or disease categories. The 190 EDCs are organized into 27 categories called Major Expanded Diagnosis Clusters (MEDCs). As a stand-alone tool, EDCs can be used to select patients with a specific condition or combination of conditions, or to compare the distribution of conditions in one population with another. **ACG-PM:** This is a statistical model that includes ACGs, age, gender, EDCs, and diagnosis-based markers for high likelihood of future hospitalization and for significant levels of activity restriction—"frailty." Please note that specifying all mappings exactly is beyond the scope of this survey. Please refer to Chapter 4, 5 and 13 of the System Documentation and Application Manual on the *ACG Assignment Process*, *Clinical Aspects of ACGs* and *Dino-Clusters (EDCs)* respectively.
F2	The calculation of expected costs per person is separate from the assignment of risk assessment variables. For ACGs, there are two approaches for calculating weights, a PMPM (or a per-member-per-month) and a PMPY (or per-member-per-year--or other extended time period) a) $PMPM_{(ACG)} = R_{(ACG)} / Months_{(ACG)}$ (Per Member Per Month) b) $PMPY_{(ACG)} = R_{(ACG)} / N_{(ACG)}$ (Per Member Per Year-- or other extended time period) Where $R_{(ACG)}$ is calculated as the sum of resource use across all members assigned to a particular ACG and $Months_{(ACG)}$ is calculated as the total number of member months of eligibility for this cohort. In contrast, $N_{(ACG)}$ is the number of individuals in this cohort. Weights are calculated separately for each ACG category. The primary difference between these two methodologies hinges on whether costs are annualised to account for part-year enrolment.

	The preferred calculation is dependent on the intended application. For a concurrent analysis we recommend the unweighted per-member-per-period approach using ACG-cell averages. Concurrent weights are equal to the ratio of total resource consumption divided by the number of persons in each ACG cell. For a prospective analysis we recommend a weighted per-member-per-period approach with weights determined by the length of enrolment. Prospective per-member-per-month weights are equal to the ratio of total resource consumption divided by the number of member-months in each ACG cell. The components of the ACG System (ADGs, EDCs and/or ACGs) could also be used to calculate individual-level expected costs using more sophisticated linear regression approaches. Generally the more straightforward actuarial approach is the preferred methodology. While calibrated for high risk case identification, the ACG-PM combines a variety of components of the ACG toolkit in a regression model that provides a prospective cost estimate expressed as a relative weight. With a mean of 1.0, predicted values range from a low near zero to highs of some 40 times the cost of the average enrollee.
F3	Yes. The ACG system is highly versatile and can be adapted in a number of ways. ACG-PM can accommodate additional predictors, such as the German disability indicator, regional markers, alternative age/sex groupings, or other markers. ACGs themselves can be collapsed into iso-resource groups. We call these groups "resource utilization bands" or RUBs. The assignment of ACGs to RUB categories depends on (1) number of RUBs desired by the user and (2) the size of the RUB groups. Users of ACGs have experience with as few as 3 RUB or as many as 14 RUB categories. The analyst must decide how many RUBs makes sense given the application and whether he/she desires groups of equal size or larger groups for low cost ACGs and smaller for high cost ACGs.

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	By adding diagnosis codes to demographic data, the ACG System reduces risk selection by setting rates that more closely approximate actual future expenditures. Compared with age/sex adjustment, the ACG system can increase explanatory and predictive performance from approximately 3-5% to as high as 50-60% in concurrent and 20-30% in prospective applications.
G2	Rate setting using the diagnosis-based ACG System will provide an efficiency incentive to Sickness Funds by tying payments to expected utilization. Funds that can align expenses with payments according to the healthcare needs of their beneficiaries will experience positive financial outcomes. The open-architecture of the ACG system is a useful tool for gaining univer-

	sal acceptance by various participants of the risk adjustment process. Once ACGs are implemented as a payment system, we have observed that providers and plans begin to make the case that higher costs are indicated because they are providing higher quality of care, rather than having sicker patients. In effect, ACG adjustment removes differences in population healthcare needs from discussions on payments and resource use. In this way, ACG-based risk adjustment promotes fairness and equity in healthcare.
G3	The ACG technology is site of service neutral in the sense that it does not distinguish between sources of diagnoses (i.e. inpatient vs. ambulatory setting).
G4	It is difficult to distinguish up-coding, "code-creep", from better accounting or accurate recording of all of a patient's diagnoses. When payment is based on the quality of diagnosis data, invariably the number and quality of the diagnosis codes increases and improves. Code-creep can be addressed with regular re-calibration of the model, which aligns changes in coding practices with current resource consumption and thus provide a system-wide disincentive for up-coding. Doing this annually is probably sufficient but if code creep is a significant concern updating the frequency of this recalibration, to say quarterly, would effectively level the playing field every three months.
G5	The logic inherent in the ACG System is very robust to strategic coding, manipulation or gaming. Systems that use disease categories are particularly prone to these problems, because a change in one code can mean a large change in the payment weights. This is not the case with ACGs. Because ACGs reflect the totality of a patients healthcare experience, changing a single code or even a few codes tends to have a negligible impact on expected costs
G6	In advanced market economies such as those in Germany and the United States, receiving too many services is one of the largest quality problems. Risk adjustment with ACGs provides no incentives to provide unnecessary services, and brings needs and resource consumption into closer alignment. The predictive performance of the ACG system is as good and in many evaluations better than other risk adjustors.
G7	Stinting is a result of the payment methodology, not the risk adjustment system. When capitated payments are used, the most fundamental incentives for patient treatment are to provide fewer services. Risk adjustment with ACGs, however, greatly minimizes this effect, by providing much higher payments for the sickest patients. Analysts can investigate whether stinting may be occurring by using ACGs in case-mix adjusted profiling analyses. Very low cost (i.e. providers who appear to be very efficient) may "look" efficient not because they provide excellent care, but rather are stinting on patient care.
G8	We recognize the need for acceptance from all parties involved in implementing a nationwide risk-adjusted payment methodology.

	Simplicity: The limited data requirements and the simplicity of the system enable easily understood explanations of how patients are categorized. The medical background contributing to the conceptualization of the ACG mappings diminishes concerns of inappropriate clinical assignments. Simplicity is a tremendous strength of ACGs, particularly the categorical or actuarial cell approach. Regression models can be very difficult to understand for insurers and providers with little statistical knowledge. They also can generate thousands of risk scores. ACGs on the other hand use just 100 categories, and their cost weights are very easy to calculate and understand. The architecture of ACGs is fully open and transparent. Implementation Expense: Since the System uses routinely collected data from administrative claims records the operational costs are minimal. Weights need to be calibrated on an annual basis only, although they can be generated more frequently if desired Monitoring/Auditing: The inherent transparency of the ACG System enables all parties involved the ability to monitor the outcomes. The combination of tools available in the ACG suite—ACGs, EDCs, and ACG-PM—permit a variety of auditing, and fraud and abuse types of analyses to be done. In addition, the documentation is designed to make ACGs easily understand by a broad range of users.
G9	Yes. ACGs have been used to exchanges millions of dollars in the US and Canada for the care of millions of patients. This real-world track record is perhaps the best test of the system's validity for payment applications. The main difference between a concurrent and a prospective payment system is that a prospective system is calibrated to future costs rather than past costs. A second difference is that we recommend ACGs or ADGs for concurrent analyses, whereas we recommend ACG-PM for prospective applications that call for a multivariate approach and ACGs when a categorical model is desires. For prospective applications we recommend a weighted per-member-per-month calculation to account more fully for part-year enrollments. For retrospective applications, a per-period approach is preferred.
G10	No. We would have no objection and in fact a concurrent ACG model used for prospective payments has been implemented in the Minnesota Medicaid program for several years. A summary of this implementation may be found at http://www.riskadjustment.org/Implementation_Site_Descriptio/mnmedkf
G11	The robustness of the ACG System facilitates a variety of different models and applications. Members of the ACG Development Team at JHU are eager to work with users in the Federal Republic of Germany to customize an ACG model to the particular needs of your implementation.

H Model properties (measures and measurement)

H1	For large populations, the cost weights have high precision as measured by their standard errors. Cost weights depend on a plan's benefit structure. For plans with similar benefits, ACG-based cost weights tend to be within narrow ranges. When cost weights differ, it is typically easy to trace the differences to varying benefit structures (for example, a mental health carve-out). The concurrent ACG model with truncation at $50,000 has R^2 values between 0.35 and 0.55 for several common dependent cost measures. A concurrent ADG model has similar concurrent explanatory power. Though not necessarily recommended for profiling, combining the various building blocks of the ACG System (ACGs, ADGs, and/or EDCs) can yield concurrent explanatory power as high as 0.60. The prospective ACG model has R^2 values around 0.20, whereas an ACG-PM model can be as high as 0.25 or better. A prospective ADG model has slightly higher explanatory power. Though not necessarily recommended for payment, combining the various ACG System building blocks can yield prospective R^2 as high as 0.30. For further information we refer you to our article, "Adjusted Clinical Group – ein Instrument zur Prognose des Ressourcenverbrauchs", C. Forrest, K. Kinder, K. Lemke, R. Reid, *Gesundheits- und Sozialpolitik*, 1-2 / 2004, pp. 8-15. ACG-based relative weights have proven to be very stable across time. For example, the Maryland Medicaid program, a public program that supports care for the medically indigent and needy, has used ACG weights in the form of resource utilization bands (RUBs) for approximately seven years in a risk based reimbursement tool for health care organizations. Maryland Medicaid has found that the RUBs change very little from year to year. This stability is very important in a reimbursement system where extreme fluctuations could have adverse consequences for health care providers.
H2	Clinical and content validity: ACGs are based on literally tens of thousands of clinical decisions concerning which ADG to assign and ICD code and which EDC to assign and ICD code. These decisions were made by large numbers of clinicians, both primary care and specialist physicians, who work at Johns Hopkins University. This clinical basis for ACGs is a tremendous strength of the system from the perspective, in particular, of providers. Criterion Validity: The system provides risk scores that are highly correlated (>0.8) with other risk adjusters. Construct Validity: Perhaps the strongest type of validity is whether the system works well in real-world settings; does it do what it is intended to do. ACGs have been used to exchange tens of billions of dollars and to help manage care for tens of millions of covered lives. No other risk adjustment system has this type of track record.

H3	We have done an internal study to assess the effect of both varying the diagnosis input streams and various truncation of diagnosis codes. We measured the effect using both concurrent and prospective R2. Generally the system is fairly robust to various diagnosis truncation tests. More recent work has focused on requiring multiple occurrences of a diagnosis as a means of testing for rule-out or provisional diagnoses codes. The models are substantially more sensitive to requiring multiple occurrences of a diagnosis codes.
H4	Robustness: We have found ACGs to be very robust across different diagnostic coding practices. For example, the explanatory power of ACGs in Canada, which only uses 3 and 4 digit ICD diagnostic codes, is quite similar in its explanatory power with the more specific 5-digit codes used in the US. The reader is again referred to our article, "Adjusted Clinical Group – ein Instrument zur Prognose des Ressourcenverbrauchs", C. Forrest, K. Kinder, K. Lemke, R. Reid, *Gesundheits- und Sozialpolitik*, 1-2 / 2004, pp. 8-15. (See also G5)
H5	Research that our team has done evaluating the so-called "BHCAG" demonstration in the State of Minnesota found that ACG-based risk adjustment in combination with quality monitoring has been associated with better quality of care among the integrated delivery systems that participate in this employer healthcare purchasing project.
H6	The ACG system has been used in the public sector and commercial market for 15 years. The client base continues to grow. Renewal licenses have exceeded 90% over the product's life cycle. Additionally, there are regular conferences that provide the opportunity for users to share their experience and to provide feedback on the research and development priorities of the ACG Development Team.
H7	From our 20 years of experience we anticipate operational costs to be minimal in the German context since ACGs are based on available data. The approach of ACGs is comparable to the existing structure of the Risk Structure Adjustment (RSA) and therefore additional on-going tasks are not foreseen. There are no significant hardware requirements specific to the ACG system. Implementing a nationwide risk-adjusted payment methodology will of course require additional resources for documenting the methodology, gaining universal acceptance, training and testing the results. Annual recalibration of the weights will also involve time. .

J Model applications

J1	The ACG System is currently used by more than 250 organizations around the world and is the most widely used diagnosis health-based risk adjustment system. The user base has steadily increased since 1991, when the ACG system first became available. Users of the system include insurers and managed care organizations, public payers, employers, decision-support vendors, international governments, consultants, actuaries, universities and

	other research organizations. The primary applications of the system include: assessing provider efficiency, evaluating access to care, resource planning, determining capitation or budgeted payments for managed care organizations, financial exchange between health plans and providers, high cost case identification, quality improvement and monitoring outcomes.
J2	See above.
J3	Each year, approximately 42 million lives are currently impacted by the ACG System.
J4	The ACG System software is implemented for Windows® systems, a variety of UNIX platforms, DEC Alpha computers and IBM mainframe computers. Output person-level files can be easily imported into analytic software.
J5	Yes. The standard print file includes many built-in population-level descriptive reports.
J6	The software produces an ASCII text file that includes one record for each unique member that is submitted to the grouper. In addition to data specified on input, the output file includes ACG assignments, ADG assignments, and ACG-PM scores. A separate file provides EDC assignments. These files can be read by most popular statistical software applications

K Model / system updates

K1	The frequency of updating depends on how the system is applied. Individual risk assessment variables and cost weights will need regular (probably annual) updating, although more frequent intervals are possible. Albeit probably less frequently, the risk adjustment technology itself (i.e. the grouper) needs updating on a regular basis to incorporate new ICD codes.
K2	A new release of the ACG System incorporating new codes and often, new ways of applying the system, is released approximately every 18 months.

L License policy

L1	The ACG grouper and its source code are not in the public domain.
L2	The ACG system is supplied as a standalone software application that can be easily integrated into the user's system. Johns Hopkins University has successfully adapted the software to a variety of different hardware and software configurations.
L3	The assignment process is fully explained in the technical documentation. The architecture is open. With the one exception that the ICD to ADG mappings are proprietary, the architecture is open. Our team has developed an ICD-10 version of the grouper expressly for German users. This software required our clinical teams to code all ICD-10 codes to an ADG and EDC, which was a considerable undertaking. We

	strongly believe that a German-specific model will and should be developed, because of the unique healthcare context presented by the nation. Johns Hopkins University will support this adaptation. (See L5).
L4	The ICD mappings to an ADG are proprietary.
L5	We recognize that a German version would be needed and would welcome the opportunity to assist the German Ministry of Health, the Federal Insurance Agency, and all other involved parties in the development of a customized version. (See Section P).

M Support / consultative services

M1	The System Documentation and Application Manual, as much a monograph on risk adjustment as it is specific to the ACG System, is available for download from our website (http://www.acg.jhsph.edu/index.htm). On-line tutorials, conference information (including presentations) and many other resources are also available on our web-site free of charge to any who wish to access these materials. Additionally, regular conferences are held (the next in May, 2004) to enable users the opportunity to exchange experiences and concerns with other users as well as the developers.
M2	Assistance with the inputs and outputs of the grouper is included as a part of the license agreement. Additional support for implementing the grouper within an analysis is available with a support agreement. (See also L5).
M3	Consultants are available to assist with planning the project, developing the best methodology, running simulations and supporting the decision process.
M4	Consultants are available to explain the methodology and results as needed. The open architecture of the System generally leads to easier acceptance of ACGs when compared to other "black-box" methodologies.

N Pricing Policy

N1	We are committed to negotiating a fair and reasonable arrangement that does not represent a barrier to the adoption of our system.
N2	There is no charge for updates of the software to licensed users of the ACG System.
N3	Typically support and consulting services are paid for separately through a support agreement based on the needs of the project.
N4	See N3.
N5	See N3.

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	No additional modifications would be necessary. The input requirements of the software are a flat file containing unique member ID, age (or date of birth), gender and string of ICD diagnosis codes. The predictive accuracy of the predictive model may be improved by the inclusion of pharmacy cost information. A model incorporating ICD-10 codes is presently in use testing in Germany and Sweden, thus eliminating the need for conversions and transformations.
P2	While the current ICD-10 version of the ACG software is based on WHO standards, the ACG Development Team is working with several German health care organizations to adapt the software to the unique aspects of the German coding system. (See L3).
P3	Using crosswalks introduces possible error when mappings are inaccurate, therefore an ICD-10 version has been developed reflecting an improvement in the assignments.
P4	When using the ACG System, the calculation of weights is completely separate from the assignment of risk assessment variables. As we believe that weights always need to be recalibrated to the specific time, circumstance and benefit structure, the issues with German cost weights are no different than any US-based organization implementing the ACG System. A protocol has been created to assist users in developing German local weights. In addition, the ACG Development Team is prepared to further assist in this endeavor.
P5	No. Based on our experience in diverse settings and our knowledge of the German context, we are confident the ACG software is applicable.
P6	A non-matched file is produced by the software which outputs all codes that can not be readily interpreted.
P7	The software only requires a unique member identifier for each person (along with age and gender). This identifier can be encrypted to ensure complete anonymity. The risk adjustment process could be totally disassociated from any files containing confidential information (address, state identification number or other “personal” information. NOTE REGARDING THE “**Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme”** The ACG Development Team is committed to working with the German Ministry of Health, the Federal Insurance Agency, and other involved parties in ensuring the proper adaptation of ACGs to the German context, including the development of German weights and the adaptation to German ICD-10 codes.

2 CD-RISC

Clinically Detailed Risk Information System for Cost

A Basics

A1	Clinically Detailed Risk Information System for Cost (CD-RISC)
A2	RAND Kanika Kapur, Chien-Wen Tseng, Afshin Rastegar, Grace Carter, Emmett Keeler
A3	RAND Kanika Kapur
A4	First Release: 1997 (for Medicaid and privately insurance), Second Release: 2001 (for Medicare)
A5	Regression approach
A6	Use of body systems and hierarchical structure, setting minimum payments (in 2001 version), episode payments (in 1997 version)

B Model range according to the model variant

B1	2001 version is applicable for Medicare population – age 65 and over plus the disabled (although models for the age 65 and over only have also been developed) (1997 version is applicable for the Medicaid population and privately insured populations) Note: all subsequent comments will refer to the 2001 version of the model
B2	Only those eligible for Medicare are included (so under 65 non-disabled are excluded)
B3	Some ICD-9 codes that were deemed to vague and gameable were excluded. In our regression analysis, conditions that were statistically insignificant were dropped (with some exceptions discussed in the report, page 27)

C Costs and cost weights (according to the model variant)

C1	Included
C2	Excluded
C3	Included
C4	Other included services: home health, durable medical equipment

C5	We set a minimum payment in cases where the payment from the full model was "too low." See page 28 for details
C6	Yes, other than the cases described in C5 where a minimum payment was used

D **Grouper input requirements, options, and the handling of additional information** (according to the model variant)

D1	24 age sex cells, percent originally disabled (eligibility was due to disability before they became aged), Medicaid eligibility, ICD-9 codes grouped into condition-severity indicators based on hospital inpatient principal diagnoses, hospital inpatient secondary diagnoses, hospital outpatient department, physician, and clinically-trained non-physician (for example, psychologist, therapist, podiatrist). ICD-9 codes that were assigned to facility types, diagnostic testing, durable medical equipment/medical supplies, and other sources were not included
D2	ICD-9-CM A number of V codes and other ICD-9 codes were excluded due to concerns about gameability and vagueness. Example: "economic status affects health," was dropped.
D3	We excluded all lab ICD-9 codes because of concerns about rule-out In a specification test, we excluded RAP diagnoses because of rule-out. (page 55)
D4	We only used ICD-9 codes
D5	N/A
D6	Age, sex, ICD-9 diagnoses, program eligibility information, and cost.
D7	No other information

E **On model development**

E1	Funded by Centers for Medicare and Medicaid Services. Medicare must implement a new risk adjustment system by 2004. The CD-RISC was one candidate model considered, but was not chosen.
E2	See above
E3	As a method of setting payments for Medicare. It can be calibrated for other public and private payment systems.
E4	Medicare administrative data Representative of Medicare beneficiaries (elderly and non-elderly disabled only)
E5	1,394,701
E6	The following exclusions were made by HER (the institution that constructed the analytic file). Our analysis was based on 1996 ICD codes and 1997 costs

	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. Detailed reasons for each are on page 6 of the report
E7	Original sample size was 2,017,964. Net sample size is 1,394,701
E8	Payment variables are based on FFS claims in Medicare administrative data, so patient out-of-pocket costs like coinsurance and copayments are not included
E9	No carve-outs in Medicare, so this was not applicable No stop-loss in 2001 model, but 1997 model did experiment with episode payments and outlier payments.

F Functioning of the model(s) (according to the model variant)

F1	ICD-9 codes are classified into condition-severity cells. Condition-severity cells reside within body systems. Only 1 condition severity within a body system can contribute to costs. See section 3 of report for details.
F2	Expected costs are predicted (additively) using regression model coefficients. See section 3 for details
F3	The model can be recalibrated using new data, keeping the basic structure of body systems and condition-severity cells.

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	Since CD-RISC assigns payment based on conditions, it would reduce risk selection of the healthy compared to a simple age-sex model.
G2	Since payments are set prospectively, providers have a strong incentive to be efficient. In addition, the model is based on diagnoses from a number of sources – inpatient, outpatient, etc. So, if providers implement new cost saving methods to reduce inpatient use, for instance, they are not penalized for this innovation.
G3	ICD-9 diagnoses from a number of sources are used in the model (see D1), hence model is as site-neutral as possible.
G4	Only the most expensive condition within a body system counts towards the costs, so coding multiple related codes does not pay more.
G5	Vague and potentially gameable ICD 9 codes are not included in the model. In addition the hierarchical system (described in G4) also reduces incentives to game

G6	Since payment is based on detailed clinical information, payments account for the expected costs of treatment, therefore, the incentive to provide good quality care is maintained.
G7	Since payment is based on detailed clinical information, payments account for the expected costs of treatment, therefore, the incentive to stint is reduced
G8	Model development is somewhat complex since the model has a hierarchical structure, and requires multiple iterations to converge. However, once the model is calibrated, it is simple to use since the model coefficients are simply added to obtain expected cost. The implementation of the model (once it is developed) can be done on a simple spreadsheet or a statistical package. It requires ICD-9 codes and basic demographic information
G9	A prospective system would require ICD-9 codes from year 1 to predict year 2 costs for model development. A retrospective system would require only 1 year of data. Both are equally easy to implement once the initial model has been developed
G10	No
G11	The model, once calibrated to the appropriate system, can be used in a variety of public and private settings. The model may need to be amended to include outlier payments, episode payments, or other stop-loss mechanisms if applied to very small providers. Small providers may be hard-hit by random variations in costs (if a prospective model is used)

H Model properties (measures and measurement)

H1	The R-square of the (prospective) model is around 11% -- similar to the R-square values for other prospective models with diagnostic information. Predictive ratios by expenditure sub-groups are generally acceptable (see tables 5.1 and 5.2 in paper)
H2	We tested out-of-sample validity by dividing the sample into tenths and using parameters from the 90% sample to predict for each 10% remaining subsample. See page 54 of report for details. We continue to find an R-square of 11%
H3	We excluded RAP diagnoses to test robustness
H4	We excluded certain diagnoses that our clinician believed would lead to inappropriate incentives. The hierarchical structure of the model, which picks only the most expensive condition in a body system, also reduces sensitivity to site of service
H5	See demonstration reports on the CMS web page
H6	CD-RISC has not been implemented
H7	We have not done these calculations

J Model applications

J1	No
J2	N/A
J3	N/A
J4	SAS
J5	No
J6	No, however these can easily be developed

K Model / system updates

K1	This would depend on whether the population has changed, the rate of health care costs increases, etc.
K2	CD-RISC is not currently marketed; however we would be happy to update as necessary

L License policy

L1	No
L2	We have not developed a kit, however, we can do so if there is interest
L3	We will share any necessary information to use the CD-RISC model
L4	N/A
L5	N/A

M Support / consultative services

M1	CD-RISC has not been marketed, so these materials are not currently available, but can be developed if there is interest.
M2	See M1
M3	See M1
M4	See M1

N Pricing Policy

N1	CD-RISC is not currently marketed commercially. We would not charge for the software. However, there would be labor costs involved with calibrating the model that would depend on quality of the data supplied and the types of models that need to be developed (prospective, retrospective, both).
N2	See N1
N3	See N1
N4	See N1
N5	See N1

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	We would need to tailor the condition codes to the sample. For example, since our current model focuses on the aged, there are very few codes for childhood diseases – these may need to be added to the model.
P2	We would need to convert ICD-9-CM codes to the German ICD codes
P3	We would use clinical assistance in the conversion – there is unlikely to be any problem with the model.
P4	We would need to rerun the hierarchical model on German data to obtain coefficients specific to the German system
P5	Yes
P6	We would conduct standard checks to make sure that conditions had appropriate frequencies for various demographic sub-groups. We would also make sure that cost data had the expected distribution
P7	We can develop the risk adjuster using scrambled identifiers to maintain confidentiality. We also have a secure computer system and a variety of internal safeguards to maintain data security. More information is available on this if required.

3 CDPS

Chronic Illness and Disability Payment System

A Basics

A1	The Chronic Illness and Disability Payment System (CDPS)
A2	University of California San Diego Richard Kronick, Todd Gilmer, Tony Dreyfus, Lora Lee
A3	Same
A4	1996/2002
A5	Additive
A6	We have developed a variant of the model for use with an elderly population; we have a drug-based model. For the elderly model, we have developed a variant that adjusts payments for end-of-life care.

B Model range according to the model variant

B1	The model has been applied primarily to publicly supported populations in the U.S. (Medicaid and Medicare beneficiaries). We believe that they are appropriate for privately insured persons as well, but we have not done direct testing in this area.
B2	In developing the Medicaid models we excluded institutionalized persons and those in 'home and community based' waiver programs. In the Medicare models, all elderly and disabled are included.
B3	We do not recommend making payment adjustments for diagnoses that are ill-defined, or for diagnoses that do not have significant effects on subsequent year expenditures. We used clinical consultants to determine whether diagnoses are 'well-defined', and empirical analysis to determine whether diagnoses were associated with elevated levels of subsequent year expenditures.

C Costs and cost weights (according to the model variant)

C1	Included in basic model.
C2	Included in basic model; variants available with pharmaceutical costs excluded
C3	Included in basic model; variant available in which only inpatient costs are included

C4	Long term care services (both institutional and home and community based) are excluded from the costs weights. Variants are available with some of these costs included.
C5	We have estimated variants of the basic models with truncation at various points (e.g,, $50,000 per year, $100,000 per year) as well as with various forms of reinsurance above the attachment point (e.g., 80/20). The basic model does not truncate expenditures.
C6	Not sure what this question is asking?

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Age, gender, and diagnoses are required. Procedures are not used. In the most recent release, we exclude diagnoses from laboratory and radiology claims in assigning diagnostic categories and computing weights.
D2	ICD-9-CM The system will accept any ICD-9-CM code that is included in the ICD-9-CM 2002 nomenclature, including some 'head' codes that should not, in theory, be used.
D3	If an ICD-9-CM code is listed on a claim record that is not laboratory or radiology, it is used to assign diagnostic groups. The system has no way of identifying codes that are 'rule out' or suspected.
D4	Not used
D5	We have a variant of the model that uses pharmaceutical information, using NDC codes
D6	ID is required, in order to be able to link eligibility and claims data. Age and gender are required as well.
D7	No other information is required to run the grouper. We have developed separate weights for disabled persons, adults who are like welfare recipients, and children who are like welfare recipients. If these weights are to be used, one of the set of weights must be selected.

E On model development

E1	The model was developed primarily at UCSD. Some of the funds used for development were supplied by grants from the Robert Wood Johnson Foundation. Support also came from the Health Care Financing Administration.
E2	To provide a tool for state Medicaid programs to use in paying health plans, enabling them to pay more to plans with sicker enrollees, and less to plans with healthier enrollees.
E3	CDPS is being used to make payments to health plans by seven state Medicaid programs, and an two more are planning on using it starting in 2003. A number of health services researchers are using CDPS to assess the relative

	risk and expected resource use of various groups.
	CDPS was originally developed using data on Medicaid beneficiaries with disabilities in seven states, and on Medicaid AFDC and related beneficiaries in five states. Dual eligibles (Medicaid recipients who also had Medicare) were excluded, and thus there were very few elderly in the original development. Subsequently, under contract with CMS, we 'tuned up' CDPS for use with the elderly. CMS is reviewing our final report, and I expect it will be publicly available shortly.
E5	Requires detailed review of earlier computer runs; can supply if important, but not a readily available number.
E6	In the development and estimation of prospective models, people were included if they had 12 months of eligibility in the base year and at least one month of eligibility in the subsequent year. We excluded persons with both Medicaid and Medicare eligibility because the diagnoses on Medicaid claims for these persons were unreliable. We excluded persons who were institutionalized or receiving home and community based waiver services because these persons are unlikely to enroll in health plans in most states.
E7	Approximately 3.3 million AFDC and related recipients, and approximately 630,000 persons with disability
E8	The dependent variable is Medicaid payments for services typically included in an HMO benefits package: physician, hospital, prescription drugs, laboratory and radiology, DME, home health care. Medicaid programs have no deductibles and virtually no copayments.
E9	In the basic model, all payments are modeled; in variants, we have estimated weights carving out various expenditures, such as blood products for hemophiliacs, and various AIDS-related pharmaceuticals.

F Functioning of the model(s) (according to the model variant)

F1	These rules can be extracted from the publicly available SAS code.
F2	The model is additive; we estimate coefficients using OLS regression.
F3	Certainly.

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	Substantially, I would imagine, but this probably requires a longer conversation, and better understanding than I know have of the mechanisms by which risk selection might occur in Germany.
G2	Because procedures are not used in the model, the incentives for efficiency are strong.
G3	Yes, the model is site of service neutral.
G4	Through extensive consultation with clinicians, we have been careful to put

	ICD-9 codes into the same category when a less severe diagnosis could easily be reclassified as a more severe diagnosis. This precaution notwithstanding, there will certainly be incentives to 'upcoding' and rewards to doing so. Careful monitoring and measurement of changes in coding over time would be needed.
G5	Within major diagnostic groups, the system is fully hierarchical: adding less severe diagnoses will not add to case-mix. We exclude from payment many high frequency low severity diagnoses to reduce the incentive to profit from recording these diagnoses and to reduce the audit burden. However, at least in the U.S., there is, in the FFS system, substantial under-reporting of diagnostic information: 20% of the people diagnosed with schizophrenia this year do not receive a single schizophrenia diagnosis in the subsequent year. Even larger percentages of people with quadriplegia and diabetes and other diagnoses do not 'persist' from one year to the next. Payors who use diagnoses in payments should be prepared for substantial changes in the nature of diagnostic reporting, which might be called 'gaming' or 'creep', or, perhaps, more accurate diagnostic reporting.
G6	Further discussion needed; the answer will be little different for CDPS than for other groupers. I can argue that the incentives for good care will be slightly stronger with CDPS than other systems because CDPS is slightly more sensitive to high need persons and does a better job of protecting against gaming, but it would be difficult to prove this point. To the extent that diagnostic adjustors increase the incentive to serve sick people they should improve the incentives to provide high quality care. With any diagnostic adjustor, however, unless there is substantial high cost case reinsurance, very high utilizers will still create financial losses for a plan.
G7	Not by the diagnostic risk-adjustor. Other sorts of monitoring are needed (e.g., comparing actual with expected use; good grievance systems; requirements for well-functioning QA/QI programs; perhaps Newhouse-type partial capitation.
G8	The system has been well accepted by health plans, Medicaid program administrators, and actuaries throughout the U.S. It is relatively simply and easy to understand. It is easy to monitor. The software is in the public domain. The development of weights has been extensively described, and we have worked closely with interested parties in a variety of states to listen and respond to concerns that have been raised.
G9	Yes. (a softball question!) In CDPS, the grouping of diagnoses is the same for the prospective and concurrent models. The weights are different, of course: the weight on the intercept (no diagnosis) is lower in the concurrent model than in the prospective model, and the weights on the diagnostic categories are higher for the concurrent than for the prospective model.
G10	I'm not sure exactly the scenario you are contemplating. If asked, I would give my best advice about the particular application, suggesting whether it made sense to me or not. The software is in the public domain, and I do not control its use.

G11	No to the first; not sure to the second – need a better understanding of the question.

H Model properties (measures and measurement)

H1	Cost weights vary relatively little across states and relatively little over time. Even more significantly, in our recent work with Medicare expenditure data, we have seen that the cost weights developed on Medicare data are not tremendously different from the cost weights estimated for Medicaid recipients with disabilities. (In contrast, weights for welfare and related Medicaid recipients are substantially different from those for the disabled or the elderly.) R-squared statistics for some of our models are reported in the Spring 2000, HCFR. R-squared statistics for our Medicare models will be available when CMS releases our report; they are generally quite similar to HCC-based statistics (except in one model where we include an indicator of whether the beneficiary died, in which the R-squared doubles!)
H2	??
H3	??
H4	??
H5	Dave Knutson has done some qualitative work in this direction. As you know, it is so difficult to measure quality to begin with, and there are no markets in which a large fraction of provider revenue is coming through risk-adjusted capitation, so it is probably not possible to imagine that there has yet been a measurable effect on quality.
H6	Yes. We ask Medicaid programs and plans that contract with them for their reactions to the system. Reactions are generally positive. Perhaps a better indication is that of the states that have adopted the system, none have discontinued its use (with the exception of Delaware, which no longer contracts with health plans on a capitated basis).
H7	No.

J Model applications

J1	The model is being used by state Medicaid programs in Colorado, Oregon, Tennessee, New Jersey, Michigan, Utah, and Washington. Pennsylvania and Oklahoma are planning to begin making risk-adjusted payments in 2003. With the exception of Michigan and Washington, these states are using the model to compute case-mix score for each contracting health plan, and then pay the plans a base rate multiplied by the case-mix score.
J2	Seven states currently, with two more planned soon. The software has been downloaded by approximately 130 organizations (mostly health plans, some researchers, actuaries, and consultants.) I don't know how many of these organizations are actively using it or exactly for what purposes.

J3	Not sure; if it is important to you I can do some digging around and come up with an estimate. An extremely rough guess would be in the neighborhood of 1 million.
J4	SAS system 8.
J5	Yes, a limited set of reports are available. In SAS, of course, extensive reporting is possible.
J6	No, other than the standard features supported by SAS.

K Model / system updates

K1	This depends on a variety of factors, including: how quickly medical technology is changing; whether the quality of coding is changing; and the availability of data.
K2	The last major update of weights was in 2,000.

L License policy

L1	Yes. Yes.
L2	
L3	Yes.
L4	
L5	N/A.

M Support / consultative services

M1	Published reports on the system and the User's Manual that is supplied with the software. We also have a 'FAQ' section on the web site.
M2	As needed and subject to mutual arrangements.
M3	We provide a variety of types of support to clients, running the gamut from brief consultations to re-estimation of weights using state-specific data and/or state-specific benefit packages (e.g., carve-out mental health services; use a reinsurance threshold; carve-out drugs for hemophilia.) For one state program, Colorado, for a number of years we received the encounter data from the HMOs and computed a case-mix for each plan (we have subsequently trained state program staff to perform these functions). As usual in capitalism, the conditions to get support are sufficient funds; as usual in a University setting, the money is balanced with our assessment of the likelihood of a successful or interesting project.
M4	See above

N Pricing Policy

N1	Public domain
N2	
N3	Negotiated on a case-specific basis; dependent on the scope of project and level of interest.
N4	
N5	

P Adaptability to Germany's health system and implementation as morbidity-based risk structure compensation scheme

P1	We would need to know how to exclude laboratory and radiology claims. Big problem is the ICD-10 issue discussed below.
P2	There are two potential approaches to dealing with the ICD-10 issue. One could convert the ICD-10 diagnoses into ICD-9 codes, and then run the grouping software 'off the shelf'.' A preferable approach, but one that would likely require more effort, would be to convert the ICD-9 codes into ICD-10, and rewrite the software to run off ICD-10. Given enough resources and enough data, it would make sense to use a combination of clinicial judgment and empirical evidence in deciding exactly how to combine and separate ICD-10 diagnoses. The drug-based mode is another story altogether. Here there are issues both of conversion of PZN to NDCs, and of likely differences between Germany and the U.S. in how pharmaceuticals are used. Although I would, in general, advise against heavy reliance on a drug-based model, if Germany goes forward in this direction, additional attention to the grouping of pharmaceuticals in the German context would be needed.
P3	The mode is less sensitive to variation in expected resource use if only 3-digit level ICD-9 codes are available. I do not have a precise estimate of the degree of sensitivity that is lost, although such an estimate could be constructed.
P4	The developer would need an estimate of resource use (payments) for each person in the analysis. One might also want geographic identifiers on each person's location of residence, to test whether there are geographic differences in resource use, controlling for diagnoses, age, and gender. If there are, a policy decision would be required about whether to reflect these differences in a payment system.

P5	We have examined the appropriateness of the basic grouping of diagnoses in quite different populations in the U.S.: Medicaid recipients with disabilities; Medicaid welfare-related recipients; and Medicare beneficiaries. The basic grouping of diagnoses is appropriate for each of these three groups, and I would anticipate that the grouping might well be appropriate for Germany as well, although recalibration of the weights would be needed. I am less confident that our (or any U.S. created) drug based model could be adopted without modification, because I think that the use of pharmaceuticals in Germany is quite different than in the U.S.
P6	We check for valid ICD-9 codes; for gender appropriateness (no hysterectomies on men; no prostatectomies on women).
P7	The risk-adjustor requires a unique identifier for each person enrolled in a health plan. The identifiers can, of course, be scrambled, but the protections on the confidentiality of the data are the responsibility of the user.

4 CRG / CRxG

Clinical Risk Groups

A Basics

A1	3M Clinical Risk Groups (CRGs/CRxGs)
A2	3M Health Information Systems 575 West Murray Boulevard Murray Utah 84123-4611 (801) 265-4400 National Association of Children's Hospitals and Related Institutions James C. Gay, MD, John H. Muldoon, MHA, John M. Neff MD 3M Health Information Systems Richard Averill, Norbert Goldfield, MD, Jon Eisenhandler, PhD, Jack Hughes, MD,
A3	3M Health Information Systems Richard Burford Product Marketing Manager 3M Health Information Systems Division 100 Barnes Road Wallingford, CT 06492-7507 001 - 203 949 6381 Office 001 - 203 949 6331 FAX rburford@mmm.com 3M Health Information Services Martin Möller General Manager Health Information Systems 3M Medica Zweigniederlassung der 3M Deutschland GmbH Hammfelddamm 11 D-41453 Neuss +49 2131- 14- 4206 +49 2131- 14- 4205 +49 171 - 56 2 25 62 mmoeller@mmm.com
A4	March 2000 / April 2001 / update in 2004
A5	Mutually Exclusive Categorical clinical model
A6	Enhanced logic to consider acute events, basic quality control reports, CRG and EDC descriptive tables

B **Range of the model(s)** according to the model variant

B1	All types
B2	None
B3	ICD-9 CM Version 2001 (To be updated)

C **Costs and cost weights** (according to the model variant)

C1	Included at users choice
C2	Included at users choice
C3	Included at users choice
C4	Included at users choice
C5	Included at users choice. We recommend extreme outliers be trimmed by way of capping – that is, outliers will be included but capped.
C6	No. The grouper assigns INDIVIDUALS to groups. The user can perform the projection of expected expenses external to the grouping process. Utilities that function with the grouper may be available to calculate appropriate statistical outputs such as Relative Weights and expected values.

D **Grouper input requirements, options, and the handling of additional information** (according to the model variant)

D1	Diagnoses, young age, specific procedures (minimal , option to use procedures is available), pharmacy For more detail see 3M Clinical Risk Grouping Definition Manual Demographic adjustments can be performed external to the grouping process
D2	ICD-9 CM, ICD-10-SBG V , ICD-10-GM 2004 , OPS 301 SGB V , OPS 2004 None, though some are not used for grouping into episode diagnostic categories as the basis of the CRG model.
D3	Inpatient diagnoses are considered accurate. Outpatient diagnoses need to be mentioned 2 or more times with an interval between mentions. History of a procedure is used when a prior diagnosis may be considered to be cured. In other words, the model handles "incomplete conversion" i.e., rule-outs, etc. through internal logic that is designed to minimize the impact of uncertain diagnoses.
D4	ICD-9 CM and (26 ~~75~~) CPT-4 / HCPCS codes were used
D5	NDC
D6	Age, sex, identification number for linking (may be encrypted)

D7	Unique individual identifier, date of birth, gender, dates of service, first date of coverage, last date of coverage site of service and type of provider See 3M Clinical Risk Grouping Installation and User´s Manual for HP-UX and NT Software Version 1.1 COD-100 Version C 04/01 for details

E On model development

E1	Joint Funding by U.S. Department of Commerce, Advanced Technology Program, National Institute of Standards and 3M See 3M Research Report 9-99 page 1 for details
E2	Risk Adjustment in Managed Care. Department of Commerce thinks that the models developed by CMS (HCFA) are not adequate to support the movement of managed care to sicker populations, increasing costs and limiting the ability for the US to compete in international markets. Designed for prospective and concurrent prediction and retrospective analysis.
E3	Tracking congenital / chronic disease prevalence rates Profiling health service utilization and practice patterns Pricing and capitation risk adjustment Linkage to measurement of patient satisfaction and Quality Assurance Targeting for case management and disease management and tracking over time Measuring the disease burden of enrolled populations
E4	250,000 Medicaid recipients from Washington state (´92 / ´93) 250,000 employer based data set 5 % National Sample data set of 2.0 million Medicare eligible (minimum three years continuous data linked over time)
E5	2.0 million
E6	Yes Development was based on individuals with full years exposure to avoid bias from left and right Censoring Benefits vary by plan, but always included complete inpatient and outpatient services
E7	1.9 million
E8	Included coinsurance and deductibles For total allowed charges For model development payment variables are independent of CRG model to fit users needs.
E9	Not used in model development For weights various models were tested including stop loss above 100K $ and outlier trim

F Functioning of the Model(s)

F1	In essence, retrospectively determined episodes of treatment (or patient histories) are combined to form severity adjusted clinical risk groups for concurrent analysis or for projections for details see 3M Clinical Risk Grouping Definition Manual Chapter 2 and Chapter 3
F2	Actuarial firm involved in weight development methods. Methods are independent of CRG model. Number of cells can vary from at users decision Expected costs based on 3 years data with and without data lags For details see final reports and document entitled "Weight Methodologies" by Jon Eisenhandler and Elizabeth McCullough
F3	Yes – the CRG *structure* supports this

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	R^2 = up to 21% (untrimmed), up to 28% (trimmed) – source M Berlinguet et al 2004, Comparison of Three Risk Adjustment Systems in Three Canadian Provinces using CRG Version 2001. Rates are expected to increase with the current version about 10 times age/sex adjustment models The risk adjustment model recognizes the differences in the cost of treating different diseases and places the greatest resources with the sickest people.
G2	This is a function of fixed payments , plans will find gaming quite difficult and easy to detect Being more efficient is the best choice under CRGs as gaming will not work well. However, plans will have a positive incentive to improve data completeness and accuracy
G3	Yes Treatment in a particular site does not increase future rates so the model does not favour one site over another
G4	Diagnosis are aggregated so that it is difficult to change groups by a small change in a diagnosis
G5	Optional use of procedures (~ 26 ~~75~~ codes), rates vary only a small amount when procedures are used .
G6	5- 6 % of the patients require up to 50 % of the insurance spending the model is focused on these peoples. In other words, the model would pay more for sick people. Severity adjusted measurements of specific chronic diseases (e.g. DM) are monitored over time periods and identification of treatment areas that are ”waste of time ” under CRGs plans will have an incentive to enroll those with multiple chronic conditions and to effectively manage the case of these individuals.

	CRGs supports related analysis, such as profiling clinical outcomes, i.e., movement between groups
G7	CRGs may be used to perform outcome analysis. They can detect under provisions of services
G8	Transparent - all logic is documented and available Understand – Categorical models facilitate communication, especially when severity adjustment is explicit Simple – the CRG clinical model is conceptually simple Inexpensive – relies on standard data, further data use is users choice Audit – severity adjustment means that true outliers are easy to find, unexpected changes in illness burden are easy to detect
G9	Yes Concurrent and prospective uses are solely determined by the weights , the CRG model can be used either concurrently or prospectively. Different types of adjustments are needed for concurrent and prospective models.
G10	No Concurrent use seems to be a good idea to solve the problem of equitization across insurance funds
G11	We have no ”non –recommended ” applications

H Model properties (measures and measurement)

H1	See the CRG Final Report, Tables (to be provided by Jon Eisenhandler). Inpat+Outpat+Drugs 19.03 % 18.63 % Source: M. Berlinguet et al 2004, Comparison of Three Risk Adjustment Systems in Three Canadian Provinces using CRG Version 2001. Rates are expected to increase with the current version Maximum Provincial R^2 for Medical Services all locations: 28% Hospital Services (excluding Emergency Room and Clinic visits): 13% Medical + Hospital services as above: 17%
H2	CRGs are a clinical model developed and reviewed by a panel of specialized physicians , subsequent physician reviews at various managed care plans have not found problems The clinical models are then tested against empirical data
H3	The CRG algorithm the CRG algorithm is not sensitive to small changes in input data
H4	Site of service does not greatly influence rates. Fixed rates will encourage the use of lowered cost care alternatives
H5	This is related to use of fixed prices and should be a concern for any capitated system. There is a recent US study that founds lower quality in for

	profit hospitals. CRGs can be a part of a continuous quality and improvement process
H6	Accepted various managed care plans, but use limited to reimbursement determination (Elder Plan) Casemix measurement and clinical management (Sharp) in targeting cases for case management and tracking over time
H7	Operation costs minimal as CRG use available data Setup – calibration of weights usually takes 2 –3 people 2 – 3 weeks A significant advantage of using a mutually exclusive categorical model is the direct approach to calculating weights (simple averages per group) when compared to a multiple dichotomous variable method that require inferential statistics to define weights which could result in negative coeffi-cients (negative costs!) that then require artificial adjustments. This simplicity and transparency becomes an important criteria for imple-mentation and acceptance by users. Note: Comparing R^2 a mutually exclusive categorical model to a multiple dichotomous variables method. The latter may by construct (many vari-ables to describe one patient instead of one as in the former model) produce higher level of explanation of variance (R^2) at the individual level without, in fact, being a better predictor for groups of individuals.

J Model applications

J1	Yes 2001 Manage Care plans for weight setting Proactive management / tracking system / drill down tool or researchers at various institutions such as Vanderbilt university
J2	As a newly released classification product, CRGs are undergoing demon-stration and testing in dozens of managed care sites throughout the U.S. A successful demonstration of the CRG software has been completed in Can-ada.
J3	CRGs, in the past year, were used to "group" millions of lives. Selected examples are as follows: Large California-based HMO 3.0 million lives; New Jersey-based case management company 800,000 lives; CMS/HCFA evaluation 1.0 million lives among others.
J4	HP-UX / Windows NT Windows NT 2000, IBM Mainframe, Sun-Solaris
J5	The software is grouping is grouping and classification software. The out-put of the software may be analyzed and reported using any variety of stan-dard drill-down analysis tools, SAS, etc. There is a simplified file format for input to SAS or Access.
J6	See 3M Clinical Risk Grouping Installation and User´s Manual for HP-UX and NT Software Version 1.1 COD-100 Version C 04/01 Chapter 6 and 7

K Model / system updates

K1	Annual updates - cost weights Clinical logic updates every 5 years.
K2	Annual updates will be provided for codes. The schedule for logic updates has yet to be determined.

L License policy

L1	No No
L2	No But we are willing to collaborate with local development teams
L3	Yes
L4	CRGs are a proprietary product owned by the 3M Company. We will be pleased to discuss this issue with the officials in Germany
L5	Yes, this can be negotiated and we hope to have the opportunity to do so. We recognize that there will be the need for a German CRG version and that CRGs future development and extensions will need to be done in Germany.

M Support / consultative services

M1	See 3M Clinical Risk Grouping Definition Manual See 3M Clinical Risk Grouping Installation and User´s Manual for HP-UX and NT Software Version 1.1 COD-100 Version C 04/01
M2	This is a new issue for us, as people do not generally wish to redevelop our software. But we will be pleased to cooperate as we recognize the need for this in Germany
M3	A – Installation support B – Software support tools C – Consulting / Actuarial and Rate setting support As for DRGs this will be done by 3M HIS Germany
M4	A – Installation support B – Software support tools C – Consulting support related to Case Management As for DRGs this will be done by 3M HIS Germany

N Pricing Policy

N1	This can be negotiated
N2	This can be negotiated
N3	This can be negotiated
N4	This can be negotiated
N5	This can be negotiated

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	Mappings ICD 10 – ICD 9 and OPS 301 – CPT-4 / HCPC and PZN –NDC, provider type mapping Site code mapping, Lab information not used at present See 3M Clinical Risk Grouping Definition Manual for details See 3M Clinical Risk Grouping Installation and User´s Manual for HP-UX and NT Software Version 1.1 COD-100 Version C 04/01 for details
P2	A conversion plan should be developed based on time and resource commitment and goals for the conversion planned jointly.
P3	General effects for any model: reduced redistribution between sickness funds / insurance companies Fewer people were identified at high severity levels . However due to the fact that the system is based on episodes , these effects (if present) should be minimal
P4	Cost weights are completely independent of the grouper. If needed we have developed techniques to augment data from one source with information from another source, this can be used to overcome limitations in data from Germany (if any)
P5	No The CRG clinical condition model will be applicable to Germany . However the CRG model will support local specific future extensions such as quality oriented redefinition of the severity scores
P6	Tools for data quality checks in recent DRG - benchmarking projects have been developed for German ICD / OPS documentation and are available
P7	Longitudinal person based data is necessary, but data protection / confidentiality can be respected by encrypted unique identifiers

5 DCG/HCC/RxGroups

Diagnostic Cost Group/ Hierarchical Condition Categories and RxGroups

A Basics

A1	DxCG® – DCG/HCC and RxGroups® models
A2	DxCG, Inc. Arlene Ash, Randall Ellis, Gregory Pope
A3	DxCG, Inc, 617.303.3790 – Boston, MA – USA www.dxcg.com Marilyn Kramer, President & CEO Sean Aherne, Vice President of International Operations 617.896.5903 sean.aherne@dxcg.com
A4	DCG/HCC: First 1996, Latest November 2001 ICD10 mapping & product released February 2004 RxGroups: First 2002, Latest May 2003
A5	Additive or categorical
A6	Payment, Explanation; Concurrent, Prospective. Drug only (RxGroups), Claims only (DCG/HCC) and combination (Rx+Dx) models available, as well as enhanced models using additional sources of data. The models also separately calibrated for over and under age 65.

B Range of the model(s) according to the model variant

B1	Medicare (over age 65 and disabled), Privately Insured, Medicaid, All ages
B2	No exclusion – all people included / modeled, even those with no claims or partial year eligibility
B3	Based on full ICD set of diagnosis codes (both ICD-9-CM and ICD-10). All diseases are classified. Procedures, place of service and types of services are not used for modeling. Because of additive nature of models, any combination of co-morbid conditions can be evaluated, even subsequent to modeling. RxGroups based on NDCs (National Drug Code) and, as of April 2004, also based on ATC (Anatomical Therapeutic Chemical) classification system.

C Costs and cost weights (according to the model variant)

C1	Included
C2	Included
C3	Included
C4	Included
C5	Models are calibrated for no truncation, as well as for truncation at $100.000, $50.000, and $25.000 (U.S. dollars).
C6	Yes, the standard, offered models predict total expected expenditure, however, some users have predicted subsets of spending such as spending on inpatient, or laboratory, or drugs. DxCG has extensive experience consulting with clients to develop customized models predicting additional outcomes, such as physician costs.

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Diagnoses, Age, Sex for each claim are needed for diagnosis-based DCG/HCC models. Drugs, Age, and Sex are needed for RxGroups. Age, Sex, Drugs, diagnoses for Rx+Dx combinations. Enhanced models that use additional information are available.
D2	Diagnoses – ICD-9-CM and ICD-10. Current software permits "illegal" 3- or 4-digit root codes to be recognized if desired. Current mappings recognize ICD-9-CM for 1999-2002 and ICD-10 for 2003.
D3	Current ICD-9-CM does not permit these distinctions to be made. A customized ICD10 Germany model could usefully reflect this important information given your current ICD10 system.
D4	DxCG does not currently use procedures for predictions
D5	NDC (National Drug Codes) and, as of April 2004, ATC.
D6	Age or date of birth, Sex, unique ID ID can be an artificially generated element that protects privacy.
D7	None is required. Optional variables are source (whether the diagnosis is from a physician, hospital, outpatient laboratory, etc.); Eligibility (number of months eligible); Date of Service and, for enhanced models, prior utilization.

E On model development

E1	Affiliations of lead authors are Boston University and Health Economics Research, Inc. (now part of RTI International, Inc.)
E2	Contract with U.S. federal government Medicare agency (Centers for Medicare & Medicaid Services - CMS - formerly HCFA) for risk adjusted payment in the U.S. for the Medicare healthcare system for persons over age 65 and those with permanent disabilities.

E3	High-risk case identification, health-adjusted payment, health-adjusted underwriting, provider (hospital or physician) efficiency reporting/profiling. Models have also been successfully used to adjust expected mortality and morbidity (e.g. risk of death after heart-attack), to inform staffing decisions and resource allocation, and for special populations including pediatric, long term care and mental health groups
E4	Models developed separately for Medicare (age over 65 and disabled) and for privately insured populations (primarily under age 65). Privately insured data and Medicare traditional indemnity samples are representative of their respective U.S. populations. Models have also been calibrated for Medicaid (primarily poor and medically needy) samples and on international data sets where there is a single-payor health care system.
E5	3-6 million individuals privately insured, 1,6 million Medicare beneficiaries; over 2 million Medicaid enrollees; 3,4 million individuals in most recent non-U.S. data.
E6	Partial year eligibles included in privately insured sample. Medicare model uses only traditional indemnity enrollees who are fully eligible for Medicare. Privately insured sample uses only those with medical and pharmacy coverage.
E7	6 million (privately insured); 1,4 million (Medicare); 1,9 million (Medicaid)
E8	Privately insured models use total covered amounts, which INCLUDE deductibles and copayments. Medicare models predict total Medicare payments, which EXCLUDE deductible and copayments. Medicaid models predict total Medicaid payments, which are approximately the same as total covered amounts, since Medicaid enrollees do not have any copayments. Recent models developed on a non-U.S. population included costs for physician, outpatient and ambulatory care services.
E9	DxCG has calibrated models including pharmacy and mental health spending, as well as pharmacy costs alone. DxCG has also worked with clients to calibrate specialized models using their own data to predict such outcomes as high cost radiology services, likelihood of hospitalization, provider “capitated” services, etc.

F Functioning of the Model(s)

F1	For diagnosis-based models – Approximately 15.000 diagnosis codes (either ICD-9-CM or ICD-10) codes map to 781 DxGroups that collapse with hierarchies and interaction terms to 184 Condition Categories for modeling. For Drugs the 70.000+ NDC codes (and approximately 4.000 ATCs) map into 155 RxGroups with hierarchies for modeling.
F2	Each person gets a score that is a combination of demographics, Condition Categories (or RxGroups) with hierarchies imposed, and interaction terms. The choice is based on a combination of statistical and clinical refinement,

	designed to balance predictive power, minimize the effect of coding variability, and effectively apply available healthcare transaction data. Payment weights are calculated using multivariate weighted linear regression models, modified by clinical and statistical judgement.
F3	Yes, the U.S. Medicare Agency – The Centers for Medicare and Medicaid Services – did exactly this when they chose the DCG/HCC models and modified them by collapsing some categories.

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	The models are designed to pay plans fairly regardless of the actual risk selection. In the state of Massachusetts, health plan payments are adjusted based on the population served after enrollment occurs. As a result, the effect of biased selection is minimized. Studies have shown that DCGs perform much better in terms of predictive power (at both the individual- and group-level) than do age and sex models.
G2	After application, the main incentive left for a risk holding entity is efficient management of care – what is the difference (or ratio – efficiency index) of observed cost of care and expected cost of care. When combined with quality measures to insure that underutilization of appropriate care does not occur, the DxCG models reward efficient, high quality care and penalize inefficient delivery.
G3	The models are site-of-service neutral. The existence of the diagnosis (or the dispensing of the drug) is what is used for predictions.
G4	Prevalence rates are easily calculated for comparison with benchmarks, hierarchies are imposed to keep a provider from getting extra payment for coding minor conditions associated with a major clinical problem. For example, individuals get the same score for metastatic cancer whether or not there also exists a claim for locally invasive cancer; same score for vascular disease with complications whether or not uncomplicated vascular diagnoses are coded. In addition to purely explanation models, DxCG produces payment models that exclude most vague and discretionary diagnosis groups.
G5	Groupings of diagnoses are modeled, not procedures – what the person has rather than what was done to the person – feeds the predictive models. DxCG created specific models to address the potential for gaming. These are distinct from the more predictive explanation models used for care management.
G6	The power in the models is high enough to drive incentives for delivery of efficient care if they are used to adjust payment. Quality of care measures naturally and easily combine with the models to create a quality-based, efficiency-driven healthcare payment system. Incentives to improve quality are complex and not easily answered in this table.

G7	If "stinting on care" means minimizing the delivery of care to minimize cost of care delivery, then it is important to monitor benchmarks for particular quality measures – such as rates of surgery in appropriate patients, preventive measure use, etc. The DxCG models create patient-level profiles describing the disease burden and specific conditions that a patient has, so they work very well to choose subsets of patients to monitor for appropriate levels of care delivery. DxCG explicitly tracks people with no claims, so non-utilizers can be readily identified.
G8	All of these attributes are described in CMS's technical paper describing why they chose the DCG models (see CMS announcement at http://www.cms.hhs.gov/healthplans/riskadj/EnclosureC.pdf). DxCG models incorporate these elements. The patient-level output includes details as to why, from a clinical perspective, the score is what it is – it describes the specific diagnoses a person carries.
G9	DxCG has models specifically designed for payment. The prospective payment model describes the ongoing health-burden a person carries. It can be used to adjust payment. The PROSPECTIVE model will reward PREVENTION of expected utilization. The concurrent model describes, given what actually happened to a patient this year, how much utilization of care is expected. The CONCURRENT model for payment DOES NOT REWARD PREVENTING the occurrence of an expected event, rather it rewards efficient care of events that do occur.
G10	The concurrent model will take in to account acute clinical events that have no or little bearing on future health costs. As such, it will not be the most efficient model for prospective payment. It would be reasonable to use the concurrent model in combination with a prospective model – to balance the reality of "random acute events" in healthcare. The prospective models typically fold these events into the age-sex component of the model, but with smaller numbers of patients at a provider-level, it may be useful to "reconcile" all or a portion of these events as they actually occurred.
G11	DxCG has seen the models applied in many novel circumstances (such as predicting morbidity and mortality and/or site-of-service specific costs – drug only, inpatient only, etc) with good results. It is possible to measure the effect by running experiments on historical data if it is available.

H Model properties (measures and measurement)

H1	These numbers are available in numerous published reports. An up to date list of references and a bibliography are available on the DxCG web site at http://www.dxcg.com/method/index.html See especially: Ash et al, 2000, Health Care Financing Review Pope, et al, 2000

	Cumming and Cameron, (2002) report for U.S. Society of Actuaries,
H2	This is difficult to summarize in a few words. See above published studies.
H3	See published studies
H4	Our model predictions do not reflect the site-of-service.
H5	See published studies.
H6	Yes. DxCG collects its own evaluations through user conference and training surveys. CMS, the Society of Actuaries in the US, and various research studies have also compared the major models.
H7	This depends on how much customization is required.

J Model applications

J1	Implemented in practice since 1996. Models are being used worldwide by private plans, public health insurance programs, federal and state government agencies, provider networks, and researchers. DxCG has licensees in ten (10) different countries.
J2	For payment more than 20 (twenty) organizations are using the system, representing over 20 million covered lives. Overall, more than 170 organizations use the model. The U.S. federal government is the biggest single user, with its use in the Medicare (senior care) system by CMS, followed by Kaiser Permanente, the largest not-for-profit health plan in the U.S...
J3	70.000.000
J4	The software is implemented on many platforms and currently in two versions: a Stand-Alone version and a SQL Server version. . Platforms included Windows, UNIX and mainframe. More details can be found at http://www.dxcg.com/uses/tech.html
J5	DxCG software products are available with built-in reporting modules, which create sets of summary statistics by user-defined grouping variables that are formatted into a set of spreadsheets using a MS Excel report template. Other specific reporting elements are available for an additional license fee.
J6	The output is compatible with input into any relational database, including SAS®.

K Model / system updates

K1	Every 2 to 4 years. This frequency balances currency and stability.
K2	Every 2 years

L License policy

L1	Parts of the DCG grouper are public domain in the United States. For ex-

	ample, segments of the classification system are available on the CMS web site. The DxCG software and RxGroups, its payment formulas, benchmarks and reports are proprietary.
L2	Developer kits are available.
L3	Extensive descriptions and examples are available in our manuals and publicly available reports. DxCG would consider disclosure of a collaboratively developed ICD10-SGB model.
L4	Weights and some specifics of the mapping, interaction terms and hierarchies are proprietary.
L5	Yes.

M Support / consultative services

M1	Electronic and Paper. User Guide, Analytic Guide, Administration Guide
M2	Extensive support on a user web site, by email and telephone, and in-person is available to licensed users. Licensing contract describes the specific terms.
M3	Staffed telephone and e-mail help desk. On-site help and/or training provided on a few for service basis. Support is included as part of the license arrangement.
M4	Staffed telephone and e-mail help desk. More extensive support, including on-site meetings and trainings is contracted for separately.

N Pricing Policy

N1	Subject to population, use and contract duration. Typically a base yearly fee based on number of covered lives.
N2	Updates to existing models/products are currently included, new products are subject to new licensing agreements.
N3	Support for clients is included with appropriate license.
N4	Support for users is included with appropriate license – specifics to be discussed with German Health Authority
N5	Included with appropriate license – specifics to be discussed with German Health Authority

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	Since early 2003, DxCG has worked earnestly to develop initial models using German data as part of a project with KBV. We are currently evaluating those models. Initial results reveal similar predictive power and us-

	ability in Germany compared to what we have seen in the U.S. and elsewhere.
P2	DxCG research efforts using ICD-10-SGB-V have resulted in successful model development and deployment of enhanced software ("DxCG 6.1 International Edition") in Germany. U.S. and KBV physicians have reviewed clinical mappings for validity and economists and statisticians have reviewed the model parameters for stability. Multiple German sickness funds have begun independent model testing and evaluation of results from the new models and software. DxCG intends to dedicate the necessary clinical, analytical and programmer resources to update the models based on feedback received from the various ongoing German projects.
P3	DxCG previously expressed its preference to develop an ICD10 mapping that takes full advantage of the new information included in the new classification system and we have done so. Using a crosswalk between ICD10 and ICD9 to force data into an existing risk adjustment model would have sacrificed predictive accuracy. Also, it would not have allowed DxCG to take advantage of the improvements in the ICD-10 over ICD-9-CM. DxCG is also finalizing preliminary work using enhanced ATC information to directly map into RxGroups, DxCG's pharmacy-based classification system.
P4	For a prospective model, recalibration using historical German data (2 years at a minimum) will give the most reliable results. Research efforts on German enrollment and claims data have offered indications that practice styles, coding completeness and relative cost between the U.S. and Germany health care data are similar for the purposes of calibrating DCG models. DxCG can provide the technical code to recalibrate the models on German data.
P5	Experience in Germany and various other diverse settings, such as the U.S. Veterans Administration, Canada, and Australia suggest that DCG models behave very well despite significant differences in practice style and costs. Because DxCG methodologies are population-based and describe at the individual- level the conditions a patient has, it is largely independent of the care system.
P6	DxCG software automatically creates data quality reports, which audit input data quality. There are also options within the software to make best use of available data and to output any data that is invalid. These mechanisms facilitate ongoing quality assurance, model development and appropriate application of results.
P7	Confidentiality can be fully protected. Identifying data is not used in the runs. The software will model patients with a meaningless number used to identify all claims related to a particular individual. Identification for profiling providers, payment or other purposes can occur completely independently of the application of the DxCG models.

6 ERG

Episode Risk Groups

A	**Basics**
A1	Episode Risk Groups (ERGs)
A2	Symmetry Health Data Systems, Inc. An Ingenix Company Dan Dunn, PhD (IHCIS) Dogu Celebi, MD (IHCIS) Eric Olmsted, MS (IHCIS) Joseph O'Connor, MS (IHCIS) Russ Robbins, M.D.(Symmetry) Cheri DiGiovanni (Symmetry)
A3	Symmetry Health Data Systems, Inc Cheri DiGiovanni Product Sales Director 4455 E. Camelback Road, Ste. C-240 Phoenix, AZ 85018
A4	First Release, Spring 2001; Latest Release, Spring 2004
A5	Additive
A6	Timing: Prospective and Retrospective (Concurrent) Age: Non-elderly and Elderly Truncation/Threshold: $25,000, $50,000, $100,000, none Input Data/Cost Outcome Predicted: Medical and Pharmacy/Medical and Pharmacy Medical/Medical and Pharmacy Medical/Medical

B	**Range of the model(s)** according to the model variant
B1	All population groups (see above)
B2	None
B3	No diseases excluded Based on episodes of care – episodes of care depend in part on ICD9 CM diagnostic codes

C Costs and cost weights (according to the model variant)

C1	All services included in outcomes variables, unless selected otherwise (See above)
C2	All services included in outcomes variables, unless selected otherwise (See above)
C3	All services included in outcomes variables, unless selected otherwise (See above)
C4	All services included in outcomes variables, unless selected otherwise (See above)
C5	Four options for truncation/threshold: $25,000, $50,000, $100,000, none
C6	ERG output includes relative health risk for each member – can be converted to expected expenditures by user using own experience.

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Primarily diagnoses, age and sex – a very small list of procedures (exclusively organ transplants and surgery following trauma)
D2	ICD-9-CM based Diagnosis codes No valid codes are considered invalid.
D3	Rule-out and vague diagnoses do not contribute to starting episodes of care and therefore do not impact ERG assignment
D4	CPT-4 and HCPCS Level II procedure codes are accepted
D5	NDC
D6	ID, age and sex
D7	Individual enrollment experience (effective/end date)

E On model development

E1	IHCIS and Symmetry are private corporations. The background of the model developers is academics and health services research.
E2	To support healthcare information analysis, including provider profiling, prediction of future expenditures for individuals, and underwriting. Could also be used for payment purposes.
E3	Has been evaluated from a number of different perspectives. (See white paper on ERGs available from Symmetry and a recent study by Milliman, USA and Park Nicolett (available on www.soa.org))
E4	10 million non-elderly and elderly individuals. Information constructed from experience of more than 20 individual health plans throughout the US and the U.S Medicare program sample analytic files.
E5	See above.

E6	Some exclusions for insufficient enrollment to measure risk. Benefit packages relatively complete. For Medical and Pharmacy models, all individuals have pharmacy benefit.
E7	About 7 million individuals across all age strata.
E8	All data was standard priced using RBRVS and other approaches to approximate average service payment levels observed in the larger database.
E9	Stop-loss simulated using truncation/threshold described above. Carve-outs not modeled explicitly.

F Functioning of the Model(s)

F1	A patient's experience is built by grouping their claims into episodes of care. Episodes are comprised of all inpatient, outpatient, pharmaceutical and ancillary claims revolving around a specific diagnosis. ERGs examine the patient's episodes and maps those episodes to ERGs. Weights for each ERG are maintained and combined with the member's age/sex weight. See white paper on ERGs available from Symmetry for more detailed information
F2	Members is assigned to one or more of 120 ERGs. Each ERG is assigned a weight (depending on model variant selected). Risk for a member is the sum of all the weights for the ERGs they were assigned to plus their age/sex risk weight. See white paper on ERGs available from Symmetry for more information.
F3	Yes. We would also expect you would want to recalibrate the model for your own experience.

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	The extent to which a model can reduce selection is dependent upon the model's predictive accuracy – in particular that accuracy that relates most to attributes of a member that can be predicted beforehand (by the member or the health plan). ERGs were constructed with this type of objective in mind – maximum predictive accuracy, given practical considerations (see ERG white paper). Empirical analysis has shown ERGs to be a leading health risk assessment tool in terms of predictive accuracy and other considerations.
G2	One of the "practical considerations" described above is the incentive for efficient and quality care. Promoting these incentives was a primary goal of ERG development.
G3	Yes – site of service (e.g., inpatient vs outpatient) does not impact risk measurement.
G4	Episode of care technology underlying ERGs (Symmetry's Episode Treatment Group (ETG) product) was designed to minimize the impact of

	coding behavior on episode assignment.
G5	Episode of care technology underlying ERGs (Symmetry's Episode Treatment Group (ETG) product) was designed to minimize the impact of coding behavior on episode assignment. Gaming is unlikely to impact risk assignment significantly – in particular for the prospective models. This was a primary goal of ERG development.
G6	See above. Explanatory power documented in ERG white paper and recent Milliman, USA study.
G7	See above.
G8	Symmetry's ETG and ERG products involve an open architecture. All mappings and algorithms are available in Symmetry's documentation delivered with the product. User guides and unlimited technical support are also provided to clients.
G9	Yes. Main difference between the prospective and concurrent models is the weights attached to each ERG. For example, chronic ERGs such as diabetes have similar weight in the prospective and retrospective models. Acute ERGs such as appendicitis have a significant retrospective weight and no prospective weight.
G10	This is a topic for further discussion. Briefly, the additional explanatory power of a concurrent model may outweigh any incentive issues related to greater likelihood of gaming. On the other hand, a related issue is what type of variation is the concurrent model explaining that the prospective model does not. If it is primarily acute events – these are the types of events that the concept of insurance is designed to handle. If you focus on chronic conditions, the retrospective and prospective models may have similar performance (some research suggests that this is the case). Again, this is a topic for discussion.
G11	Not sure what is meant by non-recommended application. Would be happy to respond if clarified.

H Model properties (measures and measurement)

H1	R2 for concurrent/retrospective models: $25,000 truncation - .53, $50,000 truncation - .50, $100,000 truncation - .45. R2 for prospective models: $25,000 truncation - .23 $50,000 truncation - .21 $100,000 truncation - .19 (See white paper on ERGs available from Symmetry and a recent study by Milliman, USA and Park Nicolett (available on www.soa.org))
H2	(See white paper on ERGs available from Symmetry and a recent study by

	Milliman, USA and Park Nicolett (available on www.soa.org))
H3	(See white paper on ERGs available from Symmetry and a recent study by Milliman, USA and Park Nicolett (available on www.soa.org))
H4	Site of service does not impact risk assignment.
H5	Robert Wood Johnson Foundation is currently undertaking such a study – or a related study.
H6	Not formally. After only one year in the market, ERGs are being used by health plans covering more than 78 million members.
H7	Set-up and running costs are minimal. The software installs onto a variety of platforms and operating systems from a CD-ROM or mainframe tape cartridge.

J Model applications

J1	See above. Health plans and other health care organizations are primary users. Purposes ranges from medical and disease management, network structuring and benefit pricing
J2	Over 70 clients are currently licensing ERGs
J3	78 million approximate covered lives
J4	PC-Windows 95 and above; Unix: Sun Solaris, AIX, HP-UX, Digital/Compaq Tru64; Linix; IBM MVS
J5	No
J6	No.

K Model / system updates

K1	Depends on application. Every two years can be used as a general rule.
K2	Expected to be every two years for significant updates.

L License policy

L1	Neither the software nor the source code is public domain
L2	Should you make your interests known, discussions on this matter can pursue further
L3	No, but a “German variant/version” model may be something we could develop together
L4	Assignments, algorithms and source code are proprietary, interface is public domain.
L5	Yes.

M Support / consultative services

M1	User Guides; Technical guides; Reference guides/spreadsheets and white-papers in Adobe Acrobat and Excel Spreadsheet. Telephonic technical support is also available
M2	Full support (English only) is available during our normal business hours. There are no conditions for support---all support is free.
M3	User Guides; Technical guides; Reference guides/spreadsheets and white-papers in Adobe Acrobat and Excel Spreadsheet. Full support (English only) is available during our normal business hours. There are no conditions for support---all support is free.
M4	User Guides; Technical guides; Reference guides/spreadsheets and white-papers in Adobe Acrobat and Excel Spreadsheet. Full support (English only) is available during our normal business hours. There are no conditions for support---all support is free.

N Pricing Policy

N1	A Per Member Per Year fee is calculated based on the number of lives ran through the grouper.
N2	Included, except for travel costs, if necessary.
N3	Included, except for travel costs, if necessary.
N4	Included, except for travel costs, if necessary.
N5	Included, except for travel costs, if necessary.

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	Diagostic/procedural and pharmaceutical crosswalks to U.S. equivalents are required.
P2	Obtaining valid crosswalks.
P3	Untested.
P4	No recalibration technique is part of the grouper software per se, this would be a post grouping exercise.
P5	We would expect some modification of the model – at a minimum a re-calibration of risk weights. Given the open architecture of ERGs, a reasonable level of modification is possible without significantly changing the methods.
P6	No.
P7	Not a function of the software.

7 GRAM

Global Risk Assessment Model

A	**Basics**
A1	GRAM
A2	Center for Health Research, Kaiser Permanente Northwest
A3	None – contact person is Mark Hornbrook, PhD Center for Health Research Kaiser Permanente Northwest 3800 North Interstate Ave Portland, OR 97227 voice: (503) 335-6746
A4	The current version is release 2.0
A5	The model groups ICD-9 codes in a hierarchical manner (based on future cost) within clinically homogenous groups
A6	The model has remained consistent in conceptual design

B	**Model range** according to the model variant
B1	All ages from newborns to the aged
B2	None
B3	The grouper classifies all ICD-9 diagnoses

C	**Costs and cost weights** (according to the model variant)
C1	Model includes only total cost weights (All health services provided by the health plan)
C2	Model includes only total cost weights (All health services provided by the health plan)
C3	Model includes only total cost weights (All health services provided by the health plan)
C4	Model includes only total cost weights (All health services provided by the health plan)
C5	Estimation truncates cost at US$400,000 before annualization (so some individuals have annualized costs over $400,000 in the estimation of the model

C6	Yes (the model is estimated on a population that has comprehensive medical coverage)

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	ICD-9-CM diagnoses, age, sex and market segment
D2	ICD-9-CM classification
D3	We have not tested the impact of alternative diagnostic schema on the model's results
D4	N/A
D5	N/A
D6	Unique ID, Birth date, "index date", market segment (commercial, aged, indigent)
D7	None

E On model development

E1	The model was developed within a public domain research department in a region of the Kaiser-Permanente health plan. Although Kaiser-Permanente operates in many US markets each region functions semi-autonomously and several regions have similar research departments.
E2	The model was developed specifically for payment purposes and all development efforts have been devoted to that goal
E3	Prospective cost evaluation
E4	A multi-health plan dataset of 1.5 million subjects was used to finalize the classification algorithn and create risk weights
E5	1.5 million
E6	We include partial year enrollees who died or left voluntarily
E7	1.5 million
E8	Health plan financial liability for health services (no copays or deductibles)
E9	The plans included in our database are full service health plans that cover the full range of health services

F Functioning of the model(s) (according to the model variant)

F1	The grouper links diagnoses to cost relevant disease categories
F2	A weighted least square regression is used to estimate cost weights for each demographic and chronic condition element in the model and person level weights are additive from these elemens

F3	Yes – users can build home grown versions but every ICD-9 code is grouped by the model

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	Our model should reduce biases against persons with chronic illnesses relative to an age sex model but it should work as well in this regard as other risk adjusters
G2	We have not examined whether the model creates incentives for plans to be more efficient
G3	The model is site of service neutral – we don't require that utilization occur in any particular setting for risk to be assessed
G4	There are no more or less incentives to game GRAM than with any other diagnostic based model
G5	The model is not currently being used to adjust capitated payments but it has been used in a variety of research purposes and is being tested for use a payment adjuster
G6	GRAM explains about 16% of the prospective variance in cost for a global population, which is comparable to other risk adjusters but we have no evidence that there is any potential impact on the quality of care
G7	We have no evidence about how GRAM might impact stinting on care
G8	
G9	GRAM should work as a payment system..
G10	No – in fact we feel that all risk models should be as flexible as possible to the user's needs
G11	Not at this time

H Model properties (measures and measurement)

H1	We have tested our model with a 1.5 million person sample from 5 health plans from across the US. We achieve a R2 of 16% in our prospective total cost validation model as compared with 10.2% for ADGs and 15.4% for HCCs.
H2	
H3	
H4	Our model uses ICD-9 diagnoses from any source and as such is independent of site of service.
H5	We have no evidence about the impact of our model on quality of care
H6	We have spoken with physicians about their understanding and acceptance of the model and generally they appreciate the openness of the classification system. Health plan administrators also like the ease of application.

H7	We have applied the model in a variety of US managed care settings and there have been no problems with creating risk scores in any of these settings

J Model applications

J1	To data GRAM has been used only in a research context
J2	The model is widely used for research purposes but I am not aware of any situations where it is used for payment purposes
J3	
J4	The code is written in SAS 8.12 format
J5	No
J6	No

K Model / system updates

K1	Annually
K2	Annually

L License policy

L1	Everything needed to run the model is in the public domain
L2	
L3	We admit that documentation is weak but the model is quite simple, the code is open sourced and the programs and classification system are very transparent
L4	
L5	

M Support / consultative services

M1	We provide a paper that describes the model and the code is well documented
M2	Individual consulting from the development team
M3	We do not have much experience with wide use of the model and have always provided individual consulting to all users
M4	At present the development team provides individual service to users

N Pricing Policy

N1	This has not yet been determined but we are committed to keeping the model accessible to all users – cost will not be a barrier to use and we have

	already made it available to researchers at not cost
N2	
N3	
N4	
N5	The development team charges $100/hour for consulting time

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	All the model needs to function is demographic data on individuals and diagnoses from all sources
P2	We have considered the issues of translating the algorithm to ICD-10 and do not think this will be a barrier to applying GRAM to European settings
P3	We have not tested this but we suspect that this should not be too great of an issue
P4	The model can be recalibrated with any relative resource use data on the estimation sample
P5	I do not think much work needs to be done
P6	We have a series of diagnostic steps we take when the model is transported to new settings that should apply to the German experience
P7	The grouper needs individual level data diagnoses and demographic information.

8 Medicaid Rx

A Basics

A1	Medicaid Rx Model
A2	University of California, San Diego Todd Gilmer PhD, Rick Kronick PhD, Paul Fishman MD, Ted Ganiats MD
A3	University of California, San Diego Todd Gilmer PhD
A4	6/01, 6/02
A5	Additive
A6	Disabled and TANF

B Model range according to the model variant

B1	Applicable to all age groups, included weights are estimated on Medicaid beneficiaries under age 65.
B2	Persons living in institutions (long term care facilities) are excluded when estimating the weights.
B3	No exclusions.

C Costs and cost weights (according to the model variant)

C1	Included.
C2	Included.
C3	Included.
C4	Included. Long term care services and dental services are excluded.
C5	No.
C6	Yes.

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Age, sex, pharmaceuticals (NDC codes)
D2	N/A

D3	N/A
D4	N/A
D5	NDC
D6	ID, age, sex
D7	Months eligible/enrolled in year, aid category if Medicaid (disabled vs. TANF)

E On model development

E1	Orange County, California, was interested in having a pharmacy-based risk adjuster available to analyze risk and adjust payments among health plans enrolling Medicaid beneficiaries through CalOptima, a county based organization for financing of Medicaid,
E2	To provide a pharmacy-based risk adjustment model that may be used in lieu of or in combination with a diagnostic based model.
E3	We have evaluated the Medicaid Rx model for use in adjusting payments to Medicaid health plans in the US.
E4	Disabled and TANF Medicaid populations in California, Colorado, Georgia, and Tennessee; non-elderly and non-institutionalized.
E5	362,000 disabled adults, 402 TANF adults, 1.1 million TANF children.
E6	No additional exclusions. Typical HMO benefit package including hospital, physician, and clinic services; lab, radiology and other services; mental health services; pharmacy use.
E7	See E5.
E8	See E6. Medicaid does not have copayments/coinsurance.
E9	No carveouts or stop-loss were present, although were are able to model them.

F Functioning of the model(s) (according to the model variant)

F1	NDC codes are assigned to disease payment categories. A few of the categories are hierarchical (for example, mental health).
F2	Expected costs per persons are the sum of the weights for the assigned Medicaid Rx categories.
F3	Yes.

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	We expect substantial reduction in risk selection.
G2	Sickness funds/health plans would receive more payment for sicker patients, providing incentive to manage costs conditional on the illness pres-

	ent, rather than to treat (or fail to treat) patients with the goal of improving risk selection.
G3	Yes.
G4	N/A. Prescriptions are required.
G5	N/A. Prescriptions are required.
G6	Medicaid Rx would provide additional payment for persons with chronic illness, making more resources available to treat sicker patients.
G7	Stinting on care should be reduced under Mdicaid Rx compared to standard adjustment using age and sex.
G8	The grouper is relatively straightforward and easily auditable.
G9	Same model for concurrent and prospective payment, although only prospective weights have been estimated at this time.
G10	**No.**
G11	**N/A.**

H Model properties (measures and measurement)

H1	The model appears stable across several Medicaid programs. R2s for: Disabled = 15.3 TANF adults = 10.9 TANF children = 5.9
H2	Physician review.
H3	Split sample validation.
H4	Unknown.
H5	Unknown.
H6	Generally accepted.
H7	It depends on the current extent of data collection. Should have minimal costs for organizations with automated pharmacy data.

J Model applications

J1	Risk adjustment consulting firms are exploring its use.
J2	Unknown.
J3	Unknown.
J4	SAS.
J5	No, but they may be easily applied.
J6	No.

K Model / system updates

K1	Yearly.
K2	Yearly.

L License policy

L1	Yes.
L2	Yes, we may provide consulting services.
L3	Yes.
L4	N/A.
L5	N/A.

M Support / consultative services

M1	Implementation instructions and a research paper are available.
M2	We provide consulting services.
M3	See M2.
M4	See M2.

N Pricing Policy

N1	The software is free.
N2	Updates are free, but are on our timeline. More frequent updates may be negotiated.
N3	Consulting support may be negotiated.
N4	See N3.
N5	See N3.

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	Drug codes must be in NDC format.
P2	Mapping from PZN to NDC.
P3	We expect minimal problems from conversion.
P4	Recalibration of the weights based on German utilization/cost data may be desirable.
P5	No.
P6	No, but we can provide general guidelines.
P7	Data confidentiality can be addressed by using encrypted identifying information.

9 PCG

Pharmacy-based Cost Groups

A	**Basics**
A1	PCG: Pharmacy-based Cost Groups
A2	Developed by LM Lamers and RCJA van Vliet, Department of Health Policy and Management, Erasmus University Rotterdam
A3	--
A4	--
A5	Additive, regression approach
A6	Model developments: Stability of the model over time is yearly tested Yearly update of weights Maintenance

B	**Range of the model(s)** according to the model variant
B1	Total population, people of all ages
B2	No exclusions
B3	13 diseases included: Respiratory illness, Asthma Epilepsy Acid peptic disease Crohn's and Ulcerative Colitis Cardiac disease / congestive heart failure / arteriosclerotic cardiovascular disease Rheumatologic conditions Parkinson's disease Diabetes (insulin users) Cystic fibrosis Transplantations Malignancies HIV / AIDS Renal disease (including ESRD)

	Psychiatric diseases are excluded because: 1) medication was not prescribed specific for the diseases concerned 2) relative low follow-up costs

C Costs and cost weights (according to the model variant)

C1	Included
C2	Included
C3	Partly excluded: Production-independent hospital costs are excluded (i.e. about 60% of hospital costs)
C4	Included: dental care for children, paramedical services, technical aids (see C1) Excluded: catastrophic risks (i.e. hospital care exceeding 1 year, long term nursing home care, Long-term care for mentally and physically handicapped persons, institutional psychiatric care) are covered by the AWBZ (exceptional Medical Expense Act) = a compulsory national health insurance.
C5	Yes, there is outlier risk sharing: 90% of the costs (for outpatient care and production-dependent hospital care) in excess of 7,500 euros is reimbursed afterwards from an outlier pool. In the regression model to estimate weights only 10% of the costs above 7,500 euros of an individual are used.
C6	Demographic + PCG model

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Age * sex (19 * 2 categories) + Degree of urbanization (5 categories) + Age * type of insurance / insurance ground (20 categories) PCGs: 13 categories (see B3)
D2	For PCG. Per prescription: • ATC-code (Anatomical Therapeutic Chemical classification index with DDDs from WHO Collaborating Centre for Drug Statistics Methodology, Oslo) • Quantity delivered • Prescribed daily doses (not necessary if # of DDDs are used to assign persons to conditions)
D3	--
D4	--

D5	ATC-code (Anatomical Therapeutic Chemical classification index with DDDs from WHO Collaborating Centre for Drug Statistics Methodology, Oslo) Any generally excepted classification system for drugs
D6	Age, sex, zip code, type of insurance / insurance ground and per prescription: ATC-code and quantity delivered (see D2)
D7	See D2, D5 and D6

E On model development

E1	Dutch sickness funds do not collect diagnoses from outpatient hospital care. Diagnoses from inpatient hospital care are not available at an individual level (due to privacy problems) in the administrative data of sickness funds Claims data for outpatient prescribed drugs (by GPs and specialists) are automatically and routinely recorded by Dutch sickness funds.
E2	Improve the model by extending the capitation formula with a health-based risk adjuster Reason for improving the formula: prevent cream skimming and to increase fairness
E3	We developed the PCG model for the Dutch social insurance sector. PCGs are used as a risk adjuster for captitation payments to Dutch sickness funds since January 2002
E4	mid 90's: database of one sickness fund (exploring phase) since 2000: we use a database with information of about 6 million Dutch sickness funds members. Number of members is increasing every year. The data are representative for the total population.
E5	About 6 million: data for two successive years. Drug information for 1997 and costs in 1998
E6	Persons who died in the base year are excluded. Basic benefit package: see C and paper about the Netherlands (accepted for publication in Health Policy)
E7	6 million
E8	There are no coinsurance payments or deductibles. Production-independent hospital costs are excluded.
E9	Yes, there is outlier risk sharing: 90% of the costs (for outpatient care and production-dependent hospital care) in excess of 7,500 euros is reimbursed afterwards from an outlier pool. The total financial risk for sickness funds is about 41% in 2002

F Functioning of the Model(s)

F1	See table with ATC-codes per chronic condition
F2	Regression model, estimated by simple OLS
F3	Yes, you can cluster PCG's based on similarities in follow-up costs into a smaller number of groups or add new groups based on the use of specific drugs (for example psychiatric diseases).

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	Hard to quantify Part of the information sickness funds can employ for risk selection is with the PCG model used as a risk adjuster. It is harder for sickness funds to find high risks and to act on that information.
G2	Especially for the persons with chronic conditions identified with PCGs, sickness funds have incentives to invest in good quality health care and efficiency and cost containment.
G3	Persons with predictable high costs suffering from conditions and diseases that are not treated with outpatient prescribed drugs (for example persons treated in an inpatient setting) are missed.
G4	• Not allow for comorbidity: only one condition (the most expensive) per person • Use number of defined daily doses to assign persons to conditions • Conditions with relative low follow-up costs are excluded • Validation of drugs for specific diseases
G5	See G5 Monitoring the prevalences of chronic conditions used in the PCG model
G6	We do not use a separate estimation and validation sample (large numbers). Explanatory power in terms of R^2 almost doubles when the demographic model is extended with PCGs. See also G2
G7	Incentives for stinting are reduced by the introduction of PCGs. "Stinting on care" is not really an issue in the Netherlands
G8	Model is simple, transparent and easy (at least for the members of the working group for research on risk adjustment (WOVM) i.e. representatives of the ministry of Health, the Sickness Fund Council, the Dutch association of care insurers and some individual sickness funds). Data are routinely collected and available in the administrations of sickness funds.

	Yearly monitoring of prevalences of chronic conditions per sickness fund + test the stability of coefficients (weights) for PCGs every year
G9	We only use the model as a prospective model. We expect that the estimation of a concurrent PCG model will hardly affect the R^2-value and coefficients for PCGs
G10	If the question means that base year = the prediction year for the estimation of weights and next use these weights to calculate next year's capitation payment, then we have no objection. Otherwise there are problems with (perverse) incentives.
G11	No evidence.

H Model properties (measures and measurement)

H1	Costs weights appeared to be stable over time. Not available R^2-value for demographic model: 5% R^2-value for PCG model: 9 - 9.5%
H2	Validity (in terms of measuring health status): assessment of the relation between prescribed drugs and the disease diagnosed. Only drugs specific for the condition concerned are included in the classification of chronic conditions for the PCG model Validity in terms of predictive accuracy for future health care expenditures: see H1
H3	Definition of robustness ? not tested
H4	Not tested See also G3
H5	Not known in the Netherlands
H6	Yes, during the development of the PCG model we had a steering committee, the WOVM. They were especially concerned about feasibility issues For description of the WOVM see G8
H7	Not known Costs of implementation depends on availability of data. Since information on prescribed drugs is available. We expect the implementation costs are low in the Netherlands.

J Model applications

J1	Yes, since January 2002 In the Netherlands the PCGs are used as a risk adjuster for capitation pay-

	ments in the Dutch social insurance sector (about 62% of the population)
J2	60-65% of the populations is a member of one of the 24 sickness funds. The capitation payments for all the sickness funds depend partly on PCGs.
J3	About 8.5% of the sickness fund members are assigned to a PCGs; 91.5% are placed in PCG 0, i.e. their capitation payments is based on demographic variables only.
J4	No grouper software available
J5	See J4
J6	See J4

K Model / system updates

K1	Every year + incidentally at the moment that major changes in the insurance system occur.
K2	We are asked every year to test the stability of coefficients (weights) for PCGs

L License policy

L1	There is no software. The knowledge to employ the system (papers, reports etc) is public. See also: www.cvz.nl
L2	--
L3	--
L4	--
L5	--

M Support / consultative services

M1	--
M2	Support can be given on a consultancy base. Researchers from the Department of health policy and management from the Erasmus University can give advise to make the system work for your specific situation and to develop your own software.
M3	--
M4	--

N Pricing Policy

N1	--
N2	--

N3	--
N4	--
N5	Rates can be asked for at the department of Health policy and Management of the Erasmus University Rotterdam.

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	ATC-codes and the quantity delivered (on the individual level) + Information on demographic variables
P2	You need a system to convert codes from a classification of drugs into ATC-codes or you have to make the translation yourself.
P3	Prevalences of conditions may change, which can result in changes of the weights for PCGs.
P4	--
P5	We think it is wise to redesign the PCG model, i.e. to evaluate and adjust the risk adjuster to the German situation. What do you want a risk adjuster to correct for? What is already in the capitation formula?
P6	No
P7	In the Netherlands we have no problems. It depends on legislation (on privacy).

General comments:

The best health-based model is based on both inpatient end outpatient diagnostic information.

In the Netherlands the government intends to extent the PCG model with DCG in 2003.

10 RxRisk

A	**Basics**
A1	RxRisk
A2	Center for Health Studies, Group Health Cooperative
A3	None – contact person is Paul Fishman, PhD Center for Health Studies Group Health Cooperative of Puget Sound 1730 Minor Ave, Suite 1600 Seattle, WA, 98101 ********** voice: (206) 287-2925 fax: (206) 287-2871 e-mail: fishman.p@ghc.org
A4	Currently 1.0 (first release although the model is based on previous work that was specific to adults and children respectively)
A5	Additive using weights derived from a weighted least squares regression weight
A6	The model has remained consistent in conceptual design – although the major change as been brining all ages into a single risk model

B	**Model range** according to the model variant
B1	All ages from newborns to the aged
B2	None
B3	Chronic diseases identified through prescription medications only – no diagnoses

C	**Costs and cost weights** (according to the model variant)
C1	Model includes only total cost weights (All health services provided by the health plan)
C2	Model includes only total cost weights (All health services provided by the health plan)

C3	Model includes only total cost weights (All health services provided by the health plan)
C4	Model includes only total cost weights (All health services provided by the health plan)
C5	Estimation truncates cost at US$400,000 before annualization (so some individuals have annualized costs over $400,000 in the estimation of the model
C6	Yes (the model is estimated on a population that has comprehensive medical coverage)

D Grouper input requirements, options, and the handling of additional information (according to the model variant)

D1	Pharmacy data using National Drug Codes (conversion to therapeutic classes is possible), age, sex and Medicare (aged) and Medicaid (indigent) status
D2	National Drug Code – the program also identifies drugs not included in the classification system
D3	Not ICD based – grouper identifies only persons likely being treated for specific chronic illnesses
D4	N/A
D5	NDC
D6	Unique ID, Birth date, “index date”, market segment (commercial, aged, indigent)
D7	None

E On model development

E1	The model was initiated for epidemiologic research and then migrated to a cost focus. All of the work has been done in an academic environment
E2	Originally – case mix adjustment but the model is used as much for payment purposes as a covariate in epidemiological and health services research
E3	Prospective cost evaluation
E4	We used the Group Health Cooperative formulary to identify drugs to treat chronic illnesses and then linked these to a national (US) database
E5	500,000 individuals
E6	We include partial year enrollees who died or left voluntarily
E7	1.5 million
E8	Health plan financial liability for health services (no copays or deductibles)

E9	The plans included in our database are full service health plans that cover the full range of health services

F Functioning of the model(s) (according to the model variant)

F1	The grouper links drug dispenses to chronic conditions – there are no intermediate steps
F2	A weighted least square regression is used to estimate cost weights for each demographic and chronic condition element in the model and person level weights are additive from these elements
F3	Yes – users can build home grown versions

G Expected impact and effects on sickness funds, providers and behavior of the insured

G1	Our model should reduce biases against persons with chronic illnesses relative to an age sex model but it should work as well in this regard as other risk adjusters
G2	We have not examined whether the model creates incentives for plans to be more efficient
G3	The model is site of service neutral – we don't require that utilization occur in any particular setting for risk to be assessed
G4	The only risk in our model is that providers write prescriptions for drugs that are not medically indicated. This could increase the cost of providing care as well as create medical risk to consumes taking medications that may not be indicated
G5	The model is currently used to adjust capitated payments within the Group Health Cooperative system– although it does not eliminate gaming (no model can) – we think that the use of drug dispenses limits the likelihood of gaming
G6	The RxRisk explains about 10% of the prospective variance in cost for a global population, which is comparable to other risk adjusters but we have no evidence that there is any potential impact on the quality of care
G7	We have no evidence about how the RxRisk might impact stinting on care
G8	We have kept the model as simple as possible, linking specific drugs to specific conditions and have found that providers and administrators appreciate the ease of use and transparency of the model
G9	RxRisk should work as a payment system. It has been used within our system to adjusts capitated payments pay ments although it has not yet been tested on a wide scale.
G10	No – in fact we feel that all risk models should be as flexible as possible to the user's needs
G11	Not at this time

H Model properties (measures and measurement)

H1	We have tested our model with a 1.5 million person sample from 5 health plans from across the US. We achieve a R2 of 8.7% in our prospective total cost validation model as compared with 10.2% for ADGs and 15.4% for HCCs.
H2	
H3	
H4	Our model uses outpatient drug dispenses and as such is independent of site of service.
H5	We have no evidence about the impact of our model on quality of care
H6	We have spoken with physicians about their understanding and acceptance of the model and generally they appreciate the openness of the classification system. Health plan administrators also like the ease of application.
H7	We find that the pharmacy data in many systems is generally if high quality and relatively easy to adapt to our system

J Model applications

J1	Group Health Cooperative uses the model to pay contract providers
J2	The model is widely used for research purposes but I am not aware of any other situations where it is used for payment outside of the Group Health system
J3	100,000
J4	The code is written in SAS 8.12 format
J5	No
J6	No

K Model / system updates

K1	Annuall
K2	Annually

L License policy

L1	Everything needed to run the model is in the public domain
L2	
L3	We admit that documentation is weak but the model is quite simple, the code is open sourced and the programs and classification system are very transparent
L4	
L5	

M Support / consultative services

M1	We provide a paper that describes the model and the code is well documented
M2	Individual consulting from the development team
M3	We do not have much experience with wide use of the model and have always provided individual consulting to all users
M4	At present the development team provides individual service to userfs

N Pricing Policy

N1	The mode is made available at no cost
N2	
N3	
N4	
N5	The development team charges $100/hour for consulting time

P Adaptability to Germany‘s health system and implementation as morbidity-based risk structure compensation scheme

P1	All the model needs to function is demographic data on individuals and their drug dispenses (with date of dispense included)
P2	Although we have not worked with the PZN system we have wide experience adapting the model to other drug classification systems with great success
P3	We have not tested this but we suspect that this should not be too great of an issue because drugs (and certainly drug classes) are easy to translate
P4	The model can be recalibrated with any relative resource use data on the estimation sample (note that this was done with little difficulty in the Netherlands)
P5	I do not think much work needs to be done
P6	We have a series of diagnostic steps we take when the model is transported to new settings that should apply to the German experience
P7	The grouper needs individual level data on drug dispenses and demographic information.