The Johns Hopkins ACG® System

The Johns Hopkins ACG® System

Excerpt from Version 11.0 Technical Reference Guide

November 2014

JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

Important Warranty Limitation and Copyright Notices

This document is produced by the Department of Health Policy and Management at The Johns Hopkins University, Bloomberg School of Public Health.

This document is provided as an information resource on measuring population morbidity for those with expertise in risk-adjustment models. The documentation should be used for informational purposes only. Information contained herein does not constitute recommendation for or advice about medical treatment or business practices.

Contents

Chapter 1:

Diagnosis-based Markers

The Johns Hopkins ACG® System is a statistically valid, case-mix methodology that allows healthcare providers, healthcare organizations, and public-sector agencies to describe or predict a population's past or future healthcare utilization and costs. The ACG System is also widely used by researchers and analysts to compare various patient populations' prior health resource use, while taking into account morbidity or illness burden.

The ACG System provides a number of markers derived from a patient's diagnosis code history from all encounters during a 12-month period. This chapter provides definition for the ACG System markers derived from diagnosis information.

Morbidity Types – Aggregated Diagnosis Groups (ADGs)

There are thousands of International Classification of Disease (ICD) diagnosis codes that clinicians can use to describe patients' health conditions. The first step of the ACG grouping logic is to assign each diagnosis code to one or more of 32 diagnosis groups referred to as Aggregated Diagnosis Groups, or ADGs. The diagnosis-to-ADG mapping embedded in the ACG Software includes an ADG assignment for all[1] ICD codes. Where a single diagnosis code indicates more than one underlying morbidity type, more than one ADG may be assigned. For example, in ICD-10 the code E11.31 (Type 2 diabetes mellitus with unspecified diabetic retinopathy) would trigger both ADG 18 (Chronic Specialty: Unstable-Eye) and ADG 11 (Chronic Medical: Unstable).

Diagnosis codes within the same ADG are similar in terms of both clinical criteria and expected need for healthcare resources. Just as individuals may have multiple diagnosis codes, they may have multiple ADGs (up to 32). The following table lists the 32 ADGs and exemplary diagnosis codes.

ADGs and Common Diagnosis Codes Assigned to Them

ADGs	ICD9-CM	ICD-10	Diagnosis
1. Time Limited: Minor	558.9 691.0	K52.9 L22	Noninfectious Gastroentritis Diaper or Napkin Rash
2. Time Limited: Minor-Primary Infections	079.9 464.4	B09 J05.0	Unspecified Viral Infection Croup
3. Time Limited: Major	451.2 560.3	I80.3 K56.7	Phlebitis of Lower Extremities Impaction of Intestine
4. Time Limited: Major-Primary Infections	573.3 711.0	K75.9 M00.9	Hepatitis, Unspecified Pyogenic Arthritis

1 Because they indicate the cause of injury rather than an underlying morbidity, ICD-9 codes beginning with E and ICD-10 codes beginning V through Y have generally been excluded from the Diagnosis-to-ADG mapping. The source of codes is the Center for Medicare and Medicaid Services (CMS) list of ICD-9 and ICD-10-CM codes (available for download at http://www.cms.gov). ICD-10 codes are sourced from the Official ICD-10 Updates published by the World Health Organization (WHO).

ADGs	ICD9-CM	ICD-10	Diagnosis
5. Allergies	477.9 708.9	J30.0 L50.9	Allergic Rhinitis, Cause Unspecified Unspecified Urticaria
6. Asthma	493.0 493.1	J45.0 J45.1	Extrinsic Asthma Intrinsic Asthma
7. Likely to Recur: Discrete	274.9 724.5	M10.9 M54.9	Gout, Unspecified Backache, Unspecified
8. Likely to Recur: Discrete-Infection	474.0 599.0	J35.1 N39.0	Chronic Tonsillitis Urinary Tract Infection
9. Likely to Recur: Progressive	250.10 434.0	E11.1 I66.9	Adult Onset Type II Diabetes w/Ketoacidosis Cerebral Thrombosis
10. Chronic Medical: Stable	250.00 401.9	E10.9 I10	Adult-Onset Type 1 Diabetes Essential Hypertension
11. Chronic Medical: Unstable	282.6 277.0	D57.1 E84.0	Sickle-Cell Anemia Cystic Fibrosis
12. Chronic Specialty: Stable-Orthopedic	721.0 718.8	M48.9 M24.9	Cervical Spondylosis Without Myelopathy Other Joint Derangement
13. Chronic Specialty: Stable-Ear, Nose, Throat	389.14 385.3	H90.5 H71	Central Hearing Loss Cholesteatoma
14. Chronic Specialty: Stable-Eye	367.1 372.9	H52.1 H11.9	Myopia Unspecified Disorder of Conjunctiva
16. Chronic Specialty: Unstable- Orthopedic	724.02 732.7	M48.0 M92.8	Spinal Stenosis of Lumbar Region Osteochondritis Dissecans
17. Chronic Specialty: Unstable-Ear, Nose, Throat	386.0 383.1	H81.0 H70.1	Meniere's Disease Chronic Mastoiditis
18. Chronic Specialty: Unstable-Eye	365.9 379.0	H40.9 H15.0	Unspecified Glaucoma Scleritis/Episcleritis
20. Dermatologic	078.1 448.1	A63.0 I78.1	Viral Warts Nevus, Non-Neoplastic
21. Injuries/Adverse Effects: Minor	847.0 959.1	S13.4 T09.0	Neck Sprain Injury to Trunk
22. Injuries/Adverse Effects: Major	854.0 972.1	S06 T46.0	Intracranial Injury Poisoning by Cardiotonic Glycosides and Similar Drugs

ADGs	ICD9-CM	ICD-10	Diagnosis
23. Psychosocial: Time Limited, Minor	305.2 309.0	F12.1 F32.0	Cannabis Abuse, Unspecified Brief Depressive Reaction
24. Psychosocial: Recurrent or Persistent, Stable	300.01 307.51	F41.0 F50.3	Panic Disorder Bulimia
25. Psychosocial: Recurrent or Persistent, Unstable	295.2 291.0	F20.2 F10.3	Catatonic Schizophrenia Alcohol Withdrawal Delirium Tremens
26. Signs/Symptoms: Minor	784.0 729.5	G44.1 M79.6	Headache Pain in Limb
27. Signs/Symptoms: Uncertain	719.06 780.7	M25.4 R53	Effusion of Lower Leg Joint Malaise and Fatigue
28. Signs/Symptoms: Major	429.3 780.2	I51.7 R55	Cardiomegaly Syncope and Collapse
29. Discretionary	550.9 706.2	K40 L72.1	Inguinal Hernia (NOS) Sebaceous Cyst
30. See and Reassure	611.1 278.1	N62 E65	Hypertrophy of Breast Localized Adiposity
31. Prevention/Administrative	V20.2 V72.3	Z00.1 Z01.4	Routine Infant or Child Health Check Gynecological Examination
32. Malignancy	174.9 201.9	C50 C81.9	Malignant Neoplasm of Breast (NOS) Hodgkin's Disease, Unspecified Type
33. Pregnancy	V22.2 650.0	Z33 080.0	Pregnant State Delivery in a Completely Normal Case
34. Dental	521.0 523.1	K02 K05.1	Dental Caries Chronic Gingivitis

Note: Only 32 of the 34 markers are currently in use.

When the *lenient* diagnostic certainty option is applied, any single diagnosis qualifying for an ADG marker will turn the marker on. However, the *stringent* diagnostic certainty option can also be applied. For a subset of chronic diagnoses, there must be more than one diagnosis qualifying for the marker in order for the ADG to be assigned. This was designed to provide greater confidence in the ADGs assigned to a patient. For more information, refer to Chapter 4 in the *Installation and Usage Guide*.

ADGs are distinguished by several clinical characteristics (time limited or not, requiring primary care or specialty care, or addressing physical health or psycho-social needs) and the degree of refinement of the problem (diagnosis or symptom/sign). ADGs are not categorized by organ system or disease. Instead, they are based on clinical dimensions that help explain or predict the need for healthcare

resources over time. The need for healthcare resources is primarily determined by the likelihood of persistence of problems and their level of severity.

Example

A patient with both Obstructive Chronic Bronchitis (ICD-9-CM code 491.2) and Congestive Heart Failure (ICD-9-CM code 428.0) will fall into only one ADG, Chronic Medical: Unstable (ADG-11), while a patient with Candidiasis of Unspecified Site (ICD-9-CM code 112.9) and Acute Upper Respiratory Infections of Unspecified Site (ICD-9-CM code 465.9) will have two ADGs, Likely to Recur: Discrete Infections (ADG-8), and Time Limited: Minor-Primary Infections (ADG-2), respectively.

The criteria for ADG assignment depends on those features of a condition that are most helpful in understanding and predicting the duration and intensity of healthcare resources. Five clinical criteria guide the assignment of each diagnosis code into an ADG: duration, severity, diagnostic certainty, type of etiology, and expected need for specialty care. The Duration, Severity, Etiology, and Certainty of the ADGs table illustrates how each of these five clinical criteria is applied to the 32 ADGs.

Duration

What is the expected length of time the health condition will last? Acute conditions are time limited and expected to resolve completely. Recurrent conditions occur episodically with intermediate disease-free intervals. Chronic conditions persist and are expected to require long-term management generally longer than one year.

Severity

What is the expected prognosis? How likely is the condition to worsen or lead to impairment, death, or an altered physiologic state? The ADG-taxonomy divides acute conditions into minor and major categories corresponding to low and high severity, respectively. The system divides chronic conditions into stable and unstable based on the expected severity over time. Unstable conditions are more likely to have complications (related co-morbidities) than stable conditions and are expected to require more resources on an ongoing basis (i.e., more likely to need specialty care).

Diagnostic Certainty

Will a diagnostic evaluation be needed or will treatment be the primary focus? Some diagnosis codes are given for signs/symptoms and are associated with diagnostic uncertainty. As such, they may require watchful waiting only or substantial work-up. The three ADGs for signs/symptoms are arranged by expected intensity of diagnostic work-up, from low to intermediate to high.

Etiology

What is the cause of the health condition? Specific causes suggest the likelihood of different treatments. Infectious diseases usually require anti-microbial therapy; injuries may need emergency medical services, surgical management, or rehabilitation; anatomic problems may require surgical intervention; neoplastic diseases could involve surgical care, radiotherapy, chemotherapy; psychosocial problems require mental health services; pregnancy involves obstetric services; and, medical problems may require pharmacologic, rehabilitative, or supportive management.

Expected Need for Specialty Care

Would the majority of patients with this condition be expected to require specialty care management from a non-primary care provider? The routine course of care for some ADG categories implies that specialty care is more likely.

Duration, Severity, Etiology, and Certainty of the ADGs

Note: ADGs 15 and 19 are no longer used.

ADG	Duration	Severity	Etiology	Diagnostic Certainty	Expected Need for Specialty Care
1. Time Limited: Minor	Acute	Low	Medical, non-infectious	High	Unlikely
2. Time Limited: Minor-Primary Infections	Acute	Low	Medical, infectious	High	Unlikely
3. Time Limited: Major	Acute	High	Medical, non-infectious	High	Likely
4. Time Limited: Major-Primary Infections	Acute	High	Medical, infectious	High	Likely
5. Allergies	Recurrent	Low	Allergy	High	Possibly
6. Asthma	Recurrent or Chronic	Low	Mixed	High	Possibly
7. Likely to Recur: Discrete	Recurrent	Low	Medical, non-infectious	High	Unlikely
8. Likely to Recur: Discrete-Infections	Recurrent	Low	Medical, infectious	High	Unlikely
9. Likely to Recur: Progressive	Recurrent	High	Medical, non-infectious	High	Likely
10. Chronic Medical: Stable	Chronic	Low	Medical, non-infectious	High	Unlikely
11. Chronic Medical: Unstable	Chronic	High	Medical, non-infectious	High	Likely
12. Chronic Specialty: Stable-Orthopedic	Chronic	Low	Anatomic/Muscu loskeletal	High	Likely: orthopedics

ADG	Duration	Severity	Etiology	Diagnostic Certainty	Expected Need for Specialty Care
13. Chronic Specialty: Stable-Ear, Nose, Throat	Chronic	Low	Anatomic/Ears, Nose, Throat	High	Likely: ENT
14. Chronic Specialty: Stable-Ophthalmology	Chronic	Low	Anatomic/Eye	High	Likely: ophthalmology
16. Chronic Specialty: Unstable-Orthopedics	Chronic	High	Anatomic/Musculoskeletal	High	Likely: orthopedics
17. Chronic Specialty: Unstable-Ear, Nose, Throat	Chronic	High	Anatomic/Ears, Nose, Throat	High	Likely: ENT
18. Chronic Specialty: Unstable-Ophthalmology	Chronic	High	Anatomic/Eye	High	Likely: ophthalmology
20. Dermatologic	Acute, Recurrent	Low to High	Mixed	High	Likely: dermatology
21. Injuries/Adverse Effects: Minor	Acute	Low	Injury	High	Unlikely
22. Injuries/Adverse Effects: Major	Acute	High	Injury	High	Likely
23. Psychosocial: Time Limited, Minor	Acute	Low	Psychosocial	High	Unlikely
24. Psychosocial: Recurrent or Chronic, Stable	Recurrent or Chronic	Low	Psychosocial	High	Likely: mental health
25. Psychosocial: Recurrent or Persistent, Unstable	Recurrent or Chronic	High	Psychosocial	High	Likely: mental health
26. Signs/Symptoms: Minor	Uncertain	Low	Mixed	High	Unlikely

ADG	Duration	Severity	Etiology	Diagnostic Certainty	Expected Need for Specialty Care
27. Signs/Symptoms: Uncertain	Uncertain	Uncertain	Mixed	High	Uncertain
28. Signs/Symptoms: Major	Uncertain	High	Mixed	Low	Likely
29. Discretionary	Acute	Low to High	Anatomic	High	Likely: surgical specialties
30. See and Reassure	Acute	Low	Anatomic	High	Unlikely
31. Prevention/Administrative	N/A	N/A	N/A	N/A	Unlikely
32. Malignancy	Chronic	High	Neoplastic	High	Likely: oncology
33. Pregnancy	Acute	Low	Pregnancy	High	Likely: obstetrics
34. Dental	Acute, Recurrent, Chronic	Low to High	Mixed	High	Likely: dental

Major ADGs

Some ADGs have very high expected resource use and are labeled as Major ADGs. The following table presents major ADGs for adult and pediatric populations.

Major ADGs for Adult and Pediatric Populations

Pediatric Major ADGs (ages 0-17 years)	Adult Major ADGs (ages 18 and up)
3 Time Limited: Major	3 Time Limited: Major
9 Likely to Recur: Progressive	4 Time Limited: Major-Primary Infections
11 Chronic Medical: Unstable	9 Likely to Recur: Progressive
12 Chronic Specialty: Stable-Orthopedic	11 Chronic Medical: Unstable
13 Chronic Specialty: Stable-Ear, Nose, Throat	16 Chronic Specialty: Unstable-Orthopedic
18 Chronic Specialty: Unstable-Eye	22 Injuries/Adverse Effects: Major
25 Psychosocial: Recurrent or Persistent, Unstable	25 Psychosocial: Recurrent or Persistent, Unstable
32 Malignancy	32 Malignancy

While the primary use of ADGs is as a means for collapsing all diagnosis codes into clinically meaningful morbidity types as a first step in the ACG assignment process, ADGs are useful as a risk assessment tool in their own right. There are many examples in the literature of using ADG markers

as generic case-mix control variables. The most common application is the introduction of individual ADG-markers as binary flags in a regression model, but something as simple as a count of ADGs or Major ADGs can be a very powerful indicator of need as well.

Relationship Between Number and Major Morbidities in Year 1 and Likelihood of Subsequent High Cost

Number of Year 1 Major Morbidities	Percent of Members	Positive Predictive Value	
		Percent High Cost in Year 2	Percent High Cost in Year 3
0 Major ADGs	77.1%	9.6%	11.0%
1 Major ADG	17.3%	20.9%	21.5%
2 Major ADGs	4.2%	34.7%	34.1%
3 Major ADGs	1.1%	43.6%	45.6%
4+ Major ADGs	0.4%	72.4%	70.1%

Patterns of Morbidity – Adjusted Clinical Groups (ACGs)

Adjusted Clinical Group actuarial cells, or ACGs, are the building blocks of The Johns Hopkins ACG System methodology. ACGs are a series of mutually exclusive, health status categories defined by morbidity, age, and sex. They are based on the premise that the level of resources necessary for delivering appropriate healthcare to a population is correlated with the illness burden of that population. ACGs are used to determine the morbidity profile of patient populations to more fairly assess provider performance, to reimburse providers based on the health needs of their patients, and to allow for more equitable comparisons of utilization or outcomes across two or more patient or enrollee aggregations.

ACGs are a person-focused method of categorizing patients' illnesses. Over time, each person develops numerous conditions. Based on the pattern of these morbidities, the ACG approach assigns each individual to a single ACG category.

The concept of ACGs grew out of research by Dr. Barbara Starfield and her colleagues in the late 1970s when they examined the relationship between morbidity or illness burden and healthcare services utilization among children in managed care settings. The research team theorized that the children using the most healthcare resources were not those with a single chronic illness, but rather were those with multiple, seemingly unrelated conditions. To test their original hypothesis, illnesses found within pediatric health maintenance organization (HMO) populations were grouped into five discrete categories:

1. Minor illnesses that are self-limited if treated appropriately, e.g., the flu or chicken pox.

2. Illnesses that are more severe but also time-limited if treated appropriately, e.g., a broken leg or pneumonia.

3. Medical illnesses that are generally chronic and which remain incurable even with medical therapy, e.g., diabetes or cystic fibrosis.

4. Illnesses resulting from structural problems that are generally not curable even with adequate and appropriate intervention, e.g., cerebral palsy or scoliosis.

5. Psychosocial conditions, e.g., behavior problems or depression.

The Johns Hopkins team's findings supported the hypothesis that clustering of morbidity is a better predictor of health services resource use than the presence of specific diseases. This finding forms the basis of the current ACG methodology and remains the fundamental concept that differentiates ACGs from other case-mix adjustment methodologies.

There are four steps in the ACG assignment process:

1. Mapping Diagnosis Codes to a Parsimonious Set of Aggregated ADGs
2. Creating a Manageable Number of ADG Subgroups (CADGs)
3. Frequently Occurring Combinations of CADGs (MACs)
4. Forming the Terminal Groups (ACGs)

The first step is described in the preceding section while the remainder are summarized in the following tables and figures depicting the ACG-decision-tree logic.

Creating a Manageable Number of ADG Subgroups (CADGs)

The ultimate goal of the ACG algorithm is to assign each person to a single morbidity group (i.e., an ACG). There are 4.3 billion possible combinations of ADGs, so to create a more manageable number of unique combinations of morbidity groupings, the 32 ADGs are collapsed into 12 CADGs or Collapsed ADGs (presented in the following table). Like ADGs, CADGs are not mutually exclusive in that an individual can be assigned to as few as none or as many as 12.

Although numerous analytic techniques could be used to form CADGs from ADGs, the ACG System has placed the emphasis on clinical cogency. The following three clinical criteria are used:

- The similarity of *likelihood of persistence or recurrence* of diagnoses within the ADG, i.e., time-limited, likely to recur, or chronic groupings
- The *severity* of the condition, i.e., minor versus major and stable versus unstable
- The *types of healthcare services required* for patient management--medical versus specialty, eye/dental, psychosocial, prevention/administrative, and pregnancy

ADGs and CADGs can be used for various analytic and research applications that do not require mutually exclusive categories such as multivariate predictive or explanatory models.

Collapsed ADG Clusters and the ADGs that Comprise Them

Collapsed ADG (CADG)	ADGs in Each
1. Acute Minor	1 Time Limited: Minor 2 Time Limited: Minor-Primary Infections 21 Injuries/Adverse Events: Minor 26 Signs/Symptoms: Minor
2. Acute Major	3 Time Limited: Major 4 Time Limited: Major-Primary Infections 22 Injuries/Adverse Events: Major 27 Signs/Symptoms: Uncertain 28 Signs/Symptoms: Major

Collapsed ADG (CADG)	ADGs in Each
3. Likely to Recur	5 Allergies 7 Likely to Recur: Discrete 8 Likely to Recur: Discrete-Infections 20 Dermatologic 29 Discretionary
4. Asthma	6 Asthma
5. Chronic Medical: Unstable	9 Likely to Recur: Progressive 11 Chronic Medical: Unstable 32 Malignancy
6. Chronic Medical: Stable	10 Chronic Medical: Stable 30 See and Reassure
7. Chronic Specialty: Stable	12 Chronic Specialty: Stable-Orthopedic 13 Chronic Specialty: Stable-Ear, Nose, Throat
8. Eye/Dental	14 Chronic Specialty: Stable-Eye 34 Dental
9. Chronic Specialty: Unstable	16 Chronic Specialty: Unstable-Orthopedic 17 Chronic Specialty: Unstable-Ear, Nose, Throat 8 Chronic Specialty: Unstable-Eye
10. Psychosocial	23 Psycho-social: Time Limited, Minor 24 Psycho-social: Recurrent or Persistent, Stable 25 Psycho-social: Recurrent or Persistent, Unstable
11. Preventive/Administrative	31 Prevention/Administrative
12. Pregnancy	33 Pregnancy

Frequently Occurring Combinations of CADGs (MACs)

The third step in the ACG categorization methodology assigns individuals into a single, mutually exclusive category called a MAC. This grouping algorithm is based primarily on the pattern of CADGs. The MACs and the Collapsed ADGs Assigned to Them table shows the MACs and the Collapsed ADGs which comprise them.

There are 23 commonly occurring combinations of CADGs which form MACs 1 through 23:

- The first 11 MACs correspond to presence of a single CADG.
- MAC-12 includes all pregnant women, regardless of their pattern of CADGs.
- MACs 13 through 23 are commonly occurring combinations of CADGs.
- MAC-24 includes all other combinations of CADGs.
- MAC-25 is used for enrollees with no service use or invalid diagnosis input data.
- MAC-26 includes all infants (age <12 months), regardless of the pattern of CADGs.

MACs and the Collapsed ADGs Assigned to Them

MACs	CADGs
1. Acute: Minor	1
2. Acute: Major	2
3. Likely to Recur	3
4. Asthma	4
5. Chronic Medical: Unstable	5
6. Chronic Medical: Stable	6
7. Chronic Specialty: Stable	7
8. Eye/Dental	8
9. Chronic Specialty: Unstable	9
10. Psychosocial	10
11. Prevention/Administrative	11
12. Pregnancy	All CADG combinations that include CADG 12
13. Acute: Minor and Acute: Major	1 and 2
14. Acute: Minor and Likely to Recur	1 and 3
15. Acute: Minor and Chronic Medical: Stable	1 and 6
16. Acute: Minor and Eye/Dental	1 and 8
17. Acute: Minor and Psychosocial	1 and 10
18. Acute: Major and Likely to Recur	2 and 3
19. Acute: Minor and Acute: Major and Likely to Recur	1, 2 and 3
20. Acute: Minor and Likely to Recur and Eye and Dental	1, 3 and 8
21. Acute: Minor and Likely to Recur and Psychosocial	1, 3, and 10
22. Acute: Minor and Major and Likely to Recur and Chronic Medical: Stable	1, 2, 3, and 6
23. Acute: Minor and Major and Likely to Recur and Psychosocial	1, 2, 3, and 10
24. All Other Combinations Not Listed Above	All Other Combinations
25. No Diagnosis or Only Unclassified Diagnosis	No CADGs
26. Infants (age less than one year)	Any CADGs combinations and less than one year old

Forming the Terminal Groups (ACGs)

MACs form the major branches of the ACG decision tree. The final step in the grouping algorithm divides the MAC branches into terminal groups, the actuarial cells known as ACGs. The logic used to split MACs into ACGs includes a combination of statistical considerations and clinical insight. During the ACG development process, the overarching goal for ACG assignment was to identify groups of individuals with similar needs for healthcare resources who also share similar clinical characteristics. Yale University's AUTOGRP Software (which performs recursive partitioning) was used to identify subdivisions of patients within a MAC who had similar needs for healthcare resources based on their overall expenditures. The variables taken into consideration included: age, sex, presence of specific ADGs, number of major ADGs, and total number of ADGs.

Note: Because prevention/administrative needs do not reflect morbidity, ADG 31 is not included in the count of total ADGs[2].

See the Final ACG Categories, Reference ACG Concurrent Risks, and RUBs table on page 30 for a complete listing and description of all ACGs.

ACG Decision Tree

The ACG Decision Tree figure illustrates the main branches of the ACG decision tree. Some MACs are not subdivided by the characteristics listed above because doing so did not increase the explanatory power of the ACG model. Some include only a single CADG: for instance, MAC-02 is composed of individuals with only acute major conditions. Others, such as MAC-01, acute conditions only, are subdivided into three age groups: ACG 0100 (Age = one year), ACG 0200 (Age = two to five years), and ACG 0300 (six or more years) because resource use differs by age for individuals with this pattern of morbidity. MAC-10, including individuals with psychosocial morbidity only and MAC-17, including individuals with psychosocial and acute minor conditions, are further split by the presence of ADG-24 (recurrent or chronic stable psychosocial conditions) and ADG-25 (recurrent or chronic unstable psychosocial conditions).

2 Refer to Weiner (91) and Starfield (91) for more detail on the historical origins of the current system including the original Version 1.0 development process.

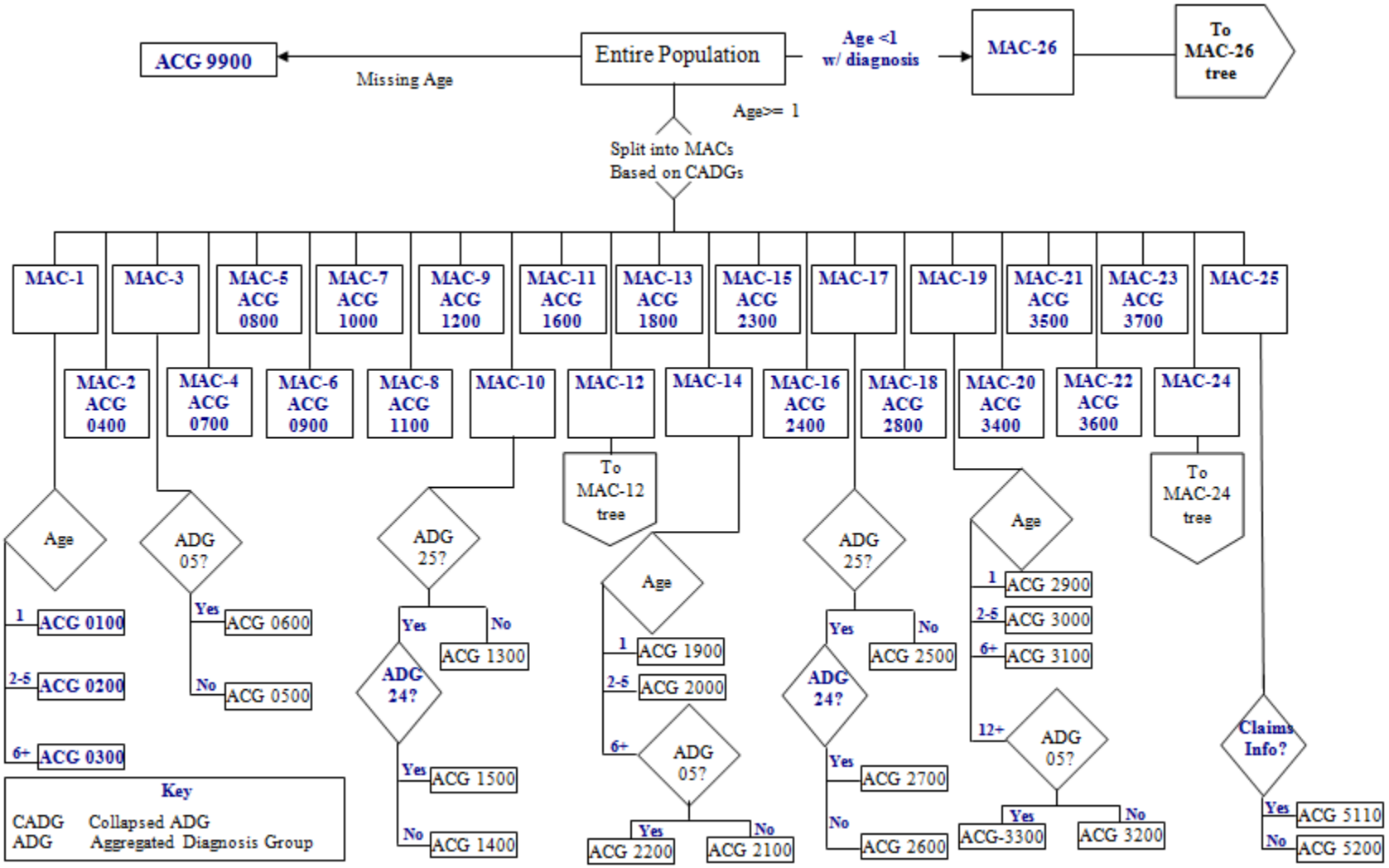

Figure 1. ACG Decision Tree

Decision Tree for MAC-12—Pregnant Women

The Decision Tree for MAC-12—Pregnant Women illustrates the grouping logic for pregnant women. All women with at least one diagnosis code indicating pregnancy are assigned to MAC-12. The ACGs for pregnant women are formed with subdivisions first on total number of ADGs (0-1, 2-3, 4-5, 6+) and second, for individuals with two or more ADGs, a split on none versus one or more major ADGs. These two splits yield seven ACGs for pregnant women.

The standard seven ACGs for pregnant women can optionally be further subdivided according to whether delivery has occurred during the time period of interest, yielding a total of 14 ACGs for women with a diagnosis of pregnancy. Either diagnosis codes for delivery or a user-supplied delivery flag can be used to separate pregnant women according to delivery status. Because of the marked differences in resource consumption for women with and without delivery and generally adequate validity of diagnoses associated with delivery, most organizations will find this option desirable to use. By default, the software will use diagnosis codes to subdivide based on delivery status.

Refer to on page and on page for a more detailed discussion of appropriate means of identifying pregnancy and delivery status using user-defined flags.

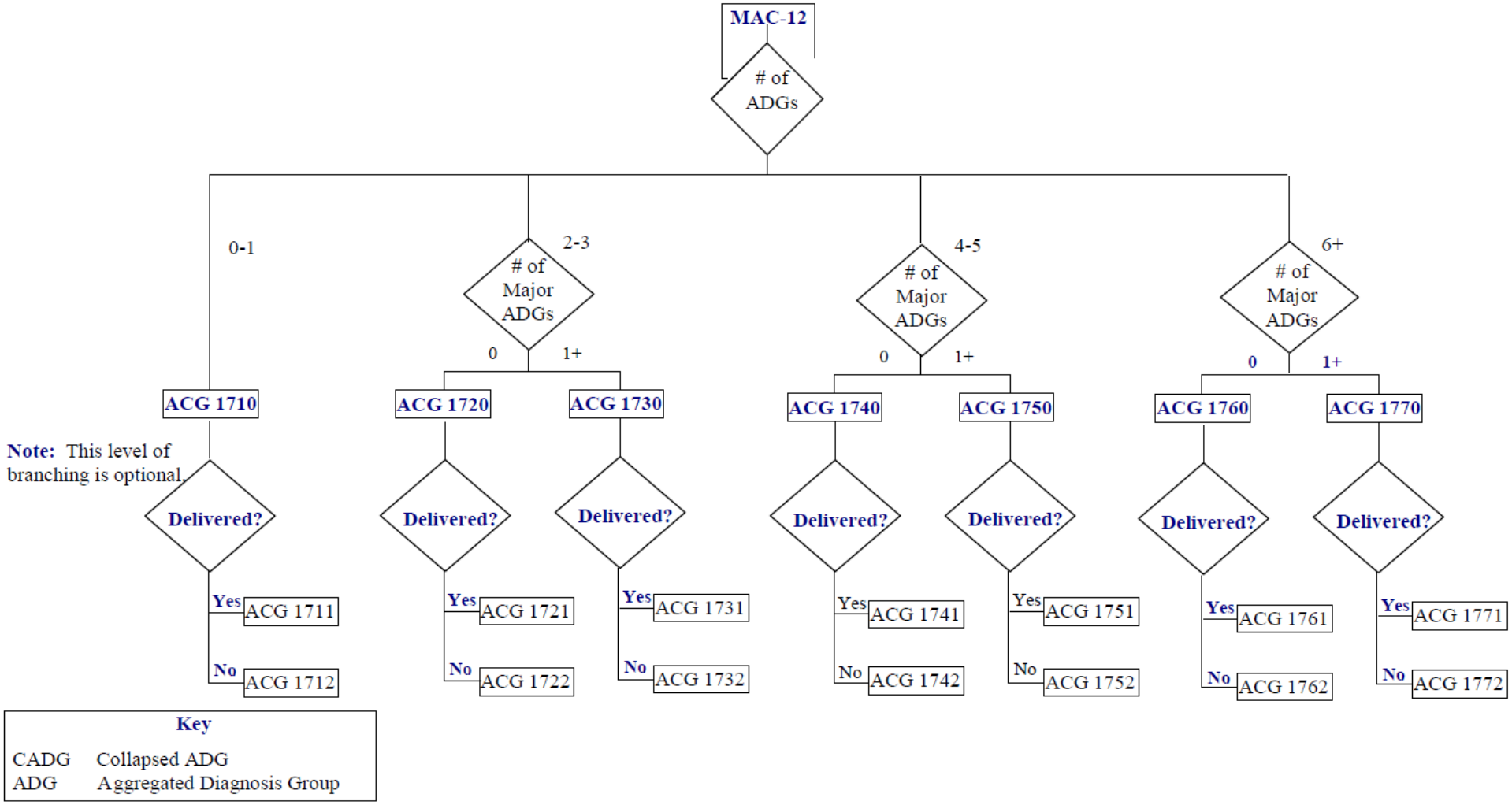

Figure 2. Decision Tree for MAC-12—Pregnant Women

Decision Tree for MAC-26—Infants

The Decision Tree for MAC-26—Infants illustrates the branching algorithm for MAC-26, which includes all infants, regardless of their pattern of CADGs. The first bifurcation is made on the total number of ADGs. Each group is further subdivided by presence of the number of major ADGs. These two splits yield four ACG groups.

For the infant ACGs, there is an optional additional split on birth weight. If there is accurate birth weight information that can be linked with claims and enrollment files, the four standard infant ACGs can be further split into low birth weight (<2,500 grams) and normal birth weight (>2,500 grams). Our developmental work suggests that this additional split improves the explanatory power of the ACG System. However, two caveats are important to consider before using this ACG option. First, our research indicates poor validity for existing ICD-9-CM birth weight codes in some administrative data sets. Second, some populations may have such low rates of low birth weight infants that the number of infants grouped into an ACG may be too small for accurate estimates. In general, we recommend that at least 30 individuals per ACG are needed to obtain stable estimates of average resource use for that ACG. By default, the ACG System will divide infants based upon the presence or absence of a diagnosis code indicating low birth weight.

Refer to on page for a more detailed discussion of appropriate means of identifying low birth weight status using user-defined flags.

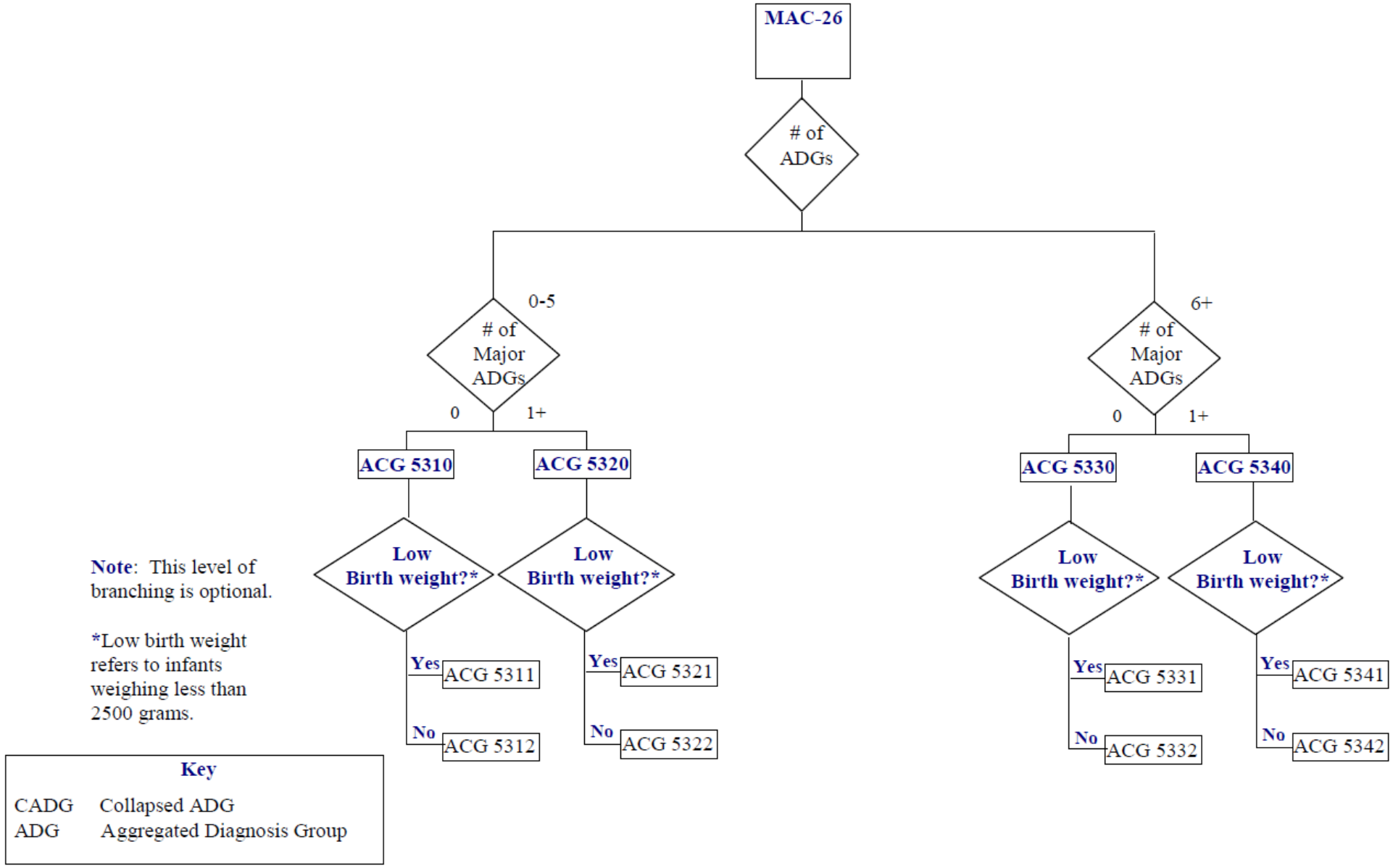

Figure 3. Decision Tree for MAC-26—Infants

Decision Tree for MAC-24—Multiple ADG Categories

The Decision Tree for MAC-24—Multiple ADG Categories illustrates the last branch of the ACG tree, MAC-24, which includes less frequently occurring combinations of CADGs. There are 33 ACGs within MAC-24. With MAC-24, the first two splits are total number of ADGs (2-3, 4-5, 6-9, and 10+) and then, within each of these four groups, by age. The age splits separate children (1-17 years) from adults (18+), and in some cases further subdivides within these groups. Additional divisions are made on sex and number of major ADGs.

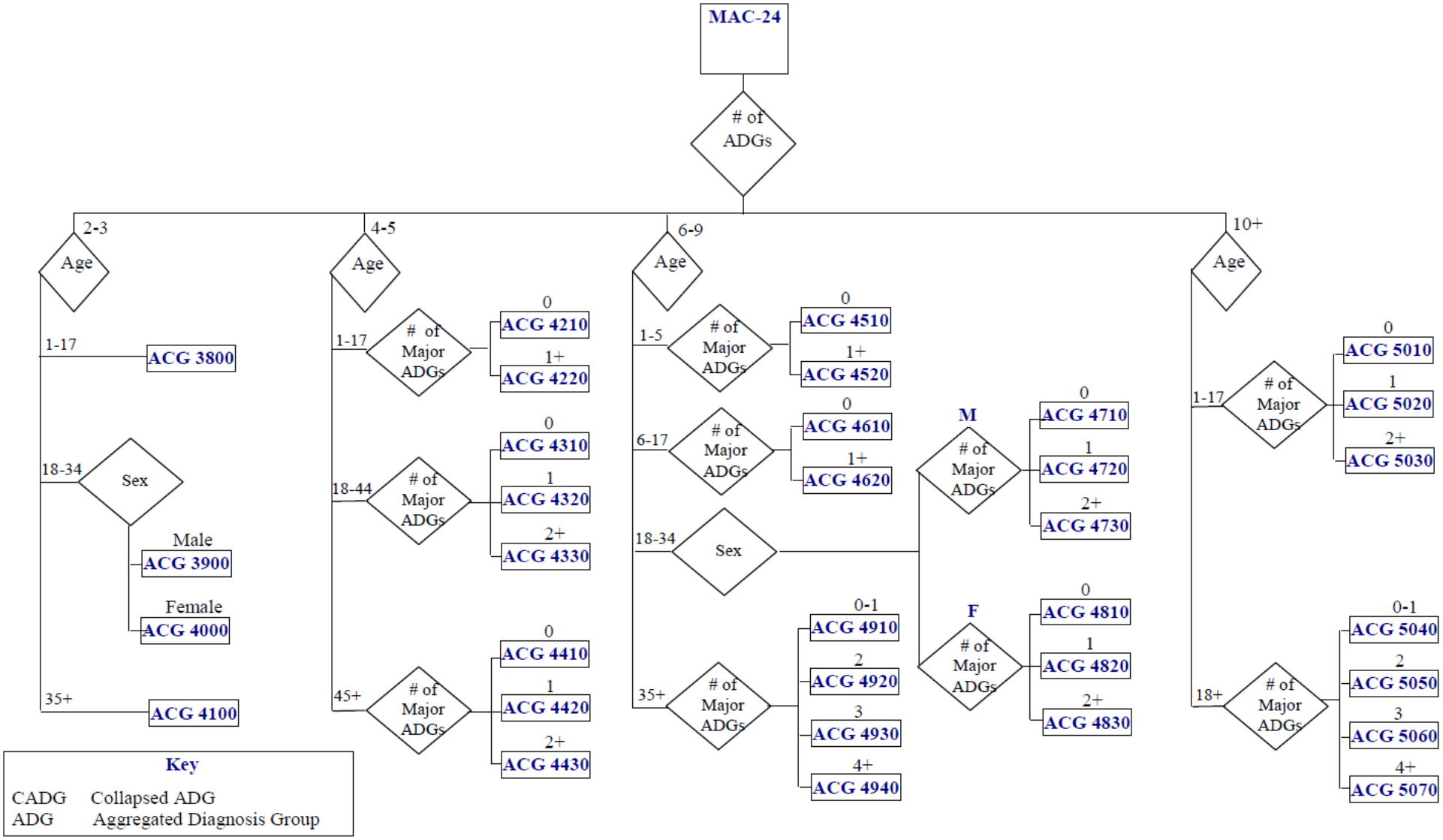

Figure 4. Decision Tree for MAC-24—Multiple ADG Categories

Clinically Oriented Examples of ACGs

Patients are categorized into an ACG based on the pattern of ADGs experienced over a predetermined interval and, in some cases, their age and sex. This approach focuses on the totality of diseases experienced by a person rather than any specific disease. Because this method diverges from the traditional biomedical, categorical method of examining morbidity, we show how ACGs classify patients with specific types of diseases.

In the examples that follow, we categorize patients by choosing a specific clinical feature that they have, such as a disease, pregnancy, or by their age. These examples show how the presence of other diseases or total number of ADGs changes ACG assignment.

Chronic Illnesses

In the following examples, **Example 1: Hypertension** presents three patients with hypertension and **Example 2: Diabetes Mellitus** presents three patients with diabetes. These individuals were actual patients selected from a private healthcare organization database. The input data used by the ACG grouping software, the output produced by the software, and the associated resource consumption variables are presented. As these patients demonstrate, there is substantial variability in patterns of morbidity and need for healthcare for different patients classified by a specific condition such as hypertension or diabetes. Thus, knowing only that a patient has a particular medical problem, even if it is a chronic condition, provides little information about the need for medical services. In general, as the number of different types of morbidities increases, the total number of ambulatory visits increases as does total expenditures. However, the total burden of morbidity as represented by the ACG – that is, the constellation of ADGs and presence of major ADGs is the most important determinant of resource consumption.

In **Example 1: Hypertension**, during the assessment period Patient 1 had diagnosis codes given for only hypertension and a routine medical exam and is therefore classified into the ACG for patients with stable, chronic medical conditions (ACG-0900). In contrast, Patient 3 with hypertension is in an ACG that branches from MAC-24 (combinations of ADGs not otherwise classified). This occurs because the combinations of ADGs occur too infrequently to merit a separate ACG. Patients in MAC-24 have both high levels of morbidity and high levels of health need. There is a strong link between the total number of ADGs/major ADGs and resource consumption.

There are two additional ACGs that describe commonly occurring combinations of morbidity for individuals with stable, chronic medical conditions. ACG-2300 (Chronic Medical--Stable and Acute Minor) is assigned to patients with uncomplicated diabetes, hypertension, or other stable chronic conditions and a minor illness, injury, or symptom. As shown in Patient 2 with Hypertension, individuals in ACG-3600 have four types of morbidities: stable chronic medical conditions (which include the diagnosis of hypertension), acute minor conditions, conditions of low severity likely to reoccur, and acute major conditions.

Example 1: Hypertension

The following patient types demonstrate the levels of hypertension, ADGs, and associated costs.

Patient 1: Low Cost Patient with Hypertension

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 51/Male	ACG-0900: Chronic Medical, Stable	Total Cost: $128 Ambulatory visits: 1 Emergency visits: 0 Hospitalizations: 0
Conditions: Hypertension, General Medical Exam	ADGs: 10 and 31. Chronic Medical: Stable, Prevention/Administrative	

Patient 2: High Cost Patient with Hypertension

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 54/Male	ACG-3600: Acute Minor/Acute Major/Likely Recur/Eye & Dental	Total Cost: $3,268 Ambulatory visits: 1 Emergency visits: 1 Hospitalizations: 0
Conditions: Hypertension, Disorders of Lipid Metabolism, Low Back Pain, Cervical Pain Syndromes, Musculoskeletal Signs and Symptoms	ADGS: 07, 10, 26, and 27 Likely to Recur: Discrete Chronic Medical: Stable Signs/Symptoms: Minor Signs/Symptoms: Uncertain	

Patient 3: Very High Cost Patient with Hypertension

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 52/Male	ACG - 5070: 10+Other ADG Combinations, Age >17, 4+ Major ADGs	Total Cost: $45,937 Ambulatory visits: 17 Emergency visits: 0 Hospitalizations: 1
Conditions: Hypertension, General medical exam, Cardiogenic Shock, Asthma, Low back pain, Peripheral Neuropathy, Anxiety, Depression, COPD, Acute Upper Respiratory Infection, Gastroesophageal Reflux, Iron Deficiency, Cervical Pain Syndromes, Sleep Problems, Obesity, Sinusitis, Joint Pain	ADGs: 02, 03*, 06, 07, 09*, 10, 11*, 16*, 24, 27, 28, and 31. Time Limited: Minor-Primary Infections Time Limited: Major, Asthma Likely to Recur: Discrete Likely to Recur: Progressive Chronic Medical: Stable Chronic Medical: Unstable Chronic Specialty: Unstable-Orthopedic Psychosocial: Recurrent or Persistent Stable Signs/Symptoms: Uncertain Signs/Symptoms: Major, and Prevention/Administrative	

*Major ADG

Example 2: Diabetes Mellitus

The following patient types demonstrate the levels of diabetes mellitus, ADGs, and associated costs.

Patient 1: Low Cost Patient with Diabetes

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 49/Female	ACG-0900: Chronic Medical, Stable	Total Cost: $296 Ambulatory visits: 1 Emergency visits: 0 Hospitalizations: 0
Conditions: Diabetes mellitus	ADGs: 1 0 Chronic Medical: Stable	

Patient 2: High Cost Patient with Diabetes

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 49/Female	ACG-3600: Acute Minor/Acute Major/Likely Recur/Eye & Dental	Total Cost: $1,698 Ambulatory visits: 6 Emergency visits: 1 Hospitalizations: 0
Conditions: Diabetes mellitus, Disorders of Lipid Metabolism, Peripheral Neuropathy, Otitis Media, Gastroesophageal Reflux, Acute sprain, Joint disorder, Bursitis, Arthropathy	ADGS: 01, 07, 08, 10, 22*, 26, and 27 Time Limited: Minor Likely to Recur: Discrete Likely to Recur: Discrete-Infections Chronic Medical: Stable Injuries/Adverse Effects: Major Signs/Symptoms: Minor Signs/Symptoms: Uncertain	

*Major ADG

Patient 3: Very High Cost Patient with Diabetes

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 51/Female	ACG - 5070: 10+Other ADG Combinations, Age >17, 4+ Major ADGs	Total Cost: $33,073 Ambulatory visits: 23 Emergency visits: 2 Hospitalizations: 1
Conditions: Diabetes mellitus, General medical exam, Ischemic Heart Disease, Hypertension, Disorders of Lipid Metabolism,	ADGs: 01, 02, 03*, 04*, 05, 07, 08, 09*, 10, 11*, 12, 16*, 17, 21, 22*, 23, 26, 27, 28, 29, 30, 31 and 34.	

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Low Back Pain, Peripheral Neuropathy, Cerebrovascular Disease, COPD, Acute Lower Respiratory Tract Infection, Allergic Rhinitis, Gingivitis, Otitis Media, Hearing Loss, Chest Pain, Syncope, Chronic Cystic Disease of the Breast, Tobacco Use, Abdominal Pain, Sinusitis, Sleep Apnea, Contusions and Abrasions, Headache, Cough, Fatigue	Time Limited: Minor Time Limited: Minor- Primary Infections Time Limited: Major Time Limited: Major-Primary Infections, Allergies Likely to Recur: Discrete Likely to Recur: Discrete-Infections Likely to Recur: Progressive Chronic Medical: Stable Chronic Medical: Unstable Chronic Specialty: Stable-Orthopedic Chronic Specialty: Unstable-Orthopedic Chronic Specialty: Unstable-Ear, Nose, Throat Injuries/Adverse Effects: Minor Injuries/Adverse Effects: Major Psychosocial: Time Limited, Minor Signs/Symptoms: Minor Signs/Symptoms: Uncertain Major, Discretionary, See/Reassure, and Prevention/Administrative	

*Major ADG

Pregnancy

Using diagnosis codes for pregnancy, the ACG System identifies all women who were pregnant during the assessment period and places them into the pregnancy MAC. ACGs are formed based on (1) total number of ADGs, (2) presence of complications (i.e., presence of a major ADG), and (3) whether the woman delivered (the default level of assignment can be overridden).

Example 3: Pregnancy/Delivery with Complications shows how the ACG System groups women with a complicated pregnancy/delivery. Both women in the example had ICD-9-CM codes that map to ADG-03 (an acute major morbidity). The salient difference between the two that explains the difference in resource consumption is that Patient 2 had a greater number of ADGs and more major ADGs and thus fits into a more resource intensive ACG. That is, Patient 2 had a higher level of morbidity than Patient 1, even though both women experienced a complicated pregnancy/delivery.

Example 3: Pregnancy/Delivery with Complications

The following patient types demonstrate the levels of pregnancy and delivery with complications, ADGs, and associated costs.

Patient 1: Pregnancy/Delivery with Complications, Low Morbidity

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 32/Female	ACG-1731: 2-3 ADGs, 1+ Major ADGs, Delivered	Total Cost: $8,406 Ambulatory visits: 3 Emergency visits: 0 Hospitalizations: 1
Conditions: General medical exam, Pregnancy and delivery - uncomplicated and Pregnancy and delivery - with complications.	ADGs: 01, 03*, 31, and 33. Time Limited: Minor Time Limited: Major Prevention/Administrative, and Pregnancy	

*Major ADG

Patient 2: Pregnancy/Delivery with Complications, High Morbidity

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 36/Female	ACG-1771: 6+ ADGs, 1+ Major ADGs, Delivered	Total Cost: $19,714 Ambulatory visits: 13 Emergency visits: 2 Hospitalizations: 1
Conditions: General medical exam Hypertension, Low Back Pain, Urinary tract infection, Renal Calculi, Cervical Pain Syndromes, Joint disorder, Pregnancy and delivery-with complications.	ADGs: 03*, 07, 08, 10, 11*, 21, 22*, 28, 31, and 33. Time Limited: Major Likely to Recur: Discrete Likely to Recur: Discrete-infections Chronic Medical: Stable Chronic Medical: Unstable Injuries/Adverse Effects: Minor Injuries/Adverse Effects: Major Signs/Symptoms: Major Prevention/Administrative, and Pregnancy	

*Major ADG

The Clinical Classification of Pregnancy/Delivery ACGs table presents an alternative clinical categorization of the pregnancy/delivery ACGs. Three dimensions are used to classify the ACGs – number of ADGs, presence of major ADGs, and whether the women delivered during the assessment period. Resource consumption increases along each of the three axes: presence of delivery, presence of a major ADG, and number of ADGs. Using various combinations of these ACGs, a clinician, or manager can determine the proportion of women with complicated pregnancies and deliveries overall, and with different levels of morbidity. The need for specialty services will be greatest for those women with higher levels of morbidity and complications as defined by presence of a major ADG.

Clinical Classification of Pregnancy/Delivery ACGs

ACG Levels	Pregnancy Only		Delivered	
Morbidity Level	Uncomplicated (No Major ADGs)	Complicated (1+ Major ADGs)	Uncomplicated (No Major ADGs)	Complicated (1+ Major ADGs)
Low (1-3 ADGs)	1712, 1722	1732	1711, 1721	1731
Mid (4-5 ADGs)	1742	1752	1741	1751
High (6+ ADGs)	1762	1772	1761	1771

Infants

The ACG System places all infants into an infant MAC. By definition, all had at least one hospitalization (at time of delivery). ACG groups are formed based on total number of ADGs and the presence of a complication or major ADG. Example 4: Infants compares an infant in the low morbidity/no complications ACG (5310, the most frequently assigned infant ACG) to an infant in the higher morbidity/with complications ACG (5340, the most resource intensive infant ACG). Infant 1 had a typical course: hospitalization at birth, routine check-ups, and illness management for upper respiratory tract infection and otitis media. Infant 2 presents a completely different picture in terms of pattern of morbidity and resource consumption, both of which are substantially greater in comparison with Infant 1.

Example 4: Infants

The following patient types demonstrate the levels of infants with complications, ADGs, and associated costs.

Patient 1: Infant with Low Morbidity, Normal Birthweight

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 0/Female	ACG 5312: 0-5 ADGs, No Major ADGs, Normal Birthweight,	Total Cost: $3,208 Ambulatory visits: 17 Emergency visits: 0 Hospitalizations: 1
Conditions: General medical exam Otitis media, Acute upper respiratory tract infection, Fungal infection and Gastroesophageal Reflux	ADGs: 02, 08, 26, and 31 Time Limited: Minor Likely to Recur: Discrete-Infections Signs/Symptoms: Minor, and Prevention/Administration	

Patient 2: Infant with High Morbidity, Low Birthweight

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Age/Sex: 0/Male	ACG 5341: 6+ ADGs, 1+ Major ADGs, Low Birthweight	Total Cost: $165,142 Ambulatory visits: 19

Input Data/Patient Characteristics	ACG Output	Resource Consumption Variables
Conditions: General medical exam, Respiratory symptoms Congenital Heart Disease, Cardiac Arrhythmia, Septicemia, Nausea, vomiting, Gastroesophageal Reflux, Neonatal Jaundice, Renal Disorders, Endocrine disorders, Vesicouretal reflux	ADGs: 03*, 04, 07 , 10, 11*, 22, 26, 27, 28, and 31 Time Limited: Major Time Limited: Major-Primary Infections Likely to Recur: Discrete Chronic Medical: Stable, Chronic Medical: Unstable Injuries/Adverse Effects: Major Signs/Symptoms: Minor Signs/Symptoms: Uncertain Signs/Symptoms: Major, Discretionary, and Prevention/Administrative	Emergency visits: 0 Hospitalizations: 1

*Major ADG

The Clinical Classification of Infant ACGs table provides a clinical classification of the infant ACGs.

Clinical Classification of Infant ACGs

	Low Birthweight		Normal Birthweight	
Morbidity Level	No Complications (no Major ADGs)	Complication (1+ Major ADGs)	No Complications (no Major ADGs)	Complication (1+ Major ADGs)
Low (0-5 ADGs)	5311	5321	5312	5322
Mid (6+ ADGs)	5331	5341	5332	5342

Resource Utilization Bands (RUBs)

ACGs were designed to represent clinically logical categories for persons expected to require similar levels of healthcare resources (i.e., resource groups). However, enrollees with similar overall utilization may be assigned different ACGs because they have different epidemiological patterns of morbidity. For example, a pregnant woman with significant morbidity, an individual with a serious psychological condition, or someone with two chronic medical conditions may all be expected to use approximately the same level of resources even though they each fall into different ACG categories. In many instances it may be useful to collapse the full set of ACGs into fewer categories, particularly where resource use similarity, and not clinical cogency, is a desired objective.

ACGs are collapsed according to concurrent relative resource use in the creation of Resource Utilization Bands (RUBs). The software automatically assigns six RUB classes:

- 0 - No or Only Invalid Dx
- 1 - Healthy Users
- 2 - Low
- 3 - Moderate
- 4 - High

- 5 - Very High

The relationship between ACG categories and RUBs is defined in the following table

Final ACG Categories, Reference ACG Concurrent Risks, and RUBs

ACG	Description	Non-Elderly (0 to 64 Years)	Elderly (65 Years and Older)	RUB
0100	Acute Minor, Age 1	0.314	N/A	2
0200	Acute Minor, Age 2 to 5	0.135	N/A	1
0300	Acute Minor, Age > 5	0.131	0.081	1
0400	Acute Major	0.283	0.144	2
0500	Likely to Recur, w/o Allergies	0.193	0.116	2
0600	Likely to Recur, with Allergies	0.199	0.090	2
0700	Asthma	0.210	0.111	2
0800	Chronic Medical, Unstable	1.220	0.312	3
0900	Chronic Medical, Stable	0.298	0.127	2
1000	Chronic Specialty, Stable	0.185	0.141	2
1100	Eye/Dental	0.093	0.076	1
1200	Chronic Specialty, Unstable	0.188	0.100	2
1300	Psychosocial, w/o Psych Unstable	0.281	0.113	2
1400	Psychosocial, with Psych Unstable, w/o Psych Stable	0.653	0.218	3
1500	Psychosocial, with Psych Unstable, w/ Psych Stable	1.026	0.218	3
1600	Preventive/Administrative	0.095	0.074	1
1710*	Pregnancy: 0-1 ADGs	1.758	N/A	3
1711	Pregnancy: 0-1 ADGs, delivered	2.510	N/A	4
1712	Pregnancy: 0-1 ADGs, not delivered	0.358	N/A	2
1720*	Pregnancy: 2-3 ADGs, no Major ADGs	2.033	N/A	3
1721	Pregnancy: 2-3 ADGs, no Major ADGs, delivered	2.888	N/A	4
1722	Pregnancy: 2-3 ADGs, no Major ADGs, not delivered	0.596	N/A	3
1730*	Pregnancy: 2-3 ADGs, 1+ Major ADGs	2.572	N/A	4
1731	Pregnancy: 2-3 ADGs, 1+ Major ADGs, delivered	3.195	N/A	4

ACG	Description	Non-Elderly (0 to 64 Years)	Elderly (65 Years and Older)	RUB
1732	Pregnancy: 2-3 ADGs, 1+ Major ADGs, not delivered	0.914	N/A	3
1740*	Pregnancy: 4-5 ADGs, no Major ADGs	2.234	N/A	4
1741	Pregnancy: 4-5 ADGs, no Major ADGs, delivered	3.197	N/A	4
1742	Pregnancy: 4-5 ADGs, no Major ADGs, not delivered	0.962	N/A	3
1750*	Pregnancy: 4-5 ADGs, 1+ Major ADGs	2.938	N/A	4
1751	Pregnancy: 4-5 ADGs, 1+ Major ADGs, delivered	3.722	N/A	4
1752	Pregnancy: 4-5 ADGs, 1+ Major ADGs, not delivered	1.332	N/A	3
760*	Pregnancy: 6+ ADGs, no Major ADGs	2.553	N/A	4
1761	Pregnancy: 6+ ADGs, no Major ADGs, delivered	3.636	N/A	4
1762	Pregnancy: 6+ ADGs, no Major ADGs, not delivered	1.537	N/A	3
1770*	Pregnancy: 6+ ADGs, 1+ Major ADGs	4.060	N/A	4
1771	Pregnancy: 6+ ADGs, 1+ Major ADGs, delivered	5.000	N/A	4
1772	Pregnancy: 6+ ADGs, 1+ Major ADGs, not delivered	2.897	N/A	4
1800	Acute Minor and Acute Major	0.432	0.190	2
1900	Acute Minor and Likely to Recur, Age 1	0.456	N/A	2
2000	Acute Minor and Likely to Recur, Age 2 to 5	0.241	N/A	2
2100	Acute Minor and Likely to Recur, Age > 5, w/o Allergy	0.262	0.118	2
2200	Acute Minor and Likely to Recur, Age > 5, with Allergy	0.287	0.109	2
2300	Acute Minor and Chronic Medical: Stable	0.354	0.150	2
2400	Acute Minor and Eye/Dental	0.181	0.092	2
2500	Acute Minor and Psychosocial, w/o Psych Unstable	0.341	0.142	2
2600	Acute Minor and Psychosocial, with Psych Unstable, w/o Psych Stable	0.740	0.320	3
2700	Acute Minor and Psychosocial, with Psych Unstable and Psych Stable	1.259	0.320	3

ACG	Description	Non-Elderly (0 to 64 Years)	Elderly (65 Years and Older)	RUB
2800	Acute Minor and Likely to Recur	0.499	0.213	3
2900	Acute Minor/Acute Major/Likely to Recur, Age 1	0.827	N/A	3
3000	Acute Minor/Acute Major/Likely to Recur, Age 2 to 5	0.508	N/A	3
3100	Acute Minor/Acute Major/Likely to Recur, Age 6 to 11	0.468	N/A	3
3200	Acute Minor/Acute Major/Likely to Recur, Age > 11, w/o Allergy	0.747	0.288	3
3300	Acute Minor/Acute Major/Likely to Recur, Age > 11, with Allergy	0.730	0.308	3
3400	Acute Minor/Likely to Recur/Eye & Dental	0.325	0.144	2
3500	Acute Minor/Likely to Recur/Psychosocial	0.558	0.207	3
3600	Acute Minor/Acute Major/Likely Recur/Eye & Dental	1.311	0.457	3
3700	Acute Minor/Acute Major/Likely Recur/Psychosocial	1.142	0.513	3
3800	2-3 Other ADG Combinations, Age < 18	0.415	N/A	2
3900	2-3 Other ADG Combinations, Males Age 18 to 34	0.541	N/A	3
4000	2-3 Other ADG Combinations, Females Age 18 to 34	0.476	N/A	3
4100	2-3 Other ADG Combinations, Age > 34	0.663	0.259	3
4210	4-5 Other ADG Combinations, Age < 18, no Major ADGs	0.557	N/A	3
4220	4-5 Other ADG Combinations, Age < 18, 1+ Major ADGs	1.071	N/A	3
4310	4-5 Other ADG Combinations, Age 18 to 44, no Major ADGs	0.638	N/A	3
4320	4-5 Other ADG Combinations, Age 18 to 44, 1+ Major ADGs	1.273	N/A	3
4330	4-5 Other ADG Combinations, Age 18 to 44, 2+ Major ADGs	2.307	N/A	4
4410	4-5 Other ADG Combinations, Age > 44, no Major ADGs	0.816	0.275	3
4420	4-5 Other ADG Combinations, Age > 44, 1+ Major ADGs	1.525	0.467	3

ACG	Description	Non-Elderly (0 to 64 Years)	Elderly (65 Years and Older)	RUB
4430	4-5 Other ADG Combinations, Age > 44, 2+ Major ADGs	2.810	0.812	4
4510	6-9 Other ADG Combinations, Age < 6, no Major ADGs	0.972	N/A	3
4520	6-9 Other ADG Combinations, Age < 6, 1+ Major ADGs	1.831	N/A	4
4610	6-9 Other ADG Combinations, Age 6 to 17, no Major ADGs	0.948	N/A	3
4620	6-9 Other ADG Combinations, Age 6 to 17, 1+ Major ADGs	2.234	N/A	4
4710	6-9 Other ADG Combinations, Males, Age 18 to 34, no Major ADGs	0.965	N/A	3
4720	6-9 Other ADG Combinations, Males, Age 18 to 34, 1+ Major ADGs	1.802	N/A	3
4730	6-9 Other ADG Combinations, Males, Age 18 to 34, 2+ Major ADGs	3.648	N/A	4
4810	6-9 Other ADG Combinations, Females, Age 18 to 34, no Major ADGs	1.045	N/A	3
4820	6-9 Other ADG Combinations, Females, Age 18 to 34, 1+ Major ADGs	1.756	N/A	3
4830	6-9 Other ADG Combinations, Females, Age 18 to 34, 2+ Major ADGs	3.332	N/A	4
4910	6-9 Other ADG Combinations, Age > 34, 0-1 Major ADGs	1.816	0.598	3
4920	6-9 Other ADG Combinations, Age > 34, 2 Major ADGs	3.616	1.088	4
4930	6-9 Other ADG Combinations, Age > 34, 3 Major ADGs	6.451	1.776	5
4940	6-9 Other ADG Combinations, Age > 34, 4+ Major ADGs	12.218	3.015	5
5010	10+ Other ADG Combinations, Age 1 to 17, no Major ADGs	1.806	N/A	3
5020	10+ Other ADG Combinations, Age 1 to 17, 1 Major ADGs	3.188	N/A	4
5030	10+ Other ADG Combinations, Age 1 to 17, 2 Major ADGs	12.171	N/A	5
5040	10+ Other ADG Combinations, Age > 17, 0-1 Major ADGs	2.790	0.889	4

ACG	Description	Non-Elderly (0 to 64 Years)	Elderly (65 Years and Older)	RUB
5050	10+ Other ADG Combinations, Age > 17, 2 Major ADGs	4.572	1.422	4
5060	10+ Other ADG Combinations, Age > 17, 3 Major ADGs	7.536	2.213	5
5070	10+ Other ADG Combinations, Age > 17, 4+ Major ADGs	18.710	4.666	5
5110	No Diagnosis or Only Unclassified Diagnosis (2 input files)	0.129	0.204	1
5200	Non-Users (2 input files)	0.000	0.000	0
5310*	Infants: 0-5 ADGs, no Major ADGs	0.870	N/A	3
5311	Infants: 0-5 ADGs, no Major ADGs, low birth weight	2.745	N/A	4
5312	Infants: 0-5 ADGs, no Major ADGs, normal birth weight	0.846	N/A	3
5320*	Infants: 0-5 ADGs, 1+ Major ADGs	2.784	N/A	4
5321	Infants: 0-5 ADGs, 1+ Major ADGs, low birth weight	10.955	N/A	5
5322	Infants: 0-5 ADGs, 1+ Major ADGs, normal birth weight	1.943	N/A	4
5330*	Infants: 6+ ADGs, no Major ADGs	1.510	N/A	3
5331	Infants: 6+ ADGs, no Major ADGs, low birth weight	3.999	N/A	4
5332	Infants: 6+ ADGs, no Major ADGs, normal birth weight	1.436	N/A	3
5340*	Infants: 6+ ADGs, 1+ Major ADGs	10.538	N/A	5
5341	Infants: 6+ ADGs, 1+ Major ADGs, low birth weight	31.997	N/A	5
5342	Infants: 6+ ADGs, 1+ Major ADGs, normal birth weight	5.478	N/A	4
9900	Invalid Age or Date of Birth	0.000	0.000	0

Source: PharMetrics, Inc., a unit of IMS, Watertown, MA; national cross-section of managed care plans; population of 3,310,540 commercially insured lives (less than 65 years old) and population of 501,987 Medicare beneficiaries (65 years and older), 2009-2011.

Note: The default is to subdivide these groups* on delivery or low birth weight status. Grouping the ACGs without these divisions is optional and must be turned on in order to be used.

Index