

eAppendix Table 1. Definition of Chronic Conditions Based on HCCs Developed by CMS^a

HCC/RxHCC/ICD-9 Label and Number	
Coronary artery disease	HCC81, HCC82, HCC83
Cancer	HCC7, HCC8, HCC9
Cerebrovascular disease and stroke	HCC96, HCC100 (remove <i>ICD-9</i> 343.X), HCC95
Congestive heart failure	HCC80
Connective tissue disease	HCC38
Chronic obstructive pulmonary disease	HCC108
Diabetes	HCC15, HCC16, HCC17, HCC18, HCC19 HCC119
Hematologic/thrombotic disease	HCC44, RxHCC100 (remove <i>ICD-9</i> 343.X)
Liver disease	HCC25, HCC26, HCC27
Parkinson's/Huntington disease	HCC73
Paralysis (not stroke)	HCC67, HCC68, HCC69
Renal disease	HCC130, HCC131, HCC132
Severe mental illness ^b	HCC54, HCC55 (remove e codes from HCC55)
Peripheral vascular disease	HCC105
Depression ^c	RxHCC62, <i>ICD-9</i> 296.2X, <i>ICD-9</i> 296.3X
Dementia	RxHCC54, RxHCC55
Substance use disorder ^d	HCC51, HCC52

HCC indicates Hierarchical Condition Categories; *ICD-9*, *International Classification of Diseases, Ninth Revision*.

^aCategories chosen for chronic nature, association with mortality, and costs.

^bSevere mental illness includes schizophrenia, bipolar disease, and depression.

^cDepression includes major depressive disorder, single episode; major depressive disorder, recurrent episode; and depression not otherwise specified and not elsewhere classified.

^dSubstance use disorder includes drug/alcohol dependence and drug/alcohol mental illness.

eAppendix Table 2. Attribution Status by RUCA Codes, 2010^a

	RUCA Codes			Observations, %
	Metropolitan Areas: Core, High Commuting, and Low Commuting	Micropolitan Areas: Core, High Commuting, Low Commuting	Small Towns (core, high commuting, low commuting), Rural Areas, Not Coded Areas	
	1, 1.1, 2, 2.1, 3	4, 4.1, 5, 5.1, 6	7, 7.1, 7.2, 8, 8.1, 8.2, 9, 10, 10.1, 10.2, 10.3, 99	
Attributable to provider groups, %	76.0	12.3	11.6	100
Unattributable to provider groups, %	76.9	11.5	11.7	100

RUCA indicates rural-urban commuting area.

^aN=12,852,274. “Not coded areas” are more likely to be less populated rural areas. Percent may not sum exactly to 100 due to rounding error. Considering each row separately:

Of all attributable beneficiaries

Attributable beneficiaries in metropolitan areas: 76.03%

Attributable beneficiaries in micropolitan areas: 12.33%

Attributable beneficiaries in small towns and rural areas: 11.64%

Of all unattributable beneficiaries

Unattributable beneficiaries in metropolitan areas: 76.86%

Unattributable beneficiaries in micropolitan areas: 11.47%

Unattributable beneficiaries in small towns and rural areas: 11.66%

eAppendix Table 3. Distribution of Decedents by Attribution Status and Month of Death

Month of Death, 2012	Attributable, %	Unattributable, %
1	4.0	34.7
2	7.1	15.1
3	8.6	10.4
4	8.5	7.2
5	8.6	5.9
6	8.3	4.7
7	8.6	4.4
8	8.7	3.9
9	8.7	3.7
10	9.3	3.7
11	9.3	3.0
12	10.3	3.3
Total, N (%)	489,354 (100)	98,105 (100)

eAppendix Table 4. Association Between Attribution Status and Beneficiary Characteristics, Dual-Eligible Beneficiaries (40% random sample)^a

Variable	Unattributable to Provider Groups ^b	
	Marginal Effect	SE
Age	-0.001***	(0.00001)
Female	-0.052***	(0.0003)
Race/ethnicity		
Black	0.023***	(0.0005)
Hispanic	0.007***	(0.0006)
Asian/Pacific Islander	-0.027***	(0.0009)
Other ethnicity	0.002*	(0.0011)
Lives in high-poverty (>20%) Census tract	0.004***	(0.0004)
Nursing home resident	-0.082***	(0.0011)
Disabled	-0.028***	(0.0005)
Chronic conditions (2011) [‡]		
0 observed chronic conditions	0.027***	(0.0006)
Non-healthcare service user (unknown chronic conditions) (2011)	0.155***	(0.0004)
Unknown chronic condition history (new 2012 FFS Medicare enrollees and 2011 managed care enrollees) (2011)	0.155***	(0.0006)
Observations	2,824,031	
Pseudo R ²	0.191	

ACO indicates accountable care organization; FFS, fee-for-service; HRR, hospital referral region; SE, standard error.

*** $P < .001$, ** $P < 0.01$, * $P < 0.05$.

^aA logistic regression was estimated for the attribution measure. The marginal effects reported are the averages of marginal effects across the sample on the predicted probability of being unattributable.

^bThe outcome variable is a dichotomous variable for whether the beneficiary is unattributable to any provider group as opposed to being attributable to a provider group (either associated with a Medicare ACO or any other provider group). The coefficients represent the estimated marginal effects or changes in the predicted probability. HRR fixed effects are included.

^cThe reference category is the group of patients with 1 or more observed chronic conditions.

eAppendix Table 5. Comparison of Attribution Methodologies: FFS Medicare Beneficiaries (2011-2012)^a

Attribution Categories in 2011	Attribution Categories in 2012					Observations, n (%)
	Attributable to (ACO and non-ACO) Provider Groups	Unattributable		Not in 2012 Data		
		Nonusers	Healthcare Service Users			
			Decedents	Survivors		
Attributable to (ACO and non-ACO) provider groups, n, (%)	10,021,587 (88.8)	127,514 (1.1)	60,445 (0.5)	183,282 (1.6)	890,675 (7.9)	11,283,503 (100)
Unattributable, n (%)	419,910 (28.7)	603,427 (41.2)	15,521 (1.1)	216,197 (14.8)	208,887 (14.3)	1,463,942 (100)
Not in 2011 data, n (%)	917,927 (76.2)	212,973 (17.7)	6091 (0.5)	674,000 (5.6)	–	1,204,391 (100)
Observations, n	11,359,424	943,914	82,057	466,879	1,099,562	13,951,836

ACO indicates accountable care organization; FFS, fee-for-service.

^aPercent may not sum exactly to 100 due to rounding error. Under prospective attribution (based on 2011 utilization), some of the 890,000 healthcare users in 2011 would be prospectively attributable to provider groups (ACOs and non-ACOs) in 2012 even though they were no longer enrolled in 2012—those who have lost eligibility for enrollment in 2012. Beneficiaries who may have died in 2011, following the end of the attribution window (October-September) and production of the attribution list would be removed. Over 370,000 (127,514 + 60,445 + 183,282) unattributable beneficiaries in 2012 would be prospectively attributable beneficiaries to provider groups based on their utilization in 2011. About 920,000 new (parts A & B) FFS Medicare beneficiaries in 2012 attributable to provider groups in 2012 would be excluded from responsibility of provider groups.

Under the proposed hybrid attribution and focusing on 2011 and 2012 data above, over 10,000,000 beneficiaries would be attributable in 2012 based on retrospective attribution method. To that number would be added over 127,000 2012 unattributable healthcare nonusers, 60,000 2012 unattributable decedents, and 183,000 2012 unattributable survivors who were attributable in 2011 under the long-term or “sticky” attribution recommendations. Attestation would permit attribution for additional 2012 unattributable patients, those who were new enrollees in 2012, and patients with some healthcare use in 2012 but who were unattributable in 2011. Finally, some of the remaining 2012 unattributable decedents would further be included by broadening assignment to hospice and palliative care.