

**Medicare Health Outcomes Survey (HOS)
2014-2016 Cohort 17 Case-Mix Adjustment
August 2017**

The longitudinal outcomes for the Medicare Health Outcomes Survey (HOS) 2014-2016 Cohort 17 Performance Measurement analysis are based on risk-adjusted mortality rates, changes in physical health as measured by the physical component summary (PCS) score, and changes in mental health as measured by the mental component summary (MCS) score for the participating Medicare Advantage Organizations (MAOs). For reporting purposes, death and PCS outcomes are combined into one overall measure of change in physical health. Thus, there are two primary outcomes: (1) Alive and PCS Better + Same (vs. PCS Worse or Death) and (2) MCS Better + Same (vs. MCS Worse). For the Medicare Part C Star Ratings, the primary outcomes are reported as the percentage of respondents within an MAO who are “Improving or Maintaining Physical Health” (C04), and the percentage within an MAO who are “Improving or Maintaining Mental Health” (C05) over the two-year period, after adjustment for case-mix.

The analysis of death outcomes for the HOS performance measurement included beneficiaries who are 65 or older at baseline, completed the HOS at baseline with a calculable PCS or MCS score, and whose MAO participated in the HOS at follow up. Beneficiaries are included in the analysis of PCS and MCS change scores if they are age 65 or older at baseline, alive at follow up, enrolled in their original MAO at follow up, and completed the HOS with calculable PCS and MCS scores at baseline and follow up. HOS outcomes are analyzed by calculating the national averages, and the differences between actual and expected contract-level results for death, PCS, and MCS over two years. The expected results are adjusted for the case-mix of beneficiaries within an MAO to control for pre-existing baseline differences across MAOs with respect to covariates, such as baseline measures of sociodemographic characteristics, chronic medical conditions, and functional health status. The PCS results are combined with the percentage remaining alive in the MAO. An adjusted contract-level percentage for each of the two primary outcomes is calculated by combining the national average and the MAO difference score, using a logit transformation.

Tables 1-3 below include a series of 12 different multivariate logistic regression models (six death models, three PCS models, and three MCS models) that are used to case-mix adjust HOS outcomes, and to calculate expected outcomes for each beneficiary. For each of the three types of models (death, PCS, and MCS), the first model (Model A) is used for those beneficiaries with complete data and the other alternative models are used for those respondents with different patterns of missing data for the model outcome. To address the issue of missing data, a series of cascading logistic regression models was developed. Alternative death, PCS, and MCS models allow for missing income, education, marital status, and homeownership, which generally are the most commonly missing variables. These models also allow for the CMS administrative (rather than self-reported) race/ethnicity, which is non-missing for all beneficiaries. In addition, the alternative death models allow for different patterns of missing across the baseline chronic medical conditions and functional status items.

The coefficients in the tables report the log-odds for beneficiaries with a given characteristic having the expected outcome compared to beneficiaries in the reference category for that characteristic, controlling for all other model characteristics. In Table 2: HOS PCS Better + Same Model Covariates, the Model A coefficient for “Female” is -0.413, indicating a lower probability of PCS Better + Same for female compared to male respondents (the reference category), who otherwise have the same demographic and health characteristics. However, the coefficient for age and gender interaction in the PCS Better + Same Model A is 0.006, indicating a very small positive difference in the expected outcome between females and males of the same age. It is important to note that the case-mix patterns are not always consistent across the 12 different logistic regression models.

More information about the calculation of HOS outcomes at the beneficiary and MAO contract levels is available on the HOS website at www.hosonline.org.

**Medicare Health Outcomes Survey (HOS)
2014-2016 Cohort 17 Case-Mix Adjustment
August 2017**

Table 1: HOS Death Model Covariates

Death Model Covariates	Model A	Model B	Model C	Model D	Model E	Model F
<i>Baseline Demographics</i>						
Constant	-6.256	-6.290	-6.405	-4.045	-4.336	-7.963
Age (linear)	0.056	0.056	0.055	0.059	0.063	0.069
Age 75+	0.031	0.028	0.032	0.030	0.027	0.044
Age 85+	0.026	0.029	0.026	0.029	0.026	0.019
Age and gender interaction	-0.003	-0.004	0.000	0.003	0.003	0.002
Female	-0.275	-0.164	-0.394	-0.685	-0.742	-0.632
Married	-0.196	-0.171				
Hispanic only	-0.493	-0.485				
Asian only	-0.739	-0.719				
Native Hawaiian or Pacific Islander only	0.021	-0.210				
Black only	-0.211	-0.248				
American Indian or Alaskan Native only	-0.026	0.061				
Multiracial	0.014	0.001				
CMS Hispanic only			-0.645	-0.611	-0.662	-0.580
CMS Asian or Pacific Islander only			-0.715	-0.666	-0.700	-0.738
CMS Black only			-0.168	-0.174	-0.169	-0.152
CMS American Indian or Alaskan Native only			0.064	0.093	0.155	0.323
CMS other race only			-0.538	-0.515	-0.527	-0.587
CMS unknown race only			-0.636	-0.662	-0.632	-0.769
Receive Medicaid	-0.046	-0.044	0.151	0.294	0.305	0.681
Eligible for SSI	0.039	0.011	0.048	0.106	0.081	0.794
Home owner	-0.173	-0.156				
High school graduate or greater	-0.021	-0.042				
Household income <\$20,000	0.068	0.071				
<i>Baseline Functional Status</i>						
One-item measure of General Health compared to others	0.252	0.252	0.254			
Physical Functioning/Activities of Daily Living Scale	-0.020	-0.019	-0.021			
General Health item	0.162	0.178	0.165			
Physical Functioning item (limitations in moderate activities)	-0.013	-0.031	-0.024			
Physical Functioning item (limitations climbing several flights of stairs)	0.057	0.058	0.072			
Role Physical item (accomplished less than would like)	0.017	0.029	0.022			
Role-Physical item (limited in the kind of work or other activities)	0.035	0.044	0.045			
Role-Emotional item (accomplished less than would like)	0.001	-0.012	0.009			

Medicare Health Outcomes Survey (HOS)
2014-2016 Cohort 17 Case-Mix Adjustment
August 2017

Death Model Covariates	Model A	Model B	Model C	Model D	Model E	Model F
Role-Emotional item (did not do work or other activities as carefully)	-0.014	-0.015	-0.025			
Bodily Pain item (pain interfered with normal work)	-0.080	-0.080	-0.090			
Mental Health item (felt calm and peaceful)	-0.033	-0.036	-0.029			
Vitality item (had a lot of energy)	0.063	0.068	0.070			
Mental Health item (felt downhearted and blue)	0.017	0.007	0.009			
Social Functioning item (health interfered with social activities)	-0.107	-0.090	-0.080			
Baseline Chronic Medical Conditions						
Hypertension	-0.012					
Angina/coronary artery disease	0.014					
Congestive heart failure	0.511					
Myocardial infarction	0.108					
Other heart conditions	0.088					
Stroke	0.131					
Pulmonary disease	0.341					
Gastrointestinal disorders	-0.205					
Arthritis of hip or knee	-0.340					
Arthritis of hand or wrist	-0.184					
Sciatica	-0.294					
Diabetes	0.120					
Depression	-0.076					
Any cancer other than skin cancer	0.472					
Colon cancer treatment	0.428					
Breast cancer treatment	0.099					
Prostate cancer treatment	-0.281					
Lung cancer treatment	1.125					
Large positive disease groups ¹		2.008	1.943	1.927		
Medium positive disease groups ²		0.674	0.691	0.836		
Unchanged disease groups ³		-0.093	-0.103	-0.100		
Negative disease groups ⁴		-1.306	-1.310	-1.450		
Baseline Summary Scores						
Baseline PCS				-0.048	-0.048	
Baseline MCS				-0.026	-0.025	

¹ congestive heart failure, any cancer, lung cancer, and colon/rectal cancer,

² pulmonary disease, stroke, diabetes, and myocardial infarction

³ angina/coronary artery disease, breast cancer, depression, hypertension and other heart conditions

⁴ gastrointestinal disorders, arthritis [both types], sciatica, and prostate cancer

Medicare Health Outcomes Survey (HOS)
2014-2016 Cohort 17 Case-Mix Adjustment
August 2017

Table 2: HOS PCS Better + Same Model Covariates

PCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	2.038	1.887	1.964
Age (linear)	-0.015	-0.013	-0.012
Age 75+	-0.021	-0.024	-0.026
Age 85+	0.011	0.019	0.018
Age and gender interaction	0.006	0.004	0.003
Female	-0.413	-0.294	-0.234
Married	0.034	0.053	
Hispanic only	-0.005	-0.012	
Asian only	0.053	0.057	
Native Hawaiian or Pacific Islander only	-0.067	0.003	
Black only	0.000	-0.023	
American Indian or Alaskan Native only	0.107	0.124	
Multiracial	-0.142	-0.094	
CMS Hispanic only			-0.072
CMS Asian or Pacific Islander only			0.064
CMS Black only			-0.067
CMS American Indian or Alaskan Native only			-0.045
CMS other race only			-0.006
CMS unknown race only			0.253
Receive Medicaid	0.001	-0.023	-0.084
Eligible for SSI	-0.038	-0.048	-0.062
Home owner	0.073	0.084	
High school graduate or greater	0.056	0.081	
Household income <\$20,000	-0.084		

Medicare Health Outcomes Survey (HOS)
2014-2016 Cohort 17 Case-Mix Adjustment
August 2017

Table 3: HOS MCS Better + Same Model Covariates

MCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	1.581	1.645	2.052
Age (linear)	0.003	0.000	-0.001
Age 75+	-0.037	-0.035	-0.035
Age 85+	0.006	0.009	0.009
Age and gender interaction	0.002	0.001	0.002
Female	-0.166	-0.131	-0.148
Married	-0.135	-0.100	
Hispanic only	-0.239	-0.273	
Asian only	-0.084	-0.106	
Native Hawaiian or Pacific Islander only	-0.142	-0.288	
Black only	-0.101	-0.137	
American Indian or Alaskan Native only	-0.054	-0.174	
Multiracial	-0.268	-0.295	
CMS Hispanic only			-0.341
CMS Asian or Pacific Islander only			-0.145
CMS Black only			-0.146
CMS American Indian or Alaskan Native only			-0.095
CMS other race only			-0.073
CMS unknown race only			0.023
Receive Medicaid	-0.111	-0.201	-0.376
Eligible for SSI	-0.253	-0.295	-0.310
Home owner	0.165	0.202	
High school graduate or greater	0.248	0.281	
Household income <\$20,000	-0.219		