

# **Medicare Health Outcomes Survey (HOS) 2017-2019 Cohort 20 Case-Mix Adjustment August 2020**

## **HOS 2017-2019 Cohort 20 Case-Mix Adjustment**

The longitudinal outcomes for the Medicare Health Outcomes Survey (HOS) 2017-2019 Cohort 20 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 includes beneficiaries who are age 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 (PCS and MCS change scores) is calculated by combining the national average and the MAO difference score, using a logit transformation.

Tables 1-6\* 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 5: HOS PCS Better + Same Model Covariates, the Model A coefficient for “Female” is -0.173, 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 0.003, 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](http://www.hosonline.org).

\* Please note that the tables are numbered A-3 – A-5 in the CMS Medicare 2020 Part C & D Star Ratings Technical Notes.

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Table 1: HOS Death Model Covariates – Baseline Demographics

Death Model Covariates – Baseline Demographics	Model A	Model B	Model C	Model D	Model E	Model F
Constant	-6.364	-6.289	-6.033	-3.278	-3.827	-7.312
Age (linear)	0.055	0.051	0.049	0.049	0.055	0.060
Age 75+	0.030	0.028	0.035	0.041	0.038	0.049
Age 85+	0.028	0.035	0.026	0.025	0.019	0.020
Age and gender interaction	0.001	-0.001	0.000	0.002	0.002	0.002
Female	-0.624	-0.400	-0.455	-0.615	-0.713	-0.635
Married	-0.139	-0.144				
Hispanic only	-0.501	-0.524				
Asian only	-0.666	-0.669				
Native Hawaiian or Pacific Islander only	-0.454	-0.324				
Black only	-0.251	-0.303				
American Indian or Alaskan Native only	-0.220	-0.335				
Multiracial	0.029	0.019				
CMS Hispanic only			-0.632	-0.622	-0.703	-0.611
CMS Asian or Pacific Islander only			-0.677	-0.571	-0.655	-0.728
CMS Black only			-0.182	-0.188	-0.169	-0.145
CMS American Indian or Alaskan Native only			-0.002	0.079	0.074	0.097
CMS other race only			-0.496	-0.425	-0.453	-0.493
CMS unknown race only			-0.488	-0.461	-0.490	-0.674
Receive Medicaid	0.118	0.096	0.224	0.307	0.312	0.710
Eligible for SSI	0.118	0.048	0.042	0.018	-0.010	0.609
Home owner	-0.135	-0.132				
High school graduate or greater	0.024	0.026				
Household income <\$20,000	0.106	0.108				

Table 2: HOS Death Model Covariates – Baseline Functional Status

Death Model Covariates – Baseline Functional Status	Model A	Model B	Model C	Model D	Model E	Model F
One-item measure of General Health compared to others	0.216	0.225	0.226			
Physical Functioning/Activities of Daily Living Scale	-0.021	-0.020	-0.020			
General Health item	0.202	0.210	0.170			
Physical Functioning item (limitations in moderate activities)	0.053	0.029	0.001			
Physical Functioning item (limitations climbing several flights of stairs)	-0.007	0.004	0.041			
Role Physical item (accomplished less than would like)	0.061	0.062	0.041			
Role-Physical item (limited in the kind of work or other activities)	0.034	0.053	0.046			
Role-Emotional item (accomplished less than would like)	0.025	0.044	0.026			
Role-Emotional item (did not do work or other activities as carefully)	-0.008	-0.015	-0.010			
Bodily Pain item (pain interfered with normal work)	-0.118	-0.137	-0.125			
Mental Health item (felt calm and peaceful)	-0.015	-0.012	-0.022			
Vitality item (had a lot of energy)	0.049	0.054	0.085			
Mental Health item (felt downhearted and blue)	0.020	0.015	-0.002			
Social Functioning item (health interfered with social activities)	-0.067	-0.065	-0.065			

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Table 3: HOS Death Model Covariates – Baseline Chronic Medical Conditions

Death Model Covariates – Baseline Chronic Medical Conditions	Model A	Model B	Model C	Model D	Model E	Model F
Hypertension	-0.053					
Angina/coronary artery disease	-0.071					
Congestive heart failure	0.547					
Myocardial infarction	0.067					
Other heart conditions	0.075					
Stroke	0.134					
Pulmonary disease	0.301					
Gastrointestinal disorders	-0.173					
Arthritis of hip or knee	-0.322					
Arthritis of hand or wrist	-0.131					
Sciatica	-0.272					
Diabetes	0.135					
Depression	-0.133					
Any cancer other than skin cancer	0.383					
Colon cancer treatment	0.238					
Breast cancer treatment	-0.135					
Prostate cancer treatment	-0.137					
Lung cancer treatment	1.387					
Large positive disease groups <sup>1</sup>		1.652	1.695	1.715		
Medium positive disease groups <sup>2</sup>		0.795	0.763	0.960		
Nominal disease groups <sup>3</sup>		-0.066	-0.083	-0.040		
Negative disease groups <sup>4</sup>		-1.533	-1.554	-1.711		

<sup>1</sup> congestive heart failure, any cancer, and lung cancer

<sup>2</sup> colon/rectal cancer, pulmonary disease, stroke, and diabetes

<sup>3</sup> myocardial infarction, hypertension, angina/coronary artery disease, and other heart conditions

<sup>4</sup> depression, breast cancer, gastrointestinal disorders, arthritis [both types], sciatica, and prostate cancer

Table 4: HOS Death Model Covariates – Baseline Summary Scores

Death Model Covariates – Baseline Summary Scores	Model A	Model B	Model C	Model D	Model E	Model F
Baseline PCS				-0.048	-0.048	
Baseline MCS				-0.028	-0.023	

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Table 5: HOS PCS Better + Same Model Covariates

PCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	1.649	1.633	1.765
Age (linear)	-0.008	-0.008	-0.008
Age 75+	-0.039	-0.038	-0.038
Age 85+	0.051	0.043	0.039
Age and gender interaction	0.003	0.002	0.003
Female	-0.173	-0.145	-0.194
Married	0.010	0.010	
Hispanic only	0.022	0.003	
Asian only	-0.010	-0.017	
Native Hawaiian or Pacific Islander only	-0.327	-0.156	
Black only	0.070	0.044	
American Indian or Alaskan Native only	-0.071	-0.104	
Multiracial	0.120	0.062	
CMS Hispanic only			-0.048
CMS Asian or Pacific Islander only			-0.005
CMS Black only			0.033
CMS American Indian or Alaskan Native only			-0.117
CMS other race only			0.011
CMS unknown race only			0.156
Receive Medicaid	-0.027	-0.066	-0.109
Eligible for SSI	-0.053	-0.046	-0.036
Home owner	0.014	0.006	
High school graduate or greater	0.101	0.122	
Household income <\$20,000	-0.053		

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Table 6: HOS MCS Better + Same Model Covariates

MCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	1.815	1.811	2.138
Age (linear)	-0.003	-0.005	-0.005
Age 75+	-0.039	-0.035	-0.035
Age 85+	0.017	0.013	0.013
Age and gender interaction	0.002	0.003	0.002
Female	-0.192	-0.203	-0.148
Married	-0.076	-0.034	
Hispanic only	-0.208	-0.212	
Asian only	-0.104	-0.102	
Native Hawaiian or Pacific Islander only	-0.148	-0.150	
Black only	-0.079	-0.120	
American Indian or Alaskan Native only	-0.431	-0.289	
Multiracial	-0.237	-0.274	
CMS Hispanic only			-0.202
CMS Asian or Pacific Islander only			-0.124
CMS Black only			-0.137
CMS American Indian or Alaskan Native only			-0.263
CMS other race only			-0.152
CMS unknown race only			0.160
Receive Medicaid	-0.116	-0.192	-0.363
Eligible for SSI	-0.278	-0.287	-0.291
Home owner	0.151	0.169	
High school graduate or greater	0.231	0.255	
Household income <\$20,000	-0.198		