

Medicare Health Outcomes Survey (HOS) 2018-2020 Cohort 21 Case-Mix Adjustment May 2021

HOS 2018-2020 Cohort 21 Case-Mix Adjustment

The longitudinal outcomes for the Medicare HOS 2018-2020 Cohort 21 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 Centers for Medicare and Medicaid Services (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 -0.206720, 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 0.002894, 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.

* Please note that the tables are numbered A-3 – A-5 in the CMS Medicare 2022 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	-5.988799	-6.145470	-6.017978	-3.545753	-3.727501	-7.019539
Age (linear)	0.056650	0.056207	0.052877	0.051642	0.054888	0.059023
Age 75+	0.034318	0.031967	0.035603	0.041201	0.036859	0.047802
Age 85+	0.019139	0.023619	0.032339	0.032461	0.028564	0.028428
Age and gender interaction	-0.005554	-0.006718	-0.003508	0.000902	0.000665	0.000439
Female	-0.088649	0.026794	-0.181290	-0.523741	-0.611878	-0.507872
Married	-0.148415	-0.174711				
Hispanic only	-0.368171	-0.411156				
Asian only	-0.709604	-0.659598				
Native Hawaiian or Pacific Islander only	0.178314	0.112149				
Black only	-0.070734	-0.128285				
American Indian or Alaskan Native only	0.059389	-0.002470				
Multiracial	-0.022842	-0.012111				
CMS Hispanic only			-0.542498	-0.501679	-0.597974	-0.484794
CMS Asian or Pacific Islander only			-0.721961	-0.607767	-0.668492	-0.730841
CMS Black only			-0.026035	-0.032379	-0.025324	0.009430
CMS American Indian or Alaskan Native only			0.297500	0.140326	0.116078	0.151235
CMS other race only			-0.323186	-0.277726	-0.302228	-0.364423
CMS unknown race only			-0.372688	-0.350006	-0.355539	-0.483158
Receive Medicaid	0.060347	0.053620	0.194576	0.288617	0.316886	0.704021
Eligible for SSI	0.046576	0.022892	0.024343	0.013872	-0.005857	0.554844
Home owner	-0.181746	-0.178194				
High school graduate or greater	-0.025178	-0.027490				
Household income <\$20,000	0.012401	0.019569				

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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	0.180267	0.192023	0.184147			
Physical Functioning/Activities of Daily Living Scale	-0.019492	-0.018751	-0.020626			
General Health item	0.220739	0.220134	0.198292			
Physical Functioning item (limitations in moderate activities)	-0.035154	-0.049341	-0.032849			
Physical Functioning item (limitations climbing several flights of stairs)	-0.015256	0.008530	0.029684			
Role Physical item (accomplished less than would like)	0.022814	0.029616	0.014835			
Role-Physical item (limited in the kind of work or other activities)	0.059839	0.057549	0.049977			
Role-Emotional item (accomplished less than would like)	0.016077	0.012555	0.001397			
Role-Emotional item (did not do work or other activities as carefully)	0.008443	-0.004625	-0.009537			
Bodily Pain item (pain interfered with normal work)	-0.112067	-0.102905	-0.092828			
Mental Health item (felt calm and peaceful)	-0.020866	-0.026895	-0.017880			
Vitality item (had a lot of energy)	0.035584	0.045519	0.066359			
Mental Health item (felt downhearted and blue)	0.020605	0.033934	0.023779			
Social Functioning item (health interfered with social activities)	-0.067806	-0.072012	-0.058874			

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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	-0.088204					
Angina/coronary artery disease	-0.019118					
Congestive heart failure	0.521517					
Myocardial infarction	0.085098					
Other heart conditions	0.077074					
Stroke	0.176562					
Pulmonary disease	0.266545					
Gastrointestinal disorders	-0.216036					
Arthritis of hip or knee	-0.261873					
Arthritis of hand or wrist	-0.123322					
Sciatica	-0.255737					
Diabetes	0.115323					
Depression	-0.053944					
Any cancer other than skin cancer	0.380512					
Colon cancer treatment	0.374354					
Breast cancer treatment	-0.129317					
Prostate cancer treatment	-0.300946					
Lung cancer treatment	1.178530					
Large positive disease groups ¹		1.824028	1.824323	1.915234		
Medium positive disease groups ²		0.548735	0.582286	0.751776		
Nominal disease groups ³		0.014167	0.005888	0.019523		
Negative disease groups ⁴		-1.328823	-1.418554	-1.556182		

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

² pulmonary disease, stroke, and diabetes

³ depression, myocardial infarction, hypertension, angina/coronary artery disease, and other heart conditions

⁴ 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				-0.046927	-0.046908	
Baseline MCS				-0.022813	-0.021844	

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Table 5: HOS PCS Better + Same Model Covariates

PCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	1.890148	1.858809	1.975921
Age (linear)	-0.010264	-0.010338	-0.009754
Age 75+	-0.037185	-0.035852	-0.037799
Age 85+	0.038190	0.034224	0.039629
Age and gender interaction	0.002894	0.002119	0.001736
Female	-0.206720	-0.155532	-0.129053
Married	0.035727	0.040634	
Hispanic only	-0.037471	-0.050691	
Asian only	-0.042550	-0.034504	
Native Hawaiian or Pacific Islander only	0.068823	-0.015099	
Black only	0.095115	0.066495	
American Indian or Alaskan Native only	0.006660	0.001999	
Multiracial	0.020441	0.046202	
CMS Hispanic only			-0.078496
CMS Asian or Pacific Islander only			-0.052364
CMS Black only			0.017723
CMS American Indian or Alaskan Native only			-0.152768
CMS other race only			-0.080112
CMS unknown race only			0.242387
Receive Medicaid	-0.048258	-0.079885	-0.137421
Eligible for SSI	0.016676	-0.017377	-0.022335
Home owner	0.022977	0.042307	
High school graduate or greater	0.112024	0.116820	
Household income <\$20,000	-0.085288		

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Table 6: HOS MCS Better + Same Model Covariates

MCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	1.686787	1.607787	1.795212
Age (linear)	-0.002486	-0.002127	-0.002450
Age 75+	-0.027321	-0.028730	-0.026582
Age 85+	-0.011061	-0.013487	-0.020081
Age and gender interaction	0.004323	0.003881	0.002943
Female	-0.429316	-0.400062	-0.317406
Married	-0.067704	-0.045247	
Hispanic only	-0.073934	-0.118148	
Asian only	-0.040161	-0.060287	
Native Hawaiian or Pacific Islander only	-0.309790	-0.185523	
Black only	-0.008574	-0.026771	
American Indian or Alaskan Native only	-0.218962	-0.198355	
Multiracial	-0.123690	-0.083329	
CMS Hispanic only			-0.097822
CMS Asian or Pacific Islander only			-0.075379
CMS Black only			-0.044106
CMS American Indian or Alaskan Native only			-0.319898
CMS other race only			-0.041499
CMS unknown race only			0.037130
Receive Medicaid	-0.122882	-0.184232	-0.283446
Eligible for SSI	-0.111275	-0.117147	-0.105462
Home owner	0.101701	0.108232	
High school graduate or greater	0.146085	0.154638	
Household income <\$20,000	-0.139514		