

Medicare Health Outcomes Survey (HOS)
2019-2021 Cohort 22 Case-Mix Adjustment
May 2022

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The longitudinal outcomes for the Medicare HOS 2019-2021 Cohort 22 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” and the percentage within an MAO who are “Improving or Maintaining Mental Health” 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 when the follow up sample was drawn, 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 & 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 -0.220967, 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 0.003309, 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.

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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	-5.357472	-5.431234	-5.191671	-3.005327	-3.565400	-6.791977
Age (linear)	0.053340	0.052789	0.048145	0.047096	0.052300	0.056518
Age 75+	0.031211	0.032444	0.039854	0.044784	0.041753	0.050822
Age 85+	0.019404	0.016274	0.020305	0.025884	0.018434	0.022997
Age and gender interaction	-0.000368	-0.001565	-0.000265	0.002214	0.000457	0.000329
Female	-0.451289	-0.344170	-0.401290	-0.609579	-0.591975	-0.494932
Married	-0.145651	-0.140544				
Hispanic only	-0.316672	-0.379318				
Asian only	-0.736102	-0.733530				
Native Hawaiian or Pacific Islander only	0.079630	-0.005295				
Black only	-0.049535	-0.065171				
American Indian or Alaskan Native only	0.243815	0.260630				
Multiracial	0.060202	0.037442				
CMS Hispanic only			-0.516228	-0.457282	-0.526223	-0.437894
CMS Asian or Pacific Islander only			-0.810133	-0.695982	-0.732748	-0.765851
CMS Black only			-0.015658	-0.029229	-0.005020	0.007174
CMS American Indian or Alaskan Native only			0.171564	0.107343	0.047775	0.097185
CMS other race only			-0.307654	-0.293355	-0.324523	-0.371051
CMS unknown race only			-0.646577	-0.617026	-0.675897	-0.839291
Receive Medicaid	0.125028	0.117700	0.272903	0.345071	0.361112	0.729089
Eligible for SSI	0.005573	-0.009433	0.015327	-0.010114	-0.037254	0.504023
Home owner	-0.150501	-0.159409				
High school graduate or greater	0.019651	0.009273				
Household income <\$20,000	0.071773	0.086623				

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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	0.202110	0.218113	0.215732			
Physical Functioning/Activities of Daily Living Scale	-0.020663	-0.019964	-0.021286			
General Health item	0.157232	0.154652	0.130135			
Physical Functioning item (limitations in moderate activities)	-0.036086	-0.032548	-0.051134			
Physical Functioning item (limitations climbing several flights of stairs)	0.021436	0.019298	0.042914			
Role Physical item (accomplished less than would like)	0.058819	0.047203	0.034148			
Role-Physical item (limited in the kind of work or other activities)	0.031607	0.038611	0.028871			
Role-Emotional item (accomplished less than would like)	0.010161	0.013337	0.019113			
Role-Emotional item (did not do work or other activities as carefully)	-0.000853	-0.002678	-0.011173			
Bodily Pain item (pain interfered with normal work)	-0.129696	-0.126432	-0.116665			
Mental Health item (felt calm and peaceful)	-0.054738	-0.042014	-0.020627			
Vitality item (had a lot of energy)	0.058406	0.063194	0.066772			
Mental Health item (felt downhearted and blue)	-0.007583	-0.010239	-0.008237			
Social Functioning item (health interfered with social activities)	-0.089731	-0.089336	-0.070559			

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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	-0.035251					
Angina/coronary artery disease	-0.027514					
Congestive heart failure	0.551278					
Myocardial infarction	0.085959					
Other heart conditions	0.021027					
Stroke	0.145115					
Pulmonary disease	0.260776					
Gastrointestinal disorders	-0.163142					
Arthritis of hip or knee	-0.255611					
Arthritis of hand or wrist	-0.156220					
Sciatica	-0.289616					
Diabetes	0.181331					
Depression	-0.122855					
Any cancer other than skin cancer	0.376400					
Colon cancer treatment	0.270123					
Breast cancer treatment	-0.090522					
Prostate cancer treatment	-0.325907					
Lung cancer treatment	1.131063					
Large positive disease groups ¹		1.432071	1.408023	1.414896		
Medium positive disease groups ²		0.820869	0.823733	1.000136		
Nominal disease groups ³		-0.017801	-0.034970	0.012689		
Negative disease groups ⁴		-1.272973	-1.281952	-1.388185		

¹ congestive heart failure, any cancer, and lung cancer

² pulmonary disease, stroke, colon/rectal cancer, and diabetes

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

⁴ depression, 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				-0.045175	-0.045000	
Baseline MCS				-0.026585	-0.021736	

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Table 5: HOS PCS Better + Same Model Covariates

PCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	2.094008	1.987334	2.061948
Age (linear)	-0.013805	-0.012665	-0.012008
Age 75+	-0.032401	-0.033559	-0.034038
Age 85+	0.035126	0.031521	0.031224
Age and gender interaction	0.003309	0.003772	0.003422
Female	-0.220967	-0.255006	-0.229280
Married	0.010491	0.023191	
Hispanic only	0.035678	0.030845	
Asian only	0.014772	0.045747	
Native Hawaiian or Pacific Islander only	-0.395028	-0.314598	
Black only	0.014747	0.024373	
American Indian or Alaskan Native only	-0.220784	-0.160287	
Multiracial	-0.051995	-0.049135	
CMS Hispanic only			-0.009907
CMS Asian or Pacific Islander only			0.004863
CMS Black only			-0.017903
CMS American Indian or Alaskan Native only			-0.190038
CMS other race only			0.032028
CMS unknown race only			0.136734
Receive Medicaid	-0.070710	-0.068883	-0.127608
Eligible for SSI	0.017481	0.007474	0.013917
Home owner	0.074734	0.073064	
High school graduate or greater	0.049689	0.057591	
Household income <\$20,000	-0.032236		

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Table 6: HOS MCS Better + Same Model Covariates

MCS Better + Same Model Covariates	Model A	Model B	Model C
Constant	2.142074	2.133995	2.359448
Age (linear)	-0.006099	-0.007755	-0.008247
Age 75+	-0.041497	-0.037120	-0.034320
Age 85+	0.002922	0.004972	-0.000857
Age and gender interaction	0.004025	0.003255	0.002636
Female	-0.359805	-0.307244	-0.233126
Married	-0.129615	-0.073824	
Hispanic only	-0.125802	-0.151949	
Asian only	-0.165424	-0.174328	
Native Hawaiian or Pacific Islander only	0.140786	0.220901	
Black only	-0.171679	-0.169169	
American Indian or Alaskan Native only	-0.339669	-0.262206	
Multiracial	-0.040991	-0.119925	
CMS Hispanic only			-0.220262
CMS Asian or Pacific Islander only			-0.198145
CMS Black only			-0.181203
CMS American Indian or Alaskan Native only			-0.198136
CMS other race only			-0.105379
CMS unknown race only			0.000826
Receive Medicaid	-0.150851	-0.242233	-0.352456
Eligible for SSI	-0.268908	-0.306099	-0.303881
Home owner	0.130723	0.159215	
High school graduate or greater	0.134920	0.167185	
Household income <\$20,000	-0.201249		