

# **Medicare Health Outcomes Survey (HOS) 2016-2018 Cohort 19 Case-Mix Adjustment August 2019**

## **HOS 2016-2018 Cohort 19 Case-Mix Adjustment**

The longitudinal outcomes for the Medicare Health Outcomes Survey (HOS) 2016-2018 Cohort 19 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 -0.295, 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 0.004, 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                                       | -6.261  | -6.266  | -6.101  | -3.499  | -3.777  | -7.228  |
| Age (linear)                                   | 0.057   | 0.057   | 0.051   | 0.051   | 0.054   | 0.059   |
| Age 75+  | 0.024   | 0.022   | 0.030   | 0.036   | 0.033   | 0.047   |
| Age 85+  | 0.023   | 0.028   | 0.035   | 0.032   | 0.030   | 0.030   |
| Age and gender interaction                     | -0.003  | -0.004  | -0.001  | 0.002   | 0.000   | 0.000   |
| Female   | -0.205  | -0.143  | -0.317  | -0.519  | -0.525  | -0.452  |
| Married  | -0.223  | -0.214  |         |         |         |         |
| Hispanic only                                  | -0.447  | -0.449  |         |         |         |         |
| Asian only                                     | -0.667  | -0.686  |         |         |         |         |
| Native Hawaiian or Pacific Islander only       | -0.068  | -0.148  |         |         |         |         |
| Black only                                     | -0.124  | -0.170  |         |         |         |         |
| American Indian or Alaskan Native only         | 0.053   | -0.023  |         |         |         |         |
| Multiracial                                    | 0.103   | 0.119   |         |         |         |         |
| CMS Hispanic only                              |         |         | -0.605  | -0.596  | -0.698  | -0.603  |
| CMS Asian or Pacific Islander only             |         |         | -0.540  | -0.472  | -0.570  | -0.627  |
| CMS Black only                                 |         |         | -0.098  | -0.084  | -0.105  | -0.082  |
| CMS American Indian or Alaskan Native only     |         |         | 0.254   | 0.241   | 0.244   | 0.299   |
| CMS other race only                            |         |         | -0.322  | -0.277  | -0.313  | -0.351  |
| CMS unknown race only                          |         |         | -0.205  | -0.247  | -0.318  | -0.480  |
| Receive Medicaid                               | 0.055   | 0.036   | 0.130   | 0.220   | 0.240   | 0.627   |
| Eligible for SSI                               | -0.035  | -0.077  | -0.016  | -0.043  | -0.074  | 0.587   |
| Home owner                                     | -0.126  | -0.134  |         |         |         |         |
| High school graduate or greater                | 0.025   | 0.034   |         |         |         |         |
| Household income <\$20,000                     | 0.018   | 0.025   |         |         |         |         |

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                      | 0.225   | 0.227   | 0.226   |         |         |         |
| Physical Functioning/Activities of Daily Living Scale                      | -0.021  | -0.020  | -0.020  |         |         |         |
| General Health item  | 0.177   | 0.191   | 0.174   |         |         |         |
| Physical Functioning item (limitations in moderate activities)             | 0.007   | 0.005   | 0.010   |         |         |         |
| Physical Functioning item (limitations climbing several flights of stairs) | 0.051   | 0.045   | 0.052   |         |         |         |
| Role Physical item (accomplished less than would like)                     | 0.036   | 0.050   | 0.055   |         |         |         |
| Role-Physical item (limited in the kind of work or other activities)       | 0.040   | 0.030   | 0.025   |         |         |         |
| Role-Emotional item (accomplished less than would like)                    | -0.041  | -0.035  | -0.026  |         |         |         |
| Role-Emotional item (did not do work or other activities as carefully)     | 0.022   | 0.003   | -0.012  |         |         |         |
| Bodily Pain item (pain interfered with normal work)                        | -0.117  | -0.117  | -0.105  |         |         |         |
| Mental Health item (felt calm and peaceful)                                | 0.004   | -0.004  | -0.014  |         |         |         |
| Vitality item (had a lot of energy)  | 0.068   | 0.075   | 0.086   |         |         |         |
| Mental Health item (felt downhearted and blue)                             | -0.015  | -0.012  | -0.003  |         |         |         |
| Social Functioning item (health interfered with social activities)         | -0.071  | -0.079  | -0.082  |         |         |         |

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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   | -0.035  |         |         |         |         |         |
| Angina/coronary artery disease                               | -0.014  |         |         |         |         |         |
| Congestive heart failure                                     | 0.466   |         |         |         |         |         |
| Myocardial infarction  | 0.111   |         |         |         |         |         |
| Other heart conditions                                       | 0.057   |         |         |         |         |         |
| Stroke   | 0.117   |         |         |         |         |         |
| Pulmonary disease  | 0.334   |         |         |         |         |         |
| Gastrointestinal disorders                                   | -0.204  |         |         |         |         |         |
| Arthritis of hip or knee                                     | -0.282  |         |         |         |         |         |
| Arthritis of hand or wrist                                   | -0.212  |         |         |         |         |         |
| Sciatica   | -0.291  |         |         |         |         |         |
| Diabetes   | 0.111   |         |         |         |         |         |
| Depression   | -0.068  |         |         |         |         |         |
| Any cancer other than skin cancer                            | 0.442   |         |         |         |         |         |
| Colon cancer treatment                                       | 0.591   |         |         |         |         |         |
| Breast cancer treatment                                      | -0.102  |         |         |         |         |         |
| Prostate cancer treatment                                    | -0.156  |         |         |         |         |         |
| Lung cancer treatment  | 1.068   |         |         |         |         |         |
| Large positive disease groups <sup>1</sup>                   |         | 1.925   | 1.865   | 1.958   |         |         |
| Medium positive disease groups <sup>2</sup>                  |         | 0.649   | 0.705   | 0.850   |         |         |
| Nominal disease groups <sup>3</sup>                          |         | -0.088  | -0.092  | -0.073  |         |         |
| Negative disease groups <sup>4</sup>                         |         | -1.514  | -1.546  | -1.702  |         |         |

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

<sup>2</sup> pulmonary disease, stroke, diabetes, and myocardial infarction

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

<sup>4</sup> 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  | -0.047  |         |
| Baseline MCS                                     |         |         |         | -0.026  | -0.024  |         |

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Table 5: HOS PCS Better + Same Model Covariates

| PCS Better + Same Model Covariates         | Model A | Model B | Model C |
|--|---------|---------|---------|
| Constant                                   | 2.058   | 1.961   | 2.004   |
| Age (linear)                               | -0.013  | -0.012  | -0.011  |
| Age 75+                                    | -0.029  | -0.029  | -0.030  |
| Age 85+                                    | 0.040   | 0.034   | 0.035   |
| Age and gender interaction                 | 0.004   | 0.003   | 0.002   |
| Female                                     | -0.295  | -0.196  | -0.136  |
| Married                                    | 0.020   | 0.031   |         |
| Hispanic only                              | -0.044  | -0.041  |         |
| Asian only                                 | 0.034   | 0.042   |         |
| Native Hawaiian or Pacific Islander only   | -0.015  | -0.025  |         |
| Black only                                 | 0.013   | -0.004  |         |
| American Indian or Alaskan Native only     | 0.333   | 0.311   |         |
| Multiracial                                | -0.047  | -0.084  |         |
| CMS Hispanic only                          |         |         | -0.161  |
| CMS Asian or Pacific Islander only         |         |         | 0.059   |
| CMS Black only                             |         |         | -0.025  |
| CMS American Indian or Alaskan Native only |         |         | 0.135   |
| CMS other race only                        |         |         | 0.032   |
| CMS unknown race only                      |         |         | 0.336   |
| Receive Medicaid                           | -0.009  | -0.058  | -0.120  |
| Eligible for SSI                           | -0.053  | -0.056  | -0.046  |
| Home owner                                 | 0.049   | 0.050   |         |
| High school graduate or greater            | 0.095   | 0.106   |         |
| Household income <\$20,000                 | -0.057  |         |         |

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Table 6: HOS MCS Better + Same Model Covariates

| MCS Better + Same Model Covariates         | Model A | Model B | Model C |
|--|---------|---------|---------|
| Constant                                   | 2.018   | 1.890   | 2.157   |
| Age (linear)                               | -0.005  | -0.005  | -0.005  |
| Age 75+                                    | -0.036  | -0.037  | -0.037  |
| Age 85+                                    | 0.020   | 0.020   | 0.021   |
| Age and gender interaction                 | 0.004   | 0.003   | 0.002   |
| Female                                     | -0.358  | -0.272  | -0.163  |
| Married                                    | -0.108  | -0.064  |         |
| Hispanic only                              | -0.148  | -0.193  |         |
| Asian only                                 | -0.177  | -0.190  |         |
| Native Hawaiian or Pacific Islander only   | 0.046   | -0.013  |         |
| Black only                                 | -0.074  | -0.078  |         |
| American Indian or Alaskan Native only     | -0.126  | -0.179  |         |
| Multiracial                                | -0.168  | -0.223  |         |
| CMS Hispanic only                          |         |         | -0.280  |
| CMS Asian or Pacific Islander only         |         |         | -0.231  |
| CMS Black only                             |         |         | -0.091  |
| CMS American Indian or Alaskan Native only |         |         | -0.156  |
| CMS other race only                        |         |         | -0.137  |
| CMS unknown race only                      |         |         | 0.248   |
| Receive Medicaid                           | -0.123  | -0.215  | -0.369  |
| Eligible for SSI                           | -0.302  | -0.328  | -0.312  |
| Home owner                                 | 0.135   | 0.166   |         |
| High school graduate or greater            | 0.241   | 0.263   |         |
| Household income <\$20,000                 | -0.234  |         |         |