

Case-Mix Adjustments for Publicly Reported CAHPS® Hospice Survey Results

Overview

Prior to public reporting, hospices' CAHPS Hospice Survey results are adjusted for the effects of both mode of survey administration and case mix. Steps for calculating top-, middle-, and bottom-box scores for public reporting, including adjustment for mode of survey administration, are available at

<https://hospicecahpsurvey.org/en/public-reporting/scoring-and-analysis/>.

Data from two mode experiments, as well as CAHPS Hospice Survey national implementation data, were used to develop and validate the variables to be included in the CAHPS Hospice Survey case-mix model. In order to estimate the case-mix coefficients as accurately as possible, we employ the large sample size of each quarterly publicly reported national data set. This approach allows us to detect changes in the association of case-mix adjustors and CAHPS Hospice Survey measures over time and then adjust accordingly. This approach is consistent with recommended CAHPS practice for case-mix adjustment.¹

Case-mix adjustment is performed within each quarter of data after data cleaning and mode adjustment. *Coefficients* obtained in linear regression models estimate the tendency of caregivers to respond more positively or negatively. The *adjustments* needed to counter that tendency are obtained by multiplying the case-mix coefficients by (-1.0). The 'Top-box Adjustors' and 'Bottom-box Adjustors' tabs in the Excel file posted on <https://hospicecahpsurvey.org/en/public-reporting/scoring-and-analysis/> report average case-mix *adjustments* across the relevant 8-quarter rolling reporting period for each question composing a publicly reported CAHPS Hospice Survey measure top- or bottom-box score.² As an example, if in a given reporting period, caregivers aged 18-44 were 4.74% less likely to provide the most positive response ("Definitely yes," the top-box response) for the Willing to Recommend this Hospice item ("Would you recommend this hospice to your friends and family?") when compared to the reference group of caregivers aged 55-64, the corresponding adjustment for caregivers aged 18-44 for the top-box score of that measure would be an addition of

¹ See, for example: O'Malley AJ, Zaslavsky AM, Elliott MN, Zaborski L, Cleary PD. Case-mix adjustment of the CAHPS Hospital Survey. *Health Serv Res.* 2005 Dec;40(6 Pt 2):2162-81. <https://pmc.ncbi.nlm.nih.gov/articles/PMC1361241/>

² Note that bottom-box adjustments for items in the Emotional and Spiritual Support composite are not needed, as this measure has no middle-box score.

4.74%. This would be reflected in an entry of “4.74%” in the “Top-box Adjustors” tab for that reporting period.

Publicly reported CAHPS Hospice Survey measure scores are adjusted to reflect the overall national mean of case-mix variables across all reporting hospices. For instance, if 2.8% of responding caregivers are age 18-44, then hospice scores are adjusted as if 2.8% of caregivers in each hospice were age 18-44. National means of case-mix variables are reported in the ‘National Means’ tab of the Excel file for the relevant reporting period. Thus, whether the scores of a given hospice are adjusted upward or downward for a given measure depends not only on these case-mix adjustments, but also on the case mix of that hospice relative to the national average of these case-mix characteristics. Specifically, the total case mix-adjustment for a given hospice is the sum of a series of products, where each product multiplies the adjustments in the ‘Top-box Adjustors’ or ‘Bottom-box Adjustors’ tab by the difference between the hospice’s mean on the corresponding case-mix variable and the national mean on that case-mix variable (from the ‘National Means’ tab).

Four sets of numbers are needed to calculate final case-mix adjusted top- or bottom-box scores for a given hospice for a given quarter: (1) Mean top- or bottom-box scores of the items that compose each CAHPS Hospice Survey measure for the hospice in question that have been adjusted for survey mode; (2) item-level case-mix adjustments from the ‘Top-box Adjustors’ or ‘Bottom-box Adjustors’ tabs; (3) that hospice’s means on case-mix variables; and (4) national means on case-mix variables from the ‘National Means’ tab.

Variable Definitions

In this section, we provide additional detail regarding the calculation of the response percentile variable and the definition of the primary diagnosis categories.

Each hospice’s response percentile is calculated as follows. For a given hospice and a given quarter, all completed surveys are ranked based on their respective “lag times.” Lag time is the number of days between a decedent’s death and the return of the mail survey, or the final disposition of the telephone or web survey. Ranks are averaged in the case of ties. Response percentile is calculated by dividing lag time rank by quarterly sample size. For caregivers surveyed in the web-mail mode and whose family member’s hospice had valid email addresses available for 20% or more of their sampled caregivers, response percentile is calculated separately for sampled caregivers with and without an available email address; this avoids inappropriately adjusting hospice scores for characteristics associated with having an email address or adjusting hospice scores differently depending on the proportion of caregivers who have an email address.

ICD-10 codes are used to categorize primary diagnosis. The 20 most common terminal diagnoses categories among hospice patients in 2004-2009³ were used to define diagnosis categories with an 'Other' category including all other diagnoses. Two of the 20 categories, 'Debility, Not Otherwise Specified' and 'Failure to Thrive' were rare in these data and thus were collapsed into the 'Other' category. Further collapsing was attempted but analyses examining the predictive ability of these diagnosis categories to predict measure scores indicated that the only appropriate collapsing was of "Alzheimer's Disease" and "non-Alzheimer's Dementias" into a single category; no other categories were combined.

Score Calculation

The formula for applying case-mix adjustment is as follows:

- Let y be the mode-adjusted hospice mean of an item that composes a CAHPS Hospice Survey measure.
- Let n be the number of adjustments from the 'Top-box Adjustors' or 'Bottom-box Adjustors' tab for all rows other than reference categories. For instance, the case-mix adjustment variable Caregiver Education has six categories, one of which is a reference category; therefore, this variable has five categories for adjustment. The value n refers to the total number of categories, excluding reference categories, across all case-mix adjustment variables.
- Let a_1 through a_n be the corresponding adjustments from the 'Top-box Adjustors' or 'Bottom-box Adjustors' tab for all rows other than reference categories.
- Let m_1 through m_n be the national means for the CMA variables in the same rows in the 'National Means' tab.
- Let h_1 through h_n be the CMA means for the hospice in question in the same form as the 'National Means' tab.
- Then $y' = y + a_1(h_1 - m_1) + a_2(h_2 - m_2) + \dots + a_{n-1}(h_{n-1} - m_{n-1}) + a_n(h_n - m_n)$ is the case-mix and mode-adjusted hospice score for that item.

CAHPS Hospice Survey publicly reported multi-quarter hospice scores are a weighted average of quarterly scores. Specifically, each quarter's score has a weight equal to the quarter's number of decedent/caregiver respondents. Multi-quarter hospice scores are calculated after case-mix adjustment and survey mode adjustments are applied within each quarter.

Within each quarter, adjusted scores that are below 0 are truncated at 0 and adjusted scores that are above 100 are truncated at 100. For public reporting purposes, CAHPS Hospice Survey measure scores are rounded to integer percentages. Rounding occurs after case-mix and mode adjustments have been applied and after data have been combined across quarters.

³ https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/Hospice/Downloads/Medicare_Hospice_Data_1998_2009.zip.

Please note: The information presented here will permit a hospice to closely approximate the effect of case-mix adjustment on its CAHPS Hospice Survey results. However, exact replication of published CAHPS Hospice Survey results may not be possible because of (1) the effects of data cleaning, and (2) small differences between the effects of quarterly case-mix adjustments and the most-recent-quarter averages presented in Excel files updated and posted quarterly on <https://hospicecahpssurvey.org/en/public-reporting/scoring-and-analysis/>.