Simulation and Analysis of an Alternative Medicare Home Health Payment System Not Based on Number of Therapy Visits

A report by the Urban Institute for the Medicare Payment Advisory Commission

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1. Introduction

MedPAC is concerned that the current prospective payment system (PPS) for Medicare home health contains incentives that encourage the use of therapy relative to other services. In particular, Medicare uses the actual number of therapy visits provided as a factor in determining payment, with payments increasing with the number of therapy visits. Therapy episodes have increased significantly in volume since the introduction of the PPS and the use of therapy as a payment factor may have contributed to this growth. In its March 2011 Report to Congress, MedPAC recommended the elimination of therapy visits as a factor in payment. The purpose of this report is to outline a possible approach to implementing the recommendation, and to describe the likely impacts of such a change.

In this report, we simulate a prospective payment system for home health that uses patient characteristics, but not the number of therapy visits, to establish payments. We estimate a model of the total costs of visits provided using patient and stay characteristics from administrative data sources. Predicted costs from the model are then used to set the payments per episode, based on those characteristics, for our simulation of this alternate prospective payment system. Payments under this alternate PPS are then compared to payments based on case-mix weights from the 2012 Medicare Home Health PPS (HHPPS).

The models used in our simulation provide an indication of how a system would perform with truly prospective payments. This analysis is intended to offer a framework for redesigning the prospective payment system and the possible impacts of such a refinement. HHAs would be paid the expected cost of treating a particular type of patient, but would not receive higher payments for providing additional therapy visits given the type of patient. Payments would be based solely on patient characteristics, eliminating the incentive to provide more therapy to increase payment.

In the next section, we provide an overview of the home health payment system and evidence of problems with that system, followed by a description of the data files used for the analysis (Section 3). In Section 4, we report on the accuracy of the 2012 HHPPS case-mix weights and

the home health case-mix groups that underlie them, followed by estimates of the proportionality of the 2012 HHPPS case-mix weights to costs.[1] In Sections 5 and 6, we describe the alternative case-mix model and report estimates of its accuracy and proportionality to costs. In Section 7, we report the impact on patient and agency subgroups of changing to the alternative payment system. We conclude with a summary and discussion in Section 8.

2. Background

Medicare beneficiaries who are unable to leave their homes without considerable effort and need skilled care (e.g., from a nurse or physical therapist) on a part-time or intermittent basis are eligible to receive Medicare-covered home health services. In 2012, 3.4 million Medicare beneficiaries received home health services. In return for providing these services, home health agencies (HHAs) received an average payment of about $5,247 per user and $2,677 per episode, with a total cost to the Medicare program of $15.4 billion (Medicare Payment Advisory Commission, 2014).

The Balanced Budget Act of 1997 and subsequent legislation mandated that the Centers for Medicare and Medicaid Services (CMS) (called the Health Care Financing Administration at the time) develop a PPS for the reimbursement of home health services. Under the PPS, home health agencies are reimbursed for care provided to home health patients for each 60-day episode. The payment rates are based on patients' conditions and service use, and are adjusted to reflect local variation in labor costs through a wage index. If fewer than 5 visits are delivered, the home health agency is paid per visit by visit type, rather than by the episode payment method. This low utilization payment adjustment (LUPA) is intended to guard against the incentive to stint on the amount of care delivered under prospective payment. Adjustments for other special circumstances, such as high-cost outliers and partial episodes, can also modify standard payments.

Under the current payment system, each 60-day episode is assigned to one of 153 Home Health Resource Group (HHRG) categories, according to a formula based on whether the episode is

[1] In 2012 CMS implemented case-mix weights that replaced those in effect since 2008. These are referred to in this report as the 2012 HHPPS case-mix weights. Estimated payments, based on 2008 base rates and the 2012 HHPPS case-mix weights are referred to as payments based on the 2012 HHPPS case-mix weights.

early (first or second) or late (third and subsequent) in a sequence of consecutive home health episodes, the number of therapy visits provided in an episode, and indicators of functional and clinical condition. Each episode is assigned a case-mix weight, which measures the relative cost of the patient's condition based on their characteristics. The case-mix weight is an estimate of the relative expected costs for all covered home health services. Covered services include skilled nursing, physical, occupational, and speech-language therapy, home health aide, and medical social services.[2]

The original home health PPS featured a large boost in payment for any episode including 10 or more therapy visits, creating a strong financial incentive to provide at least 10 visits to get the large payment increase, and few therapy visits beyond 10. Indeed, the data showed increased clustering of episodes with 10 to 13 visits following implementation of the HHPPS (Coleman, Wu, et al., 2008). Revisions to the PPS in 2008 introduced a more graduated scale of visit thresholds, spreading out the discontinuities in payment with payment steps at 6, 14, and 20 therapy visits, continuing the link between payment and the number of visits provided.

The changes in therapy utilization in 2008 suggested that agencies continued to be sensitive to the payment incentives of the revised system (Medicare Payment Advisory Commission, 2011). The number of therapy episodes with decreased payments under the new system—those in the range of 10 to 13 therapy visits—dropped by about 28 percent. Conversely, payment for episodes with six to nine visits increased by 30 percent, and the share of these episodes increased from 8.6 percent to 11.6 percent. Payment for episodes with 14 or more therapy visits increased by 26 percent, and the share of these episodes increased from 12 percent to 15 percent. The immediate change in utilization demonstrated that home health providers can quickly adjust services to payment changes in the therapy visit thresholds. In the 2011 home health payment regulation, CMS concluded that a significant portion of the changes in therapy use in 2008 was a "behavioral response" by HHAs attributable to the payment changes (Centers for Medicare & Medicaid Services, 2011).

[2] The home health PPS has a separate case-mix system that covers non-routine supplies. This project focused on the case-mix system that pays for practitioner visits and accounts for over 90 percent of home health payments.

Prospective payment is intended to encourage more efficient provision of care. Linking payment to the amount of services provided runs contrary to the goals of prospective payment, as it generally rewards HHAs for providing additional services. Having more (and smaller) payment steps tied to the number of therapy visits, while reducing the strength of the incentive to cluster around any single number of visits, simply takes the system closer to a fee schedule for therapy services, reducing incentives to use therapy services efficiently. It also creates an unusual asymmetry in the treatment of different types of visits that is difficult to rationalize. The volume changes in 2008 indicate that financial incentives to increase therapy provision remain even under the modified thresholds (Medicare Payment Advisory Commission, 2011).

How payments, costs, and margins vary with the number of visits provided in the current system

By examining how payments vary with the number of therapy visits in the current HHPPS more closely, and comparing them to costs and margins, we gain a clearer picture of how the current payment system incentivizes use of therapy visits (*the analyses presented in the remainder of this section are based on data described in more detail in section 3 below*). Using data on all episodes in the analysis sample with 40 therapy visits or less, Figure 1 plots average payments and average cost for home health episodes, by number of therapy visits actually provided. Two payment values are shown. The 2008 HHPPS payment reflects the payment rules in place at the time of the episodes.[3] Also displayed are the 2008 payments under the 2012 HHPPS case-mix weights.[4] Average costs are based on number of visits of various kinds and the average costs per each type of visit provided by agency. Figure 1 shows how payments increase in a step-wise manner when patients receive more therapy visits. After 20 therapy visits, payments flatten out. As was CMS's intent, payments based on 2012 HHPPS case-mix weights are lower than 2008 payments for episodes with 20 or more therapy visits, and somewhat higher for episodes with relatively few therapy visits. We note that Figure 1 and other figures in this sub-section are not case-mix-adjusted, so that average payments and costs by number of therapy visits also reflect differences in patient characteristics besides the number of therapy visits.

[3] The 2008 HHPPS payments were computed by applying the 2008 HHPPS case-mix weights to the 2008 base rate.
[4] This was computed by applying the 2012 HHPPS case-mix weights to the 2008 base rate.

Dollar margins—the difference between the episode payments and costs shown in Figure 1—are highest for patients who receive 20 therapy visits per episode. This can be seen more clearly in Figure 2 which plots dollar margins directly on the y-axis. Dollar margins are shown using both 2008 and 2008 payments computed with the 2012 HHPPS case-mix weights measures. Relative to 2008, the payments based on the 2012 HHPPS case-mix weights update reduced a spike in payment in excess of cost that agencies had received for providing the 20th therapy visit. It remains the case under the 2012 HHPS case-mix weights based payments that agencies receive the highest profit, on a total dollar basis, for patients who receive exactly 20 therapy visits. As Figure 2 shows, with more than 20 visits, margins fall steadily with each additional visit.

Figure 3 shows how the percent margins, as measured by the ratio of total payments to total costs, vary by the number of therapy visits. Percent margins based on 2012 HHPPS case-mix weights fluctuate between 20 percent and 40 percent for patients with 20 or fewer therapy visits, begin to fall after 20 visits, and become unprofitable after 30 visits. Figure 4 shows the relative frequency (i.e., volume) of episodes by number of therapy visits provided, along with the payment-to-cost ratio (using 2008 payments) for comparison. The number of therapy visits for most episodes are in the profitable range. Figure 4 shows only a small amount of "clustering", where spikes in episode frequency occur at spikes in profitability. In prior work using 2007 data, when the payment system had involved a single large spike in payment associated with providing the tenth therapy visit, we had observed significantly more clustering than what is observed in Figure 4.

Figures 5 through 8 provide similar analyses as Figures 1 through 4, respectively, but plot the number of non-therapy visits on the x-axis. Figure 5 shows average episode payments and costs, by number of non-therapy visits. After 5 visits, average episode payments are about $3000 per episode, with little variability, whereas costs increase with the number of non-therapy visits in a roughly linear pattern. Holding patient characteristics and the number of therapy visits fixed, additional non-therapy visits within an episode do not result in additional payment. The limited payment variability seen in Figure 5 reflects small differences in case-mix weight for the average patient as the number of non-therapy visits increases. Across this range of visits, the typical

number of clinical and functional characteristics that drive the home health case-mix weight and number of therapy visits for patients vary modestly.

Figures 6 and 7 show dollar margins and percent margins respectively, by number of non-therapy visits. Margins are very high for episodes with few non-therapy visits. Percent margins are more than 50 percent for episodes with fewer than 7 non-therapy visits. Margins fall with increased non-therapy visits and become negative after 17 non-therapy visits. As shown in Figure 8, most patient volume (measured by the relative frequency line) is concentrated on patients in the profitable range of the number of non-therapy visits.

Additional perspective on the incentives created by the relationships among the number of visits and payments in the current HHPPS can be obtained by examining the marginal effect of an additional visit of each type on payments, costs, and margins. We estimate the marginal effects with linear regressions as shown in Table 1 (this analysis focuses on the payment measure based on the 2012 HHPPS case-mix weights). To limit the impact of episodes with extreme numbers of visits (visit outliers), we exclude episodes with more than 40 therapy visits and more than 40 non-therapy visits.

Using the payments based on the 2012 HHPPS case-mix weights as the dependent variable, the findings in Table 1 indicate that overall, an additional therapy visit is associated with an additional $150 in payment, whereas each additional non-therapy visit is associated with an additional $9 in payment. Jointly, the number of visits (expressed in simple linear form) explains 81 percent of payment variation in the HHPPS. Using costs as the dependent variable, the second column of results in Table 1 shows an additional therapy visit is associated with an additional $140 in episode cost overall, whereas an additional non-therapy visit is associated with an additional $89 in episode cost. Using the dollar margin (payment – cost) as the dependent variable in the third column, an additional therapy visit is associated with an additional $10 in margin, whereas an additional non-therapy visit is associated with an $80 reduction in margin.

The findings for margins in Table 1 in particular help clarify the incentives of the current HHPPS. Providing an additional therapy visit while holding the number of non-therapy visits fixed would net an additional $10 of margin. But *substituting* a non-therapy visit with a therapy visit would net $90 of additional margin. The current system therefore contains a strong incentive to substitute non-therapy visits for higher-cost therapy visits whenever it is feasible to do so. Trend data from 2000 to 2012 shows declining home health aide visits per episode accompanied rising therapy visits per episode—a pattern that is consistent with the incentive to substitute non-therapy visits with therapy visits.[5]

Given the features of the current HHPPS, we would expect agencies with a higher share of therapy episodes to be more profitable. We find evidence of this pattern in Table 2. Agencies are grouped into quintiles based on the share of their episodes that are therapy episodes (episodes with 6 or more therapy visits). Agencies in the bottom quintile of the share of therapy cases provide 1.7 therapy visits per episode on average, while agencies in the top quintile provide 10.7 therapy visits per episode. The results show significant differences in overall profitability for agencies depending on how much therapy they provide. The payment-to-cost ratios for the bottom quintile of agencies providing fewer therapy visits is 1.14, as compared to 1.22 for the top quintile providing more therapy visits. A key driver of the differences in profitability shown in Table 2 is that the agency groups providing more therapy visits tend to provide fewer non-therapy visits, which offsets their increased costs overall while having no effect on payment.

3. Data Sources

Analysis sample

The primary data source for this study is a 20 percent sample of home health agencies and their associated home health episodes from the Home Health Datalink file for 2008. Each record in the file is a home health episode. We use data from two episode-level sub-files: the home health claims file and the **O**utcome and **AS**sessment **I**nformation **S**et (OASIS) administered at the beginning of each payment episode. The claims file contains detailed information from the Standard Analytic Files and other sources about utilization, payment, and provider and

[5] This is based on an unpublished MedPAC analysis.

beneficiary characteristics for each episode. The OASIS file contains the OASIS assessment instrument data for each home health episode, including detailed diagnoses, measures of functional status, and status of wounds and ulcers. In addition, we use agency-level data on costs per visit from the Health Care Cost Report Information System (HCRIS).

The analytic file for this study is obtained by first merging data from claims and OASIS using the beneficiary Health Insurance Claim (HIC) number and the episode from-date. The claims file contains 1,221,257 episodes. Of these, 70,694 episodes do not have a match in the OASIS and are excluded from the analytic file. We then excluded episodes with one or more of the following problems or characteristics:

- episodes overlap (1,279)
- episodes of fewer than 60 days (44,769)
- the claim has a Low Utilization Payment Adjustment (106,066)
- episodes that have missing data not due to skip patterns (746)
- episodes without a report of total minutes of service provided (8,341)
- episodes that did not use the updated coding of diagnoses (145,907)
- episodes from Puerto Rico (1,278)
- statistical outliers with a log of total resource weighted minutes more than three standard deviations above or below the mean (5,570)
- episodes missing home health resource group assignment (2,013).

Our sample size prior to excluding payment outliers and agencies without data on costs per visit is 832,322 from 1,835 agencies.

Exclusion of payment outliers

MedPAC became concerned early in the project that including outlier claims in the analysis could raise issues. Public reports indicate that a significant share of outlier claims may be fraudulent, and that the utilization reported on many claims reflected fraud rather than the appropriate costs of providing needed services (Centers for Medicare & Medicaid Services, 2008; Weems, 2008). Payment outliers comprise 3.75 percent of the otherwise valid sample

(31,284) and the decision to include or exclude them has a substantial effect on the model predictive power and impacts. For example, whether an individual can self-inject medication is quite strongly related to service use in the full sample, but essentially unrelated when the payment outliers are excluded.

In evaluating whether to include payment outliers in our sample, we examined whether outlier use was related to particular HHAs, beyond what one would expect based on its caseload composition. Agencies with disproportionate use of outliers not explained by case-mix are relatively likely to have abused the outlier system. We first modeled receipt of outlier payments for an episode as a function of the independent variables in our model. For each agency, we predicted the expected distribution of the number of outlier payments given their mixture of cases and the probability of seeing at least as many outlier payments at a given agency as we do, just by chance. We found that a large number of agencies receiving outlier payment do so significantly more often than we would expect with typical practice and their case mix. Furthermore, when we remove agencies with more than the expected number of outlier payments from the analysis, we obtain results that closely mirror those excluding all outlier cases. For simplicity, we exclude all payment outlier episodes from the analysis. Our analytic sample, after excluding outliers and prior to excluding agencies without data on costs per visit, consists of 801,332 episodes from 1,832 agencies.

Exclusion of cases without data on agency costs per visit

In the current study, costs per episode are estimated by applying costs per visit for six resource types provided on the HCRIS to the reported number of visits of each type for each episode. The six resource types are physical therapy, occupational therapy, speech therapy, skilled nursing, home health aides, and medical social services. Previous studies for CMS, as well as our own work for MedPAC, have measured costs using resource-weighted minutes, obtained by applying a national wage rates to the number of minutes per episode of each resource type.

Measuring costs using agency costs per visit provides a more inclusive measure of costs than resource weighted minutes, by including non-labor resources and overhead and by measuring

agency costs rather than national costs. As a result, costs based on agency costs per visit provide a more realistic comparison of absolute payments and costs than when costs are based on minutes. Furthermore, if non-labor resources and overhead vary by agency or the agency's patient mix, the observed variation in resource-weighted minutes will not fully capture variation of total costs with patient or agency type. This could lead to problems in the estimation of both payment-cost ratios and payment models of costs. While measurement by costs per visit is also imperfect – for example, it does not attempt to capture within-agency variation in costs of a given resource type across episodes and it inevitably isn't fully accurate – it provides an agency-specific estimate of costs and thus allows the models to capture relative costs across groups of agency or patient types.

The analytic sample was merged to HCRIS cost report records for all agencies. Episodes were kept if the agency could be matched to the HCRIS files and had complete data on costs per visit and cost-charge ratios from the cost reports. To preserve data from agencies where costs per visit in the cost report were unusually large or small, we capped each measure of costs per visit at three standard deviations from the mean of the distribution of logged costs per visit and kept the accompanying data in the analysis. The final sample consists of 771,278 episodes from 1,628 agencies.

4. Estimates of the Accuracy of the Current Case-Mix System

In this section, we examine the ability of the current design to explain the variation in total costs, as well as the proportionality of current agency payments to agency costs. Recall that under the current payment system, each 60-day episode is assigned to one of 153 HHRG categories, according to a formula based on the timing of the episode, the number of therapy visits, and indicators of patient condition. The case-mix weight measures the relative cost of the patient's condition based on their characteristics and indicates the payment for the episode relative to a set base.

To assess the accuracy of the current payment system, we conduct three parallel analyses of the 2012 HHPPS case-mix system using the sample of 2008 episodes described above. First, we

examine the accuracy of the 2012 HHPPS case-mix weights assigned by CMS for each of the 153 HHRG case-mix groups. This allows us to assess how well the current set of payment weights and groups perform. Second, we compare the accuracy of the 2012 HHPPS case-mix weights to a case-mix weight based on the average total cost per episode for each of the 153 case-mix groups (i.e., the HHRG categories) based on the 2012 definitions and applied to our 2008 data. This allows us to estimate how the 2012 HHPPS case-mix system would perform with case-mix weights based on the year of data available for this analysis. (The 2012 HHPPS case-mix weights were constructed with 2007 data.) Finally, we combine the 153 case-mix groups into 18 case-mix groupings based on functional status, clinical condition, and early or late episode (but not therapy visits). We then created a "service-free" case-mix weight based on the average total cost for each of the 18 groups, averaging over the groups defined by the number of therapy visits. A comparison of the case-mix weights based on 153-category and 18-category case-mix groups allows us to investigate the role of therapy provision in the predictive power of the 2012 HHPPS case-mix groups.

Accuracy of 2012 case-mix weights and Home Health Resource Groups (HHRG's)

Estimates of the accuracy of the 2012 HHPPS case-mix weights for reflecting costs are reported in Table 3. Costs refer to cost-per-visit-weighted visits of services provided in an episode.[6] In the first column of Panel A, we report the R-squared statistics for predicting costs using the 2012 HHPPS case-mix weights and the case-mix groups. The R-squared statistic is the share of variation in costs explained by the case-mix weights and measures the ability of a PPS, based on the model, to predict total costs.

The 2012 HHPPS case-mix weights explain 41 percent of the variation in total costs as indicated by the R^2 of 0.410.[7] Using an updated set of case-mix weights based on the average total costs for each of the 153 case-mix groups leads to a similar share of overall variance explained

[6]Therapy costs are calculated from the number of visits and costs per visit for physical, occupational and speech language therapy. Non-therapy costs are calculated from number of visits and costs per visit for skilled nursing, home health aides and medical social services. Total costs are the sum of these two components. Extremely similar results were found using charges for each service type and episode multiplied by agency-level cost-to-charge ratios for each service type.

[7] As might be expected, given the role of therapy in the definition of the HHRGs, the weights vary closely with therapy costs (R^2=0.727), but are virtually unrelated to non-therapy costs (R^2=0.0015).

(R^2=0.428). This suggests that the 2012 HHPPS case-mix weights are well-calibrated to the observed differences in current costs across these payment groups.

The high overall predictive ability of the 2012 case-mix weights and the weights for the 153 case-mix groups is due primarily to the dependence of the case-mix groups on the number of therapy visits provided. That is, episodes are sorted into groups based on the number of therapy visits and then, not surprisingly, the groups "predict" the amount of therapy received. To see this, we modified the 153 case-mix groups to allow us to measure the loss in accuracy when therapy visits are excluded from the current case-mix groups. Each of the 153 case-mix groups was assigned to one of nine groups according to its functionality and clinical condition assignment; these nine groups were then divided into two sub-categories by whether the episode whether the episode is early (first or second) or late (third and subsequent) in a sequence of consecutive home health episodes. The resulting 18 categories reflect the dimensions of the 153 case-mix groups other than therapy service: functional status, clinical condition and whether it is an early or late episode. Using the case-mix weights based on the average total costs for the 18 collapsed groups based on functional status, clinical condition, and early or late episode, the percent of total costs explained falls from 41.0 to 5.9 percent. The reduction in explanatory power indicates that the inclusion of therapy visits in the HHRGs is the primary factor in their ability to predict total costs.

These findings have implications for developing an alternate case-mix system. The current case-mix system has a high explanatory power only because it includes therapy visits, part of the outcome being predicted, as a payment factor. It should be expected that any alternative system that does not have therapy visits used as a determinant of case-mix groups will explain a smaller share of costs. However, the lower explanatory power should not make an alternative system undesirable, since it results from eliminating the inappropriate incentives of the current system that can distort the delivery of care.

To examine the effectiveness of the 2012 HHPPS case-mix weights in assigning high payments to high-cost cases, we report the percent of high-cost cases accurately predicted in the second column of Panel A of Table 3. This indicates the extent to which payments track costs for the

most costly cases. If this proportion is low, agencies may seek to avoid the most expensive cases. The measure is defined as the proportion of episodes with costs in the top ten percent of costs that have payments in the top 10 percent. As expected, the percent of high-cost cases accurately predicted is quite high: 49.6 percent of episodes with costs in the top 10 percent have case-mix weights in the top 10 percent of the distribution.

Proportionality between an agency's payments and its expected costs

A case-mix index (CMI) coefficient measures whether the relative expected costliness of a facility's cases is proportional to its payments. Under the current PPS, the case-mix index is calculated as the average of the 2012 HHPPS case-mix weights for a facility, divided by the average case-mix weight for all episodes. Regression analysis was used to estimate the CMI coefficient, which measures the relationship between the log of actual average costs and the log of the CMI used for payments (the predicted costs). A CMI coefficient of 1.0 indicates that a facility would be paid in proportion to its costs. There would be no gain from taking a more or less difficult case load because increased payments are offset by proportionate increases in costs. A coefficient greater than 1.0 indicates that a facility with a relatively costly case mix would tend to be underpaid, whereas a facility with a relatively inexpensive case mix would tend to be overpaid (Cotterill 1986, Pettengill and Vertrees 1982). A CMI coefficient below 1.0 indicates that a facility with a relatively costly case mix would tend to be overpaid, while a facility with a less costly case mix would tend to be underpaid.

For the current system, the estimated proportionality of payments and costs differs depending on whether agency characteristics are used as control variables in the regression model, which also affects its interpretation. In models without controls for agency type, the CMI coefficient measures whether payments flow *across* agencies in proportion to their expected costs. In models with controls for agency type, the CMI coefficient measures the proportionality of payments to costs *within* agency type and is more indicative of whether agencies would have an incentive to risk-select patients on the basis of the characteristics included in the payment system (Liu et al. 2007). In a simple model with no controls, a 10 percent increase in payments is associated with an 8.8 percent increase in costs (see the first row of Panel B of Table 3). The coefficient of 0.88 suggests that agencies with lower case-mix weights are underpaid relative to

costs, and those with higher case-mix weights are overpaid relative to costs. Since therapy episodes generally have higher case-mix weights than non-therapy episodes, this finding is consistent with work by MedPAC that suggests more profitable agencies provide more therapy episodes.

However, when we control for characteristics of the agency—factors such as ownership, whether free standing, and region that agencies take as fixed—the coefficient on CMI is nearly exactly one. This suggests that payments based on the 2012 HHPPS case-mix weights are nearly proportional to costs. Agencies do not appear to face an incentive to seek a more (or less) costly casemix overall since payments would increase (or decrease) in proportion to costs.

5. Development of an Alternative Payment System

To investigate the likely effects of having a purely prospective payment system, we developed a case-mix model to predict costs that does not depend on the amount of therapy services received. The model prediction is the basis of a set of alternative model-based case-mix weights that are used to simulate payments.

Predictors of cost for alternative model-based case-mix weights

Our payment model uses the clinical and function measures detailed in the 2011 report by Abt Associates that was the basis for the revision of the HHPPS.[8] By basing the alternative payment model on predictors used by CMS, MedPAC and Urban Institute staff sought to create a model that: 1) relies on a relatively small number of clinically appropriate measures that are unlikely to be gamed and are acceptable to CMS, 2) provides reasonable predictive power, and 3) excludes the number of therapy visits received as a payment factor.[9]

The CMS payment model consists of parallel equations for four subgroups of the population. The four subgroups are combinations of whether the episode is an early episode (first or second)

[8] M. Plotzke, A. White, and H. Goldberg (2011).

[9] In earlier versions of this work, we developed a model based on Clinical Classifications Software single-level diagnoses based on the principal and diagnoses from the OASIS; indicators of ability to perform six activities of daily living; beneficiary age; indicators of IV infusion and drugs injected; whether the episode is the start of a series of sequential episodes, and whether the beneficiary had a rehabilitation or nursing facility stay in the 14 days prior to the start of the 60-day episode.

or a late episode (third or later) and whether the episode has few therapy visits (13 or fewer) or many therapy visits (14 or more). The independent variables for each equation are indicators of broad diagnosis categories, measures of functional status, and interactions of these variables. Not all independent variables are included in all four equations of Abt's final model.

For the alternative model, we follow Abt's strategy, but exclude counts of therapy visits from the design. The alternative model consists of two parallel regression equations separated by whether the episode is an early (first or second) or late (third or later) episode. The dependent variable in each model is the total costs of the episode, deflated for variation in wages across geographic areas. For this project costs are defined as the cost-per-visit-weighted visits of home health services, with cost-per-visit data derived from the home health cost report. The predictors for each equation include all of the diagnoses and measures of functional status and interactions from the CMS specification that are statistically significant and are associated with higher costs. We follow CMS practice in excluding diagnoses indicators that lower, not raise, payments. This exclusion is intended to avoid predictors that might lead HHAs to avoid beneficiaries with a given condition. This exclusion comes at the modest price of reducing the episode-level R-squared from 8.0 to 7.8 percent. The complete list of retained predictors is found in Table 4. [10]

The alternative model-based case-mix weights are based on the predictions from the two regression models. The models are estimated using ordinary least squares (OLS).[11] Coefficients and the associated t-statistics are presented in Table 5. The standard errors on the model coefficients are calculated using robust-clustered standard errors to account for the similarity of costs for patients within the same agency. The case-mix weight is given by predicted total cost, deflated to have a mean equal to that of the 2012 HHPPS case-mix weight. This adjustment ensures that the alternative payment weights are budget-neutral.

[10] We obtained data for the independent variables used in the current model from a data file produced by Abt Associates. Measures that entered all legs of their payment model were obtained directly from the Abt file and used directly in our model. Measures that were not used in all of their equations were calculated based on OASIS measures (e.g., surgical wound status) or ICD-9 diagnosis codes. A comparison of our calculated measures with the Abt data for episodes where both sources were available confirmed that the calculation approaches are quite similar.
[11] An OLS model with robust-clustered standard errors is used here for simplicity and because it has a slightly higher R-squared than generalized linear model with a log link (Poisson regression). No episode has a negative model prediction from the OLS model.

To calculate the payment for an episode, the case-mix weight for an episode (i.e., the deflated prediction) is first adjusted to include area wage differences. That is, the labor share of the case-mix weight is multiplied by the 2008 wage index and then added to the non-labor share of the case-mix weight. This adjusted case-mix weight is then deflated so that its mean equals the average wage-adjusted 2012 HHPPS case-mix weight. The payment for the episode is then calculated as the product of the wage-adjusted case-mix weight times the base rate for 2008. This procedure – applied to the budget-neutral case-mix weights – ensures that the resulting PPS is cost neutral, with equal total payments under the refined and current payment systems.

6. Accuracy of the Alternative (Non-service-based) Case-Mix Weights

Predictive power

The alternative (non-service-based) case-mix weights are found to have substantially less predictive power than the 2012 HHPPS case-mix weights. As reported in the first column of Panel A of Table 3, case-mix weights based on the prediction of a non-service-based model of total costs explain 7.8 percent of the variation in total costs. As expected, this is substantially lower than the 41.0 percent explained by the 2012 HHPPS case-mix weights, but is an improvement relative to the 5.9 percent explained by the 18 collapsed HHRG categories based on functional status, clinical condition and early or late episode.

A comparison of the percent of high-cost cases accurately predicted by the alternative model-based case-mix weights (column 2 of Panel A of Table 3) and the 2012 HHPPS case-mix weights (Panel A of Table 3) shows that the alternative case-mix weights have, as expected, a lower probability of predicting high-cost episodes than the 2012 HHPPS case-mix weights. The case-mix weights based on the predictions from the non-service-based model of total costs correctly assign 23 percent of high-cost episodes to be high payment as compared with 50 percent for the 2012 HHPPS case-mix weights. The greater ability of the HHPPS case-mix weights to predict high-cost cases results from the inclusion of therapy visits in the definition of the 153 HHRG categories. The 18-collapsed groups that exclude therapy visits accurately predict high-cost cases at roughly the same rate as the alternative case-mix weights.

Proportionality of case-mix weights

We next analyzed the proportionality of changes in case-mix weights and costs in our alternate systems. As before, we estimate the proportionality of payments and costs both without and with controls for agency characteristics. In the alternate system with no controls for agency characteristics, a 10 percent increase in the payments provided is associated with a 9.97 percent increase in costs (see Panel B of Table 3). With controls for agency characteristics, the 10 percent increase in payments is associated with an 11.5 percent increase in costs. The two measures of proportionality (0.997 and 1.15) are not statistically different from each other. Neither is statistically different from its counterpart based on the 2012 HHPPS case-mix weights. Payments under the alternative system would vary proportionately with costs at the agency level overall, as in the current system, but an episode's assignment to a high or low payment group would no longer be dependent on therapy and would thus be less gameable.

7. Findings: Impacts on Aggregate Payments

Any change to a system of payments has the potential to shift considerable resources across subgroups of beneficiaries and agencies. To examine the effects of our model-based case-mix weights, we first calculated payment-cost ratios for the payments based on the 2012 HHPPS and the alternative model-based case-mix weights to provide context for understanding whether the new system is shifting payments for groups that are relatively underpaid or overpaid. We then calculated relative payment ratios from the simulated payments, defined as the ratio of total payments to a group of beneficiaries or agencies under the newly-developed payment system to total payments based on the 2012 HHPPS case-mix weights. The payment-cost ratios for the payments based on the 2012 HHPPS case-mix weights and the alternative model-based case-mix weights are reported in the first and second columns of Table 6. Additional details are provided in Appendix Tables A-1, A-2, B-1, and B-2. Relative payment ratios are reported in the third column of Table 6, with additional details provided in Appendix Tables C-1 and C-2.

Overall, the payment-to-cost ratios for payments based on the 2012 HHPPS case-mix indicate that payments are 27 percent greater than costs. According to MedPAC staff, profitability for this sample is above that estimated from cost reports in which costly outlier episodes and low-

utilization episodes reimbursed at less than cost are included. Beyond this, the high profitability probably reflects a combination of the overall profitability of home agencies and the degree to which some elements of costs are not included in the estimated costs per visit that underlie the cost measure.[12]

Table 6 shows that for episodes without therapy, payments are 32 percent above cost, while for episodes with more than five therapy visits, payments are nearly 25 percent above costs. That is, non-therapy episodes are reimbursed at more than the average amount, while therapy visits are reimbursed at slightly less than the average amount. Though somewhat unintuitive given the incentives of the current HHPPS, these baseline findings are in fact consistent with the relationships between payment-to-cost ratios and the number of visits shown in the figures discussed above. Episodes with 1 to 5 therapy visits are profitable, and even though episodes with 20 visits are the most profitable in terms of dollar margins (as seen in Figure 2), episodes with more than 5 therapy visits include unprofitable cases with many therapy visits. We also note that episodes with more than 5 therapy visits are more profitable than those with fewer therapy visits on a dollar basis even as they are less profitable on a percentage basis.[13].

Under the alternative payment system, payments to non-therapy episodes and episodes with 1 to 5 therapy visits would increase, while payments for episodes with more than 5 therapy visits would decrease. By de-linking payments for an episode from the number of therapy visits provided, payments for episodes with higher amounts of therapy use would fall. But the alternative system would also create an incentive to reduce the number of therapy visits relative to the HHPPS, and if providers were to respond as expected, the payment-to-cost ratio for episodes with more than 5 therapy visits would rise relative to what is simulated in Table 6, which does not include such a behavioral response. If, in addition, providers responded by increasing the use of non-therapy visits as they become more profitable and the incentive to substitute therapy visits for non-therapy visits is eliminated in the alternative system, payment-

[12] The analysis does not include the costs of non-routine supplies (nor their separate payments). The analysis also does not include some services (such as durable medical equipment and osteoporosis drugs) that are paid outside of the 60-day episode payment. Together, these make up a small share of total costs.

[13] Under the current system, average dollar margins for episodes with more than 5 therapy visits is $779 vs. $536 for those with 1 to 5 therapy visits and $498 for episodes with no therapy visits (not shown in Table 6).

to-cost ratios would likely fall below the high levels shown in Table 6 in the alternative system (1.71 and 1.77 respectively).

As the above discussion indicates, evaluation of payment-to-cost ratios in the current system by groups defined based on actual number of visits must be done in the context of understanding the incentives of the system that created the observed patterns of use, which may differ substantially from patient need. At the same time, a static analysis of changes in payments from the current system to the alternative system is limited because it does not incorporate expected changes in provider behavior that are the motivation for making payment changes in the first place.

We believe a more meaningful comparison and evaluation of payments under the current and alternative systems can be made by focusing on groups of episodes defined on the basis of patient need for services, rather than the amount of services provided, as the latter is skewed by payment incentives separate from patient need. To this end, we created three groups of patients defined on the basis of patient characteristics (also shown in Table 6): patients with a low (predicted) probability of 6 or more therapy visits, moderate probability of 6 or more therapy visits, and high probability of 6 or more therapy visits. We estimate the predicted probability of an episode having more than 6 therapy visits as a function of patient characteristics, and interpret the predicted probabilities as an index of patient need for therapy. This approach assumes that, on the whole and despite the incentives affecting use patterns in the 2008 data, agencies are more likely to provide 6 or more therapy visits to patients who need them, based on their characteristics.

For the three patient groups based on therapy need in Table 6, we find that payment-to-cost ratios in the current system range from about 1.19 for patients with low therapy need to 1.36 for patients with high therapy need. Thus margins are significantly higher for patients with higher patient need for therapy. The payment ratios show that, relative to the current system, the alternative system would increase payments by about 14 percent for patients with low predicted therapy need and reduce payments for patients with high predicted therapy need by about 10 percent. The overall result is that payment-to-cost ratios would be more evenly distributed across patients who need different amounts of therapy. Under the alternative system, payment-

to-cost ratios would range from 1.36 for patients with low therapy need to 1.23 for patients with high therapy need.[14]

Examination of other subsets of patients show expected patterns. Under the current payment system, high-cost episodes among non-therapy episodes costs are substantially below costs (only 56 percent). Beneficiaries eligible for both Medicare and Medicaid are paid 28 percent above costs – roughly the population average. Under the alternative model, for non-therapy beneficiaries in the top decile of costs among non-therapy beneficiaries, the payment-to-cost ratios are slightly higher (0.76), with payments increasing by 36 percent. In addition, payments to dual beneficiaries with both Medicare and Medicaid would increase slightly, by 4 percent.

Payments also vary with agency type, perhaps owing to the disproportionate provision of therapy by free standing and for profit-agencies. Under current payments, hospital-based agencies are paid 7 percent above costs—considerably below the population average—while free-standing agencies are paid 31 percent above costs. Non-profit agencies are paid 21 percent above costs, while for-profit agencies are paid 32 percent above costs. Under the alternative payment system, payments to hospital-based agencies would increase by 5 percent, offset by a reduction in payments for free-standing agencies of 1 percent. Payments to non-profit agencies would increase by 4 percent while payments to for-profit agencies would decrease by 2 percent. As a result, payment-to-cost ratios would be more uniform across types of agencies under the alternative system.

Variation in dollar margins by number of therapy and non-therapy visits per episode.

Finally, we compare how dollar margins vary in the current and alternative systems, by combinations of the number of therapy and non-therapy visits provided. This analysis differs from the one immediately above, since it focuses on dollar margins rather than payment-to-cost ratios and the groups examined are those determined by the cross of number of therapy and non-

[14] Whereas dollar margins range from $397 for episodes with low therapy need to $919 for those with high therapy need, in the alternative system, dollar margins range from $744 for episodes with low therapy need to $579 for those with high therapy need. Thus dollar margins are more uniform under the alternative system by categories of patient need and reduce a strong incentive to select therapy patients in the current system.

therapy visits. This analysis provides additional perspective on the incentives agencies would face under the two payment systems to provide different levels of use.

Figure 9 presents a "heat map" showing average levels of dollar margin under the current system for different visit type combinations. It clearly illustrates the asymmetry of incentives to provide additional therapy vs. non-therapy visits that is a key feature of the current system. The most profitable episodes are those with around 20 therapy visits, and a low number of non-therapy visits. The system provides an incentive for an agency to prefer therapy patients over non-therapy patients, and for most therapy patients, to use more therapy visits and fewer non-therapy visits. We note that the vast majority of episodes are distributed in the lower left section of the figure so that 79 percent of episodes have a combination of therapy and nontherapy visits that are profitable on average.

Figure 10 presents an analogous heat map for the alternative system. Under the alternative system, the most profitable patients are those with low levels of visits. Increases in both types of visits reduce margins all else equal, so agencies would have an incentive to use both therapy and non-therapy visits efficiently. Agencies would be able to choose the best type of therapy for a given patient without facing a large incentive to prefer one type of visit over another. Under the alternative system, 76 percent of episodes have a combination of therapy and nontherapy visits that is profitable on average under 2008 use patterns (similar to the 79 percent under the current system). The share of profitable episodes would likely increase as providers adjusted to the new system.

8. Summary and Discussion

The current payment system for home health services under Medicare contains an incentive to increase the number of therapy visits beyond what would be considered necessary for some patients on the basis of clinical considerations alone. To address this, the Commission recommended that the home health PPS be revised so that therapy visits are no longer a factor in setting payments.

In this report, we present the results of developing and testing a model in which payments for services rely on patient characteristics. Using information collected from 2008 OASIS and claims data, we built a model of resource use that provides insight into the effects of removing therapy visits as a predictor. Overall, the model explains 8 percent of the variation in total costs of services provided. As expected, this predictive power is far less than that obtained by the 153 current case-mix categories. However, it is modestly better than that obtained using the current case-mix categories without the therapy service dimension. An agency-level analysis of case mix shows that the implied case-mix weights of the refined system are proportional to costs to roughly the same degree as the 2012 HHPPS case-mix weights.

Analysis of payments, costs, and margins shows that the current system creates a large incentive for agencies to substitute non-therapy visits for therapy visits to the extent this is possible. This feature stems from the asymmetric treatment of different types of visits in the current system. The alternative payment system presented here adjusts payments for patient characteristics as they are associated with episode costs, but it is a truly prospective system in that it does not provide additional payment for additional amounts of service provided. As such, it creates an incentive for providers to use all types of visits efficiently, without favoring one type of visit over another.

The alternative system would shift payments towards episodes that use no therapy or low levels of therapy, and away from episodes that use 6 or more therapy visits. While eliminating the incentive to substitute therapy services for non-therapy services, it would exacerbate existing differences in overall payment-to-cost ratios by patient groups defined on the basis of number and types of visits provided. We do not find this to be a compelling argument against the adoption of the alternative model, however, as the point is to eliminate the incentive for substitution of more costly for less cost types of visits. We expect the industry would respond rapidly to the changed incentives as they have in the past, and would likely reduce the use of therapy visits and increase the use of less-expensive non-therapy visits. By so doing, the payment-to-cost ratio for patients with more than 6 therapy visits would rise, and the ratio for patients with more than 6 therapy visits would fall, and by so doing, would come closer into balance.

We would put less weight on the impact findings by patients defined by types of visits used in the current system, and more weight on the impact findings for patient groups defined on the basis of need. Our findings suggest that the alternative payment system would balance payment-to-cost ratios across groups of patients defined by need for therapy services better than the current system. The findings of the impact analysis also suggest that relative to the current system, the alternative system would reduce variation in payment-to-cost ratios by type of agency and shift payments somewhat towards hospital-based agencies and non-profit agencies.

In considering adopting fully prospective payments for home health under Medicare along the lines of the one presented here, an important question is whether agencies would respond to the incentives to use visits efficiently by stinting on care (using fewer therapy or non-therapy visits in to a degree that would harm patient care). We note that the alternative design would treat therapy visits the way that non-therapy visits are already treated today, and we are not aware of evidence that non-therapy services are systematically under-provided.

Concerns about stinting are always present in prospective payment systems, but it warrants particular attention in home health because, for reasons that are not well understood, the correlation between patient characteristics and episode costs is low. Skewed incentives in the current PPS, lack of guidelines for cost-effective use of therapy services, and treatment patterns idiosyncratic to individual home health agencies could contribute to weak observed relationships in the data between clear indicators of patient need and the amount of services provided. The current system, which singles out therapy visits for fee-schedule-like reimbursement, does not appear to be the best solution if stinting on patient care is the problem. Instead a system that overall promotes efficient use of services, but which has additional monitoring for quality care delivery, or a more robust method for making low-utilization payment adjustments could be more productive routes for promoting quality patient care while incentivizing efficient use of health care resources.

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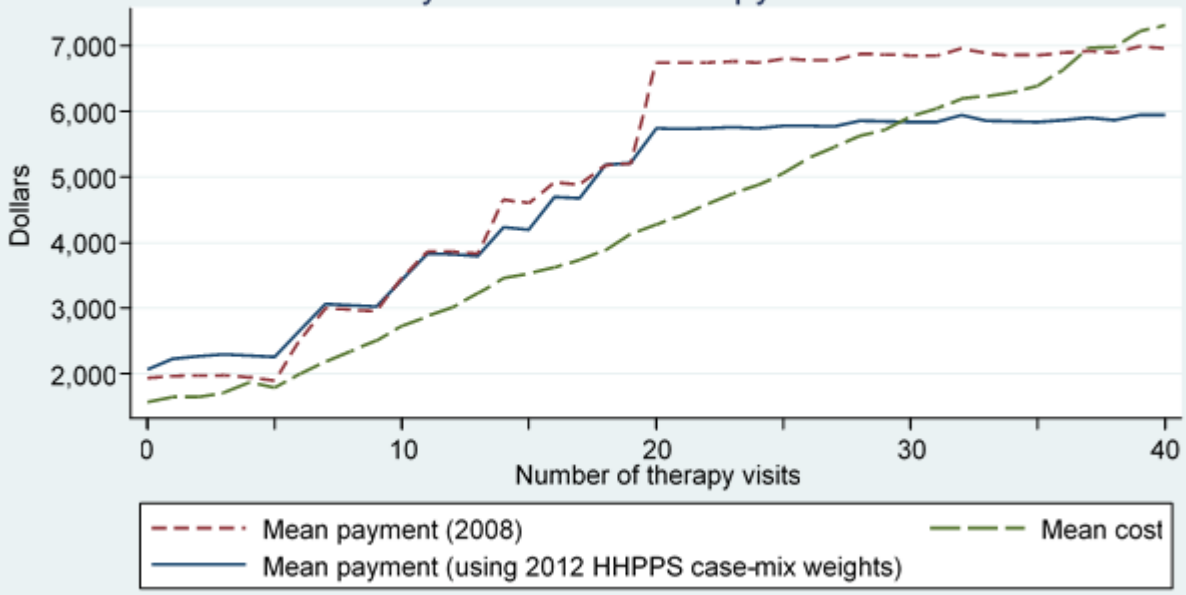
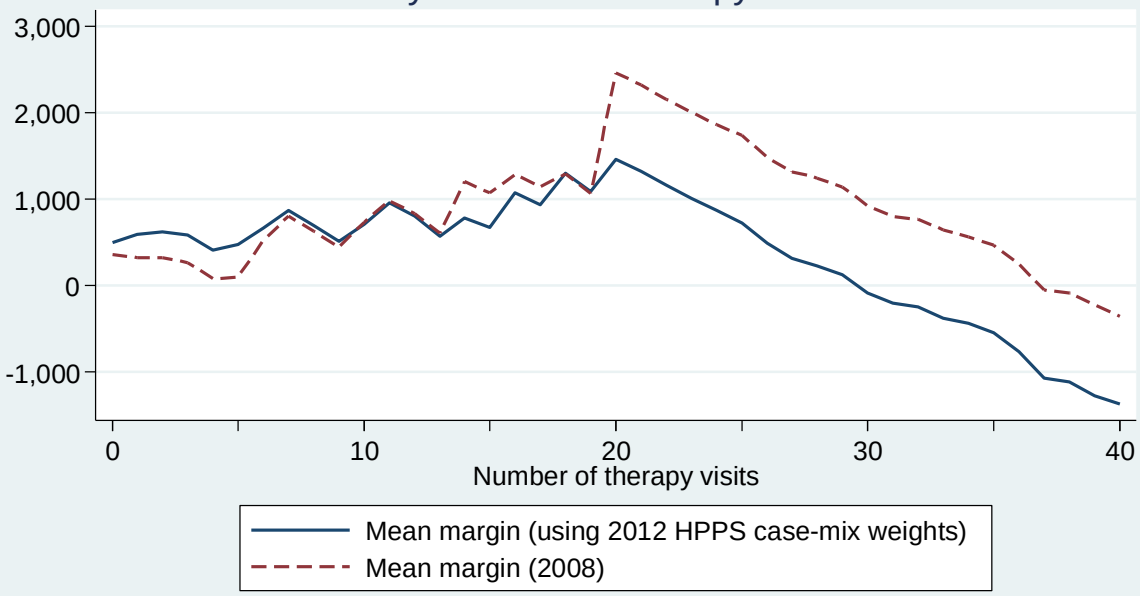
Figure 1. Home Health Episode Payments and Costs by Number of Therapy Visits



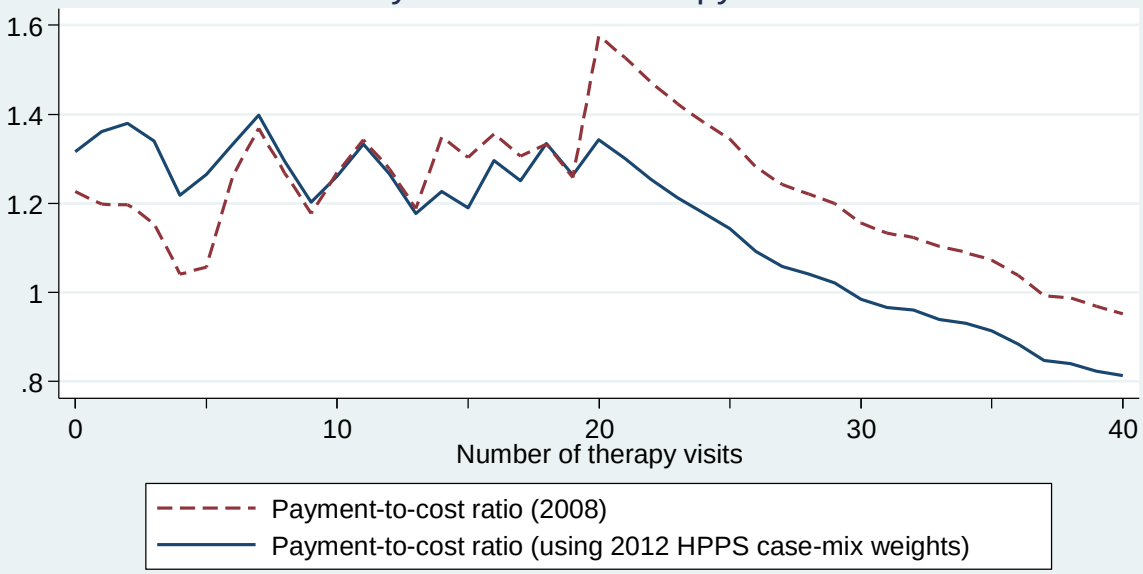
Note: Sample excludes episodes with fewer than 5 total visits and more than 40 nontherapy visits.

Figure 2. Home Health Episode Margins by Number of Therapy Visits



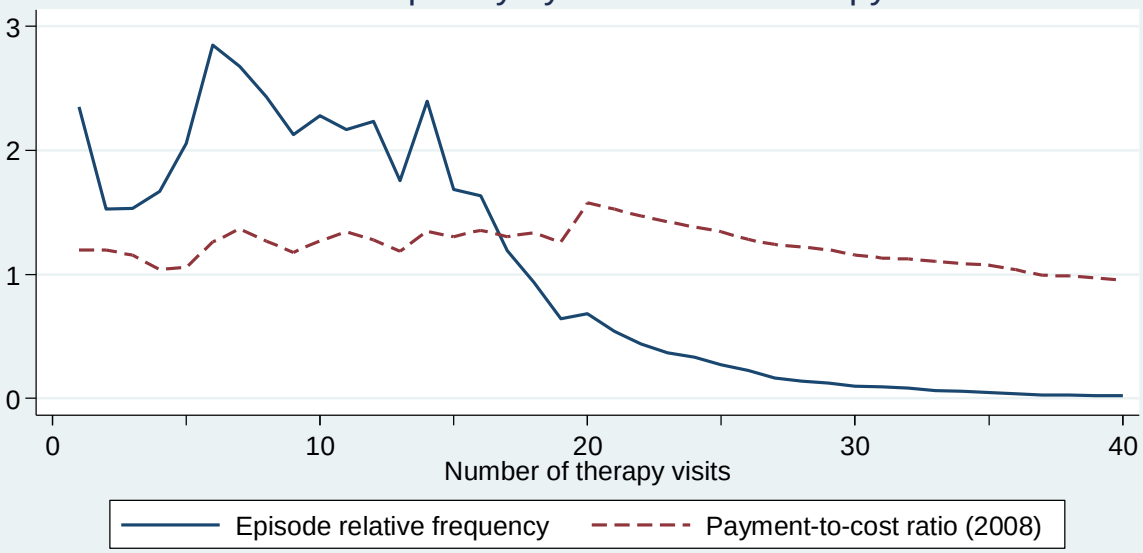
Note: Sample excludes episodes with fewer than 5 total visits and more than 40 therapy visits.

Figure 3. Home Health Episode Payment-to-Cost Ratios by Number of Therapy Visits



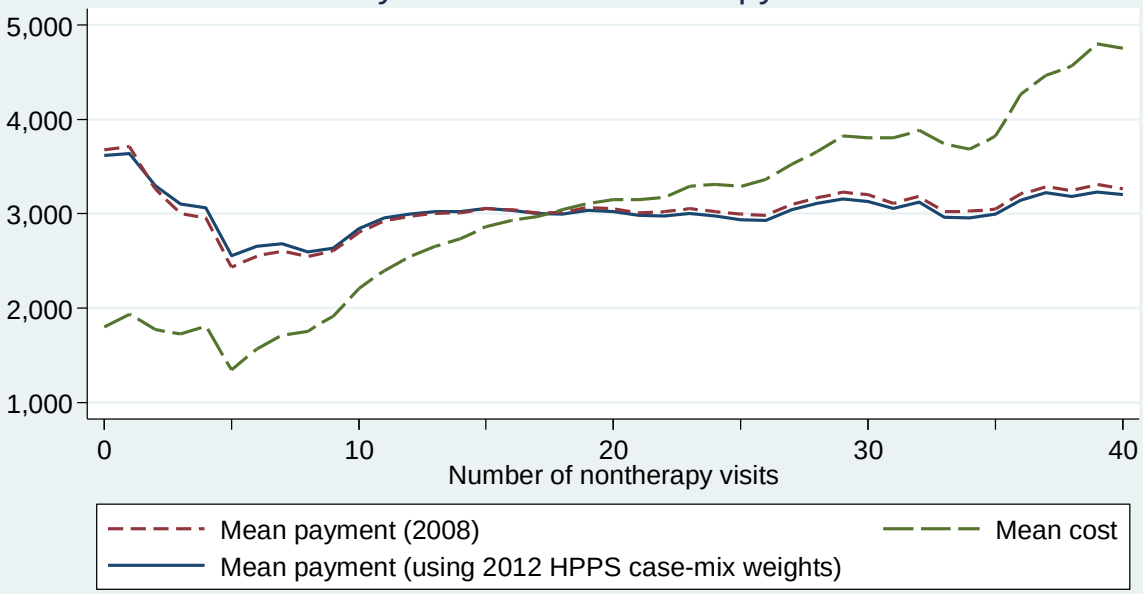
Notes: Sample excludes episodes with fewer than 5 total visits and more than 40 therapy visits.
Payment-to-cost ratios computed as mean payment divided by mean cost by number of visits.

Figure 4. Home Health Episode Payment-to-Cost Ratios and Relative Frequency by Number of Therapy Visits



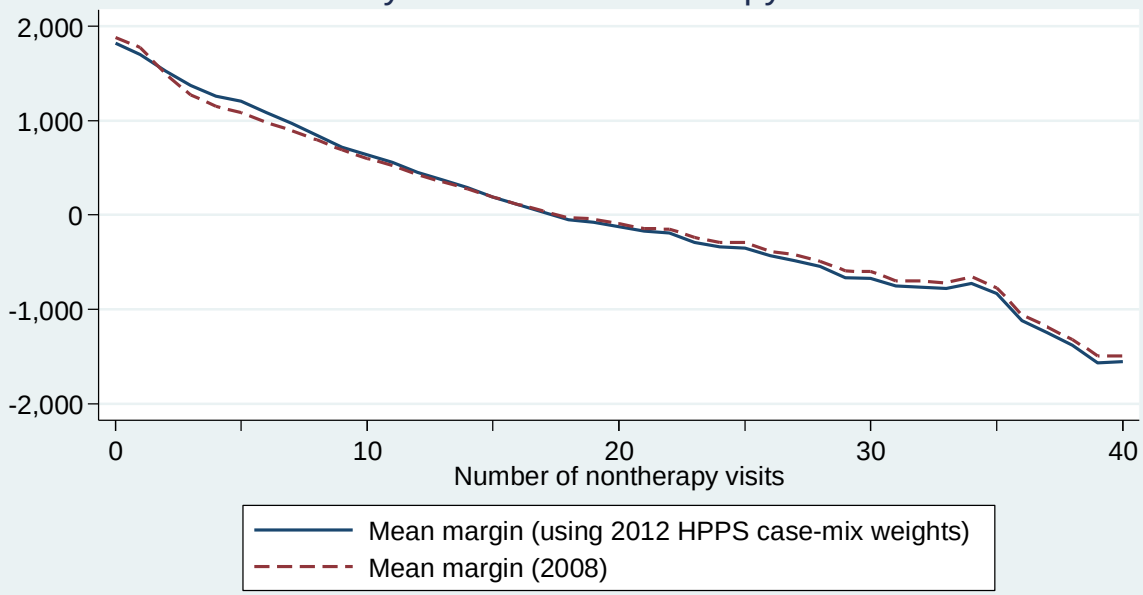
Notes: Sample excludes episodes with fewer than 5 total visits, no therapy, and more than 40 therapy visits.
Payment-to-cost ratios computed as mean payment divided by mean cost by number of visits.
Number of episodes normalized to have mean of 1.

Figure 5. Home Health Episode Payments and Costs by Number of Nontherapy Visits



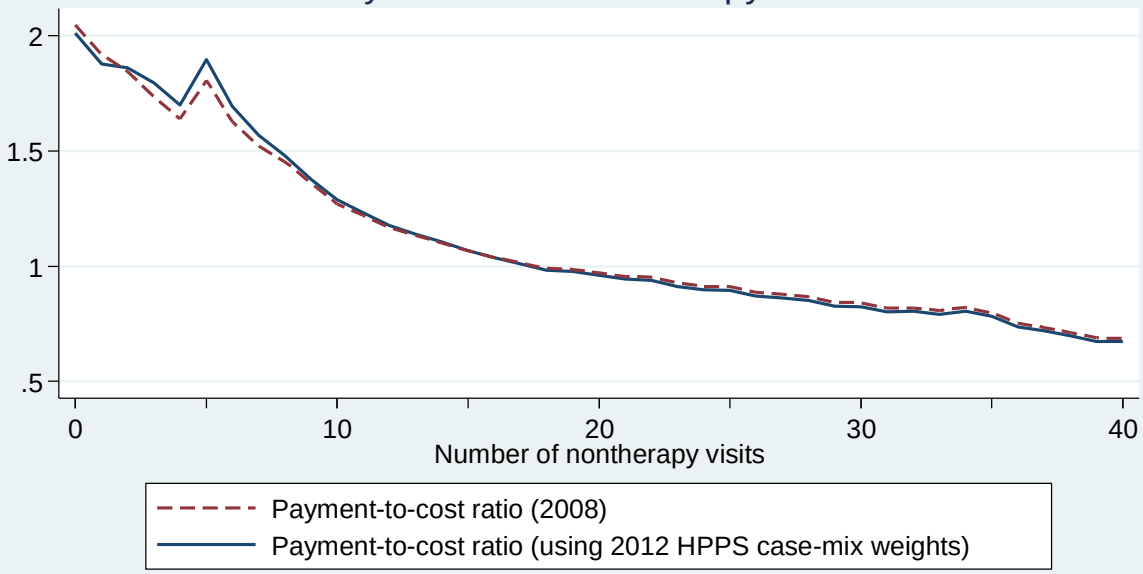
Note: Sample excludes episodes with fewer than 5 total visits and more than 40 nontherapy visits.

Figure 6. Home Health Episode Margins by Number of Nontherapy Visits



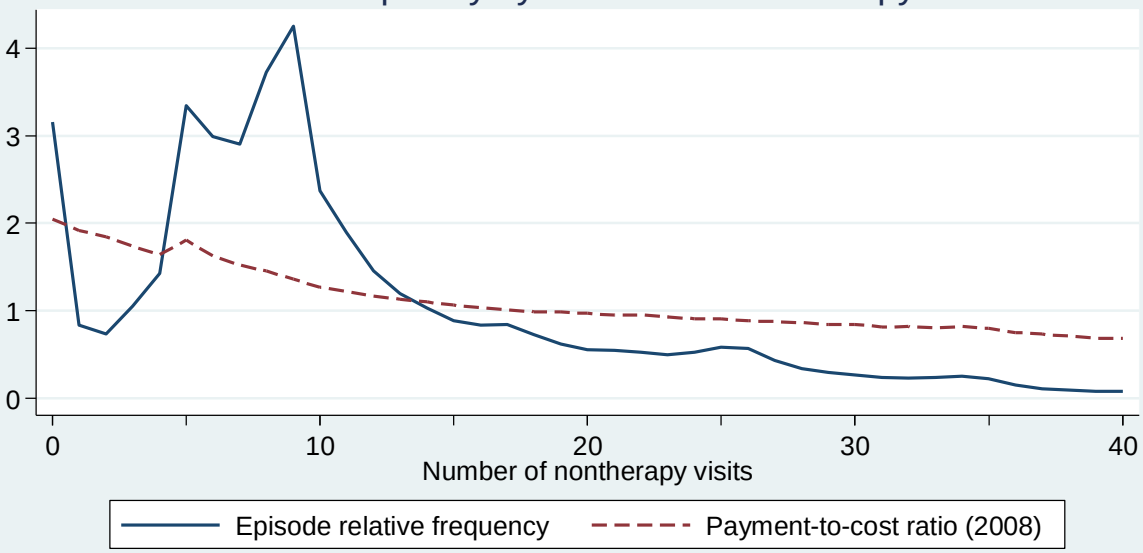
Note: Sample excludes episodes with fewer than 5 total visits and more than 40 nontherapy visits.

Figure 7. Home Health Episode Payment-to-Cost Ratios by Number of Nontherapy Visits



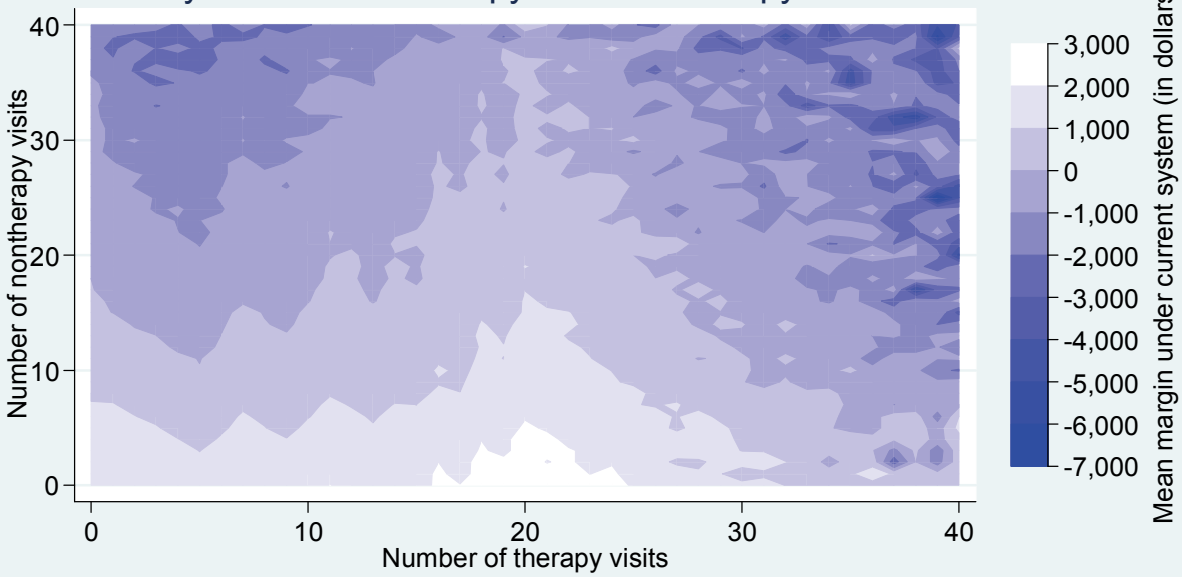
Notes: Sample excludes episodes with fewer than 5 total visits and more than 40 nontherapy visits.
Payment-to-cost ratios are computed as mean payment divided by mean cost by number of visits.

Figure 8: Home Health Episode Payment-to-Cost Ratios and Relative Frequency by Number of Nontherapy Visits



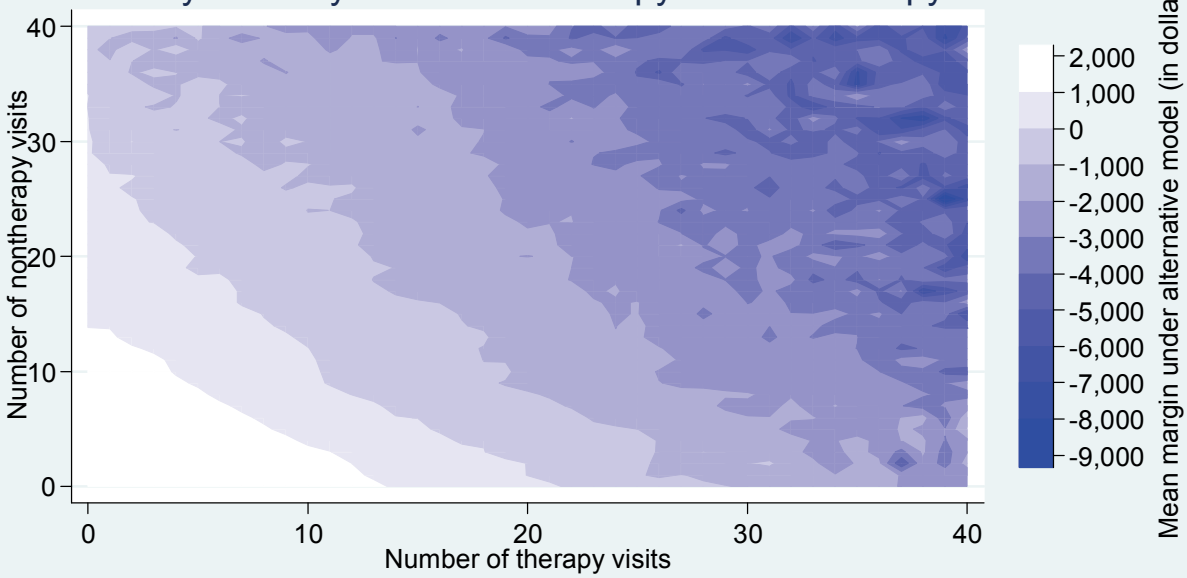
Notes: Sample excludes episodes with fewer than 5 total visits, and more than 40 nontherapy visits.
Payment-to-cost ratios computed as mean payment divided by mean cost by number of visits.
Number of episodes normalized to have mean of 1.

Figure 9. Home Health Episode Margins Under Current System by Number of Therapy and Nontherapy Visits



Notes: Sample excludes episodes with fewer than 5 total visits.
Payments used for margins are based on 2012 HHPPS case-mix weights.

Figure 10. Home Health Episode Margins Under Alternative Model-Based Payments by Number of Therapy and Nontherapy Visits



Notes: Sample excludes episodes with fewer than 5 total visits.
Payments used for margins are based on alternative model.

Table 1: Marginal Effects of Number of Visits by Type on Payments, Costs, and Dollar Margins

	Payment	Cost	Dollar margin
Therapy visits	150.14	140.49	9.65
	(0.94)	(1.90)	(1.90)
Nontherapy visits	9.43	89.26	-79.82
	(0.59)	(2.06)	(1.89)
Constant	1901.54	411.55	1489.98
	(12.86)	(17.23)	(18.13)
R-squared	0.809	0.635	0.328
N	756,988	756,988	756,988

Note: Marginal effects are estimated using OLS regressions for each dependent variable (shown in columns) using number of therapy and nontherapy visits as explanatory variables, and indicate the overall dollar change in payment, cost, or margin associated with each additional visit. Payments are based on 2012 HHPPS case-mix weights. The estimation sample excludes from the full analysis sample episodes with more than 5 total visits, 40 or fewer therapy visits, and 40 or fewer nontherapy visits. Regression coefficients (marginal effects) are shown with standard errors in parentheses.

Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and cost report data for 2008 home health non-outlier non-low-utilization episodes.

Table 2. Profitability of Home Health Groups of Home Health Agencies by Percent of Therapy Episodes

Quintile of percent of therapy episodes	Average therapy visits per episode	Average nontherapy visits per episode	Average payment	Average cost	Payment-to-cost ratio
1	1.7	16.0	$2,255	$1,984	1.14
2	4.3	13.9	$2,669	$2,306	1.16
3	5.8	12.6	$2,922	$2,525	1.16
4	7.4	11.3	$3,122	$2,695	1.16
5	10.7	10.7	$3,600	$2,955	1.22

Note: N = 1,628 agencies. Therapy episodes are those with 6 or more therapy visits. Agencies are ranked by the percent of their episodes that are therapy episodes and grouped into quintiles based on this measure from low (1) to high (5). Payments are based on 2012 HHPPS case-mix weights.

Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and cost report data for 2008 home health non-outlier non-low-utilization episodes.

Table 3: Measures of Predictive Ability of 2012 HHPPS Payment Weights and Groups and Alternative Model-Based Weights

Panel A: Episode-level measures (N=778,218)		**Share of variance of cost explained (R-squared)**	**Sensitivity of case-mix weight[a]**	**Std. deviation of case-mix weight**
2012 HHPPS payment weights	1. Actual Payment weights	0.410	0.496	0.537
	2. Total payment weights from 153 payment groups	0.428	0.503	0.606
	3. Total payment weights from 18 collapsed payment groups	0.059	0.226	0.224
Alternative model-based payment weights		0.078	0.226	0.259

Panel B: Proportionality of agency payment weights and costs (N=1628 agencies)		**Coefficient on CMI[b]**	**Robust p-value for test of CMI coefficient=1**	**R-squared statistic**
2012 HHPPS payment weights	1. No controls	0.876	0.039	0.146
	Standard error	*0.060*		
	2. With controls	0.992	0.901	0.208
	Standard error	*0.066*		
Alternative model-based payment weights	1. No controls	0.997	0.983	0.037
	Standard error	*0.143*		
	2. With controls	1.155	0.330	0.092
	Standard error	*0.159*		

Notes: [a]Sensitivity: Percent of episodes in the top decile of total costs in the top decile of the case mix measure. [b]Coefficient on case-mix index (CMI) from agency-level regression model of log(Weighted Total Costs) on log(Case Mix Index). A coefficient of one indicates that payments are proportional to costs. Model with controls includes indicators for ownership, hospital-based agencies, location in nonmetro area, and region. Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims, Outcome and Assessment Information Set (OASIS), and cost report data for 2008 home health non-outlier non-low-utilization episodes.

Table 4: Variables Included in Payment Model of Total Costs

Variable name	Definition	Definition according to OASIS variables[a]	Early episodes	Late episodes
PAIN23	Pain	M0420=2/3	X	
OSTOMY12	Ostomy	M0550=1/2	X	X
PRESS12	Pressure ulcer stage 1 and/or 2	M0460=1/2	X	X
PRESS34	Pressure ulcer stage 3 and/or 4	M0460=3/4	X	X
MULTPULC	Multiple pressure ulcers at stages 3 and/or 4	M0450_NBR_PRU_STG3+M0450_NBR_PRU_STG4 >= 2		
STASIS2	Stasis ulcer healing status=2	M0476=2	X	X
STASIS3	Stasis ulcer healing status=3	M0476=3	X	X
SURG2	Surgical wound healing status=2	M0488=2		X
SURG3	Surgical wound healing status=3	M0488=2		X
DYSP234	Dyspnea	M490=2/3/4	X	
DRESS13	Dressing 1 to 3	M0650=1/2/3 or M0660=1/2/3	X	X
BTH_GE2	Bathing >=2	M0670=2+	X	X
TOI_GE2	Toileting >=2	M0680=2+	X	
TFR_EQ1	Transferring =1	M0690=1	X	
TFR_GE2	Transferring >=2	M0690=2+	X	X
LOCO_GE1	Locomotion=1 or 2	M0700=1/2	X	X
LOCO_GE3	Locomotion >=3	M0700=3+	X	X
NEW_BPSYCH1	Primary or other dx: Affective and other psychoses, depression	PSYCH1		
bdysphagia	Primary or other dx: Dysphagia	DYSPHAGIA	X	X
i_bdysphagia_bstroke_dd2	Primary or other dx: Dysphagia and stroke)	DYSPHAGIA OR NEURO3	X	
BNEURO1	Primary or other dx: Brain disorders and paralysis	NEURO1		
NEW_PNEURO1	Primary dx: Brain disorders and paralysis	NEURO1	X	
BNEURO2	Primary or other dx: Peripheral neurological disorders	NEURO2	X	X
I_BNEURO1_BNEURO2_DRESS13	(Primary or other dx: NEURO1 or NEURO2) and dressing 1 to 3	(NEURO1 or NEURO2)& (M0650=1/2/3 or M0660=1/2/3)	X	

Table 4: Variables Included in Payment Model of Total Costs (continued)

Variable name	Definition	Definition according to OASIS variables[a]	Early episodes	Late episodes
BNEURO3	Primary or other dx: Stroke	NEURO3	X	X
BNEURO4	Primary or other dx: Multiple Sclerosis	NEURO4		
I_BSTROKE_DD2_DRESS13	Primary or other dx: Stroke and dressing 1 to 3	(NEURO3) & (M0650=1/2/3 or M0660=1/2/3)	X	
BHEART_ALL_BHYPER_ALL	Primary or other dx: Heart or hypertension	(HEART or HYPERTENSION)	X	
UI_TRACH	Tracheotomy	TRACHEOSTOMY CARE	X	X
BDM_ALL	Primary or other dx: Diabetes	DIABETES	X	
PTRAUMA_L2	Primary dx: Traumatic wounds, burns and post-operative complications	SKIN1	X	X
STRAUMA_L2	Other dx: Traumatic wounds, burns and post-operative complications	SKIN1	X	X
NEW_BTRAUMA2	Primary or secondary dx: ulcers or other skin conditions	SKIN2	X	X
bortho1	Primary or other dx: Leg disorders	ORTHO1	X	X
bortho2	Primary or other dx: Other orthopedic disorders	ORTHO2		X
b7812	Leg gait		X	X
I_BORTHO_LEG_THER_IP	Primary or other orthopedic disorders and infusion or parenteral therapy	(ORTHO1 or ORTHO2) and M0250=1/2	X	
I_BLEG_GAIT_PRESS1234	Leg gait or leg disorder and pressure ulcer	(ORTHO1 or ABNORMALITY OF GAIT) and M0460=1/2/3/4	X	

Note: OASIS (Outcome and Assessment Information Set)[a] Measures with single names in the third column (e.g., ORTHO1) are based on recoding of patient diagnoses from the Outcome and Assessment Information Set (OASIS) data. The detailed definitions are available upon request from the authors.

Table 5: Coefficients for Model of Total Costs per Episode

	Early episodes		Late episodes	
	Coefficient	**t-stat.**	**Coefficient**	**t-stat.**
Pain	55.51	3.73		
Ostomy	242.56	8.73	161.87	3.54
Pressure ulcer stage 1 and/or 2	290.74	13.01	396.30	15.24
Pressure ulcer stage 3 and/or 4	639.15	16.55	721.09	16.55
Stasis ulcer healing status=2	310.49	7.88	362.64	9.02
Stasis ulcer healing status=3	387.19	10.39	498.36	10.67
Surgical wound healing status=2			483.28	14.97
Surgical wound healing status=3			394.43	8.41
Dyspnea	124.85	6.04		
Dressing 1 to 3	107.64	6.34	85.46	3.11
Bathing >=2	315.49	18.39	381.65	15.42
Toileting >=2	206.77	6.77		
Transferring =1	148.07	8.68		
Transferring >=2	339.74	6.07	160.25	4.38
Locomotion=1 or 2	210.50	12.78	140.60	4.98
Locomotion >=3	275.77	7.26	235.86	5.61
Primary or other dx: Dysphagia	547.97	13.73	256.31	5.6
Primary or other dx: Dysphagia and stroke)	267.32	4.62		
Primary dx: Brain disorders and paralysis	313.46	7.04		
Primary or other dx: Peripheral neurological disorders	149.26	7.46	126.19	5.43
(Primary or other dx: brain disorders, paralysis, peripheral neuro. disorders) and dressing 1 to 3	73.89	3.65		
Primary or other dx: Stroke	290.13	11.16	237.57	9.54
Primary or other dx: Stroke and dressing 1 to 3	243.65	8.83		

Table 5: Coefficients for Model of Total Costs per Episode (continued)

	Early episodes		Late episodes	
	Coefficient	**t-stat.**	**Coefficient**	**t-stat.**
Primary or other dx: Heart or hypertension	68.43	5.11		
Tracheotomy	243.93	2.99	309.48	2.96
Primary or other dx: Diabetes	86.75	10.94		
Primary dx: Traumatic wounds, burns and post-operative complications	495.34	16.77	465.02	11.8
Other dx: Traumatic wounds, burns and post-operative complications	414.40	13.24	393.63	9.03
Primary or secondary dx: ulcers or other skin conditions	243.09	11.22	429.77	13.61
Primary or other dx: Leg disorders	264.21	11.81	299.63	6.63
Primary or other dx: Other orthopedic disorders			98.53	3.08
Leg gait	148.85	5.85	623.61	12.31
Primary or other orthopedic disorders and infusion or parenteral therapy	148.28	2.61		
Leg gait or leg disorder and pressure ulcer	327.36	9.14		
Constant	1421.15	52.72	1360.66	44.78
Number of episodes	506,638		264,640	

Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims, Outcome and Assessment Information Set (OASIS), and cost report data for 2008 home health non-outlier non-low-utilization episodes. Total costs based on episode number of visits and agency estimates of cost per visit by resource type.

Table 6: Ratios of Payments based on 2012 HHPPS Case-Mix Weights, Alternative Model-Based Payments, and Costs for Key Subgroups of Home Health Episodes

	Ratio of payments based on 2012 HHPPS case-mix weights to costs	Ratio of alternative model-based payments to costs	Ratio of alternative model-based payments to payments based on 2012 HHPPS weights	Number of episodes
Overall	1.272	1.272	1.000	778,278
By characteristics of episodes				
Without therapy	1.316	1.711	1.300	334,589
With 1 – 5 therapy visits	1.310	1.773	1.353	99,493
With more than 5 therapy visits	1.245	0.977	0.785	337,196
Low probability of therapy need	1.194	1.364	1.142	206,724
Moderate probability of therapy need	1.262	1.255	0.994	371,590
High probability of therapy need	1.357	1.225	0.903	192,948
W/o therapy, with high non-therapy minutes	0.558	0.758	1.358	33,458
Dual-eligible beneficiaries	1.278	1.323	1.036	274,533
By characteristics of agencies				
Hospital based	1.072	1.124	1.048	110,161
Free Standing	1.312	1.302	0.992	661,117
Non-profit	1.207	1.253	1.039	247,260
For profit	1.318	1.291	0.979	499,131

Source: Urban Institute calculations for MedPAC Home Health Payment Project based on claims, Outcome and Assessment Information Set (OASIS), and cost report data for 2008 home health non-outlier non-low-utilization episodes. Probability of therapy need is based on a logit model of whether episode had 6+ therapy visits as a function of diagnoses. Low probability of therapy indicates episodes with a predicted probability < 0.25; moderate, 0.25 - 0.613; and high, >0.613.

Appendix

Tables A-1 and A-2: Detailed Payment-Cost Ratios for Payments based on 2012 HHPPS Case-Mix Weights

Tables B-1 and B-2: Detailed Payment-Cost Ratios for Payments based on Alternative Model-Based Payments

Tables C-1 and C-2: Detailed Impact Estimates

Table A-1: Payment-Cost Ratios for Payments based on 2012 HHPPS Case-Mix Weights
2008 Home Health Episodes, Excluding Payment Outliers
by Number of Therapy Visits

	(1) Number of episodes	(2) All episodes	(3) Episodes without therapy visits	(4) Episodes with 1 to 5 therapy visits	(5) Episodes with 6+ therapy visits	(6) Episodes without therapy and with high non-therapy minutes
All agencies	771,278	1.272	1.316	1.310	1.245	0.558
Free standing / hospital based						
Free Standing	661,117	1.312	1.378	1.376	1.271	0.573
Hospital-based	110,161	1.072	1.005	1.107	1.099	0.522
Ownership status (POS)						
Non-profit	247,260	1.207	1.126	1.253	1.234	0.546
Any for-profit	499,131	1.318	1.429	1.391	1.256	0.573
Govt. owned	24,887	1.095	1.056	1.100	1.120	0.540
Metro / non-metro						
Metro	628,535	1.291	1.341	1.345	1.260	0.559
Non-metro	142,743	1.183	1.226	1.141	1.160	0.556
Division of country						
New England	44,099	1.378	1.310	1.428	1.401	0.551
Mid-Atlantic	62,292	1.275	1.191	1.358	1.290	0.560
S. Atlantic	139,298	1.212	1.214	1.240	1.207	0.553
E. South Central	32,634	1.158	1.087	1.187	1.179	0.521
W. South Central	133,100	1.371	1.377	1.443	1.359	0.571
E. North Central	77,261	1.234	1.348	1.216	1.178	0.518
W. North Central	188,550	1.262	1.423	1.258	1.142	0.602
Mountain	32,902	1.254	1.100	1.298	1.294	0.519
Pacific	61,142	1.285	1.324	1.268	1.270	0.555

Table A-1: Payment Cost Ratios for Payments based on 2012 HHPPS Case-Mix Weights by Number of Therapy Visits (Continued)

	(1) Number of episodes	(2) All episodes	(3) Episodes without therapy	(4) Episodes with 1 to 5 therapy visits	(5) Episodes with 6+ therapy visits	(6) Episodes without therapy and with high non-therapy costs
Percentage dual eligible						
Top 10 percent	32,294	1.420	1.512	1.260	1.343	0.548
Bottom 10 percent	71,980	1.326	1.256	1.351	1.339	0.561
Percent with >=6 therapy visits						
Top 10 percent	44,328	1.405	1.301	1.586	1.405	0.553
Bottom 10 percent	39,320	1.222	1.313	0.997	0.924	0.583
Average non-therapy costs for Episodes without therapy						
Top 10 percent	34,982	0.796	0.815	0.785	0.783	0.460
Bottom 10 percent	49,265	1.694	1.889	1.909	1.636	0.600
Number of episodes						
Bottom quartile	19,867	1.032	1.106	1.017	0.991	0.447
2nd quartile	73,051	1.170	1.236	1.160	1.136	0.523
3rd quartile	155,783	1.242	1.275	1.261	1.223	0.563
Top quartile	522,577	1.309	1.355	1.350	1.280	0.574
N	771,278	771,278	334,589	99,493	337,196	33,458

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Note: Payment-cost ratio = (avg. payment per episode based on 2012 HHPPS case-mix weights)/(avg. cost per episode).
Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and Outcome and Asessment Information Set (OASIS) data for 2008 home health non-outlier, non-LUPA episodes from 1628 agencies.

Table A-2: Payment-Cost Ratios for Payments based on 2012 HHPPS Case-Mix Weights
2008 Home Health Episodes, Excluding Payment Outliers
by Probability of Therapy and Dual-Eligibility

	(1) Number of episodes	(2) All episodes	(3) Low probability of therapy	(4) Moderate probability of therapy	(5) High probability of therapy	(6) Dual eligibles
All agencies	771,278	1.272	1.194	1.262	1.357	1.278
Free standing / hospital based						
Free Standing	661,117	1.312	1.254	1.298	1.385	1.310
Hospital-based	110,161	1.072	0.940	1.073	1.208	1.059
Ownership status (POS)						
Non-profit	247,260	1.207	1.052	1.194	1.372	1.171
Any for-profit	499,131	1.318	1.298	1.305	1.358	1.326
Govt. owned	24,887	1.095	1.010	1.091	1.186	1.365
Metro /non-metro						
Metro	628,535	1.291	1.211	1.278	1.376	1.292
Non-metro	142,743	1.183	1.125	1.184	1.247	1.213
Division of country						
New England	44,099	1.378	1.255	1.351	1.553	1.292
Mid-Atlantic	62,292	1.275	1.118	1.284	1.422	1.235
S. Atlantic	139,298	1.212	1.109	1.197	1.326	1.190
E. South Central	32,634	1.158	1.021	1.142	1.265	1.131
W. South Central	133,100	1.371	1.268	1.360	1.455	1.392
E. North Central	77,261	1.234	1.203	1.239	1.260	1.271
W. North Central	188,550	1.262	1.296	1.259	1.236	1.297
Mountain	32,902	1.254	1.063	1.215	1.380	1.202
Pacific	61,142	1.285	1.166	1.267	1.418	1.327

Table A-2: Payment-Cost Ratios for Payments based on 2012 HHPPS Weights by Probability of Therapy and Dual-Eligibility (Continued)

	(1) Number of episodes	(2) All episodes	(3) Low probability of therapy	(4) Moderate probability of therapy	(5) High probability of therapy	(6) Dual eligibles
Percentage dual eligible						
Top 10 percent	32,294	1.420	1.418	1.414	1.441	1.426
Bottom 10 percent	71,980	1.326	1.159	1.309	1.427	1.283
Percent with >=6 therapy visits						
Top 10 percent	44,328	1.405	1.278	1.378	1.457	1.432
Bottom 10 percent	39,320	1.222	1.223	1.226	1.200	1.279
Average non-therapy costs for Episodes without therapy						
Top 10 percent	34,982	0.796	0.751	0.807	0.825	0.838
Bottom 10 percent	49,265	1.694	1.636	1.671	1.740	1.737
Number of episodes						
Bottom quartile	19,867	1.032	0.989	1.038	1.055	1.113
2nd quartile	73,051	1.170	1.107	1.163	1.233	1.212
3rd quartile	155,783	1.242	1.164	1.232	1.319	1.263
Top quartile	522,577	1.309	1.224	1.298	1.405	1.308
N	771,278	771,278	206,724	371,590	192,948	274,533

Note: Payment-cost ratio = (avg. payment per episode based on 2012 HHPPS case-mix weights) /(avg. cost per episode). Probability of therapy is based on a logit model of whether episode had 6+ therapy visits as a function of diagnoses. Low probability had a predicted probability< 0.25; moderate, 0.25 - 0.613; and high, >0.613. Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and Outcome and Assessment Information Set (OASIS) data for 2008 home health non-outlier, non-LUPA episodes from 1628 agencies.

Table B-1: Payment-Cost Ratios for Alternative Model-Based Payments
2008 Home Health Episodes, Excluding Payment Outliers
by Number of Therapy Visits

	(1) Number of episodes	(2) All episodes	(3) Episodes without therapy Visits	(4) Episodes with 1 to 5 therapy visits	(5) Episodes with 6+ therapy visits	(6) Episodes without therapy and with high non-therapy minutes
All agencies	771,278	1.272	1.711	1.773	0.977	0.758
Free standing / hospital based						
Free Standing	661,117	1.302	1.788	1.863	0.987	0.777
Hospital-based	110,161	1.124	1.324	1.496	0.922	0.712
Ownership status (POS)						
Non-profit	247,260	1.253	1.485	1.699	1.030	0.749
Any for-profit	499,131	1.291	1.845	1.880	0.954	0.770
Govt. owned	24,887	1.132	1.386	1.491	0.891	0.736
Metro /non-metro						
Metro	628,535	1.282	1.743	1.820	0.990	0.761
Non-metro	142,743	1.227	1.593	1.546	0.902	0.749
Division of country						
New England	44,099	1.454	1.722	1.931	1.163	0.749
Mid-Atlantic	62,292	1.333	1.571	1.844	1.084	0.768
S. Atlantic	139,298	1.191	1.592	1.675	0.943	0.757
E. South Central	32,634	1.147	1.435	1.610	0.948	0.708
W. South Central	133,100	1.319	1.796	1.955	1.062	0.781
E. North Central	77,261	1.202	1.731	1.639	0.876	0.694
W. North Central	188,550	1.271	1.822	1.679	0.819	0.800
Mountain	32,902	1.190	1.445	1.761	1.028	0.701
Pacific	61,142	1.375	1.748	1.735	1.113	0.768

Table B-1: Payment Cost Ratios for Alternative Model-Based Payments by Number of Therapy Visits (Continued)

	(1) Number of episodes	(2) All episodes	(3) Episodes without therapy	(4) Episodes with 1 to 5 therapy visits	(5) Episodes with 6+ therapy visits	(6) Episodes without therapy and with high non-therapy costs
Percentage dual eligible						
Top 10 percent	32,294	1.045	1.937	1.704	1.023	0.720
Bottom 10 percent	71,980	0.938	1.650	1.830	1.059	0.772
Percent with >=6 therapy visits						
Top 10 percent	44,328	0.799	1.720	2.176	1.022	0.762
Bottom 10 percent	39,320	1.203	1.686	1.327	0.703	0.751
Average non-therapy costs for Episodes without therapy						
Top 10 percent	34,982	1.060	1.069	1.068	0.628	0.614
Bottom 10 percent	49,265	0.907	2.461	2.581	1.262	0.833
Number of episodes						
Bottom quartile	19,867	0.999	1.448	1.374	0.756	0.598
2nd quartile	73,051	1.015	1.632	1.579	0.895	0.713
3rd quartile	155,783	0.995	1.661	1.716	0.955	0.760
Top quartile	522,577	1.000	1.755	1.824	1.007	0.782
N	771,278	771,278	334,589	99,493	337,196	33,458

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Note: Payment-cost ratio = (avg. alternative model-based payment per episode) / (avg. cost per episode).
Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and Outcome and Assessment Information Set (OASIS) data for 2008 home health non-outlier, non-LUPA episodes from 1628 agencies.

Table B-2: Payment-Cost Ratios for Alternative Model-based Payments
2008 Home Health Episodes, Excluding Payment Outliers
by Probability of Therapy and Dual-Eligibility

	(1) Number of episodes	(2) All episodes	(3) Low probability of therapy	(4) Moderate probability of therapy	(5) High probability of therapy	(6) Dual eligibles
All agencies	771,278	1.272	1.364	1.255	1.225	1.323
Free standing / hospital based						
Free Standing	661,117	1.302	1.423	1.281	1.240	1.350
Hospital-based	110,161	1.124	1.114	1.116	1.147	1.146
Ownership status (POS)						
Non-profit	247,260	1.253	1.249	1.231	1.294	1.258
Any for-profit	499,131	1.291	1.450	1.273	1.194	1.355
Govt. owned	24,887	1.132	1.196	1.122	1.086	1.173
Metro / Non-metro						
Metro	628,535	1.282	1.377	1.262	1.238	1.329
Non-metro	142,743	1.227	1.309	1.219	1.148	1.299
Division of country						
New England	44,099	1.055	1.492	1.429	1.459	1.420
Mid-Atlantic	62,292	1.046	1.305	1.327	1.374	1.343
S. Atlantic	139,298	0.983	1.248	1.168	1.183	1.194
E. South Central	32,634	0.991	1.197	1.126	1.144	1.172
W. South Central	133,100	0.962	1.461	1.291	1.262	1.359
E. North Central	77,261	0.974	1.350	1.189	1.063	1.282
W. North Central	188,550	1.006	1.435	1.266	1.114	1.368
Mountain	32,902	0.949	1.206	1.151	1.222	1.194
Pacific	61,142	1.070	1.402	1.350	1.390	1.464

Table B-2: Payment-Cost Ratios for Alternative Model-based Payments by Probability of Therapy and Dual-Eligibility (Continued)

	(1) Number of episodes	(2) All episodes	(3) Low probability of therapy	(4) Moderate probability of therapy	(5) High probability of therapy	(6) Dual eligibles
Percentage dual eligible						
Top 10 percent	32,294	1.045	1.159	1.037	0.910	1.045
Bottom 10 percent	71,980	0.938	1.135	0.935	0.865	0.980
Percent with >=6 therapy visits						
Top 10 percent	44,328	0.799	0.980	0.782	0.780	0.796
Bottom 10 percent	39,320	1.203	1.190	1.206	1.220	1.203
Average non-therapy costs for Episodes without therapy						
Top 10 percent	34,982	1.060	1.157	1.052	0.968	1.091
Bottom 10 percent	49,265	0.907	1.149	0.891	0.840	0.919
Number of episodes						
Bottom quartile	19,867	0.999	1.143	0.994	0.900	1.005
2nd quartile	73,051	1.015	1.155	1.010	0.923	1.044
3rd quartile	155,783	0.995	1.150	0.992	0.894	1.033
Top quartile	522,577	1.000	1.139	0.993	0.903	1.037
N	771,278	771,278	206,724	371,590	192,948	274,533

Note: Payment-cost ratio = (avg. alternative model-based payment per episode) /(avg. cost per episode). Probability of therapy is based on a logit model of whether episode had 6+ therapy visits as a function of diagnoses. Low probability had a predicted probability< 0.25; moderate, 0.25 - 0.613; and high, >0.613.

Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and Outcome and Assessment Information Set (OASIS) data for 2008 home health non-outlier, non-LUPA episodes from 1628 agencies.

Table C-1: Payment Ratios for Alternative Model-based Payments
2008 Home Health Episodes, Excluding Payment Outliers
by Number of Therapy Visits

	(1) Number of episodes	(2) All episodes	(3) Episodes without therapy visits	(4) Episodes with 1 to 5 therapy visits	(5) Episodes with 6+ therapy visits	(6) Episodes without therapy and with high non-therapy minutes
All agencies	771,278	1.000	1.300	1.353	0.785	1.358
Free standing / hospital based						
Free Standing	661,117	0.992	1.297	1.354	0.776	1.356
Hospital-based	110,161	1.048	1.317	1.352	0.839	1.365
Ownership status (POS)						
Non-profit	247,260	1.039	1.319	1.356	0.835	1.372
Any for-profit	499,131	0.979	1.291	1.351	0.759	1.345
Govt. owned	24,887	1.034	1.312	1.356	0.796	1.365
Metro /non-metro						
Metro	628,535	0.993	1.300	1.353	0.786	1.362
Non-metro	142,743	1.037	1.299	1.355	0.777	1.347
Division of country						
New England	44,099	1.055	1.314	1.352	0.830	1.359
Mid-Atlantic	62,292	1.046	1.319	1.358	0.841	1.372
S. Atlantic	139,298	0.983	1.311	1.351	0.781	1.371
E. South Central	32,634	0.991	1.320	1.357	0.804	1.361
W. South Central	133,100	0.962	1.304	1.355	0.782	1.368
E. North Central	77,261	0.974	1.285	1.348	0.744	1.340
W. North Central	188,550	1.006	1.281	1.335	0.717	1.328
Mountain	32,902	0.949	1.314	1.357	0.795	1.351
Pacific	61,142	1.070	1.321	1.368	0.876	1.385

Table C-1: Payment Ratios for Alternative Model-Based Payments by Number of Therapy Visits (Continued)

	(1) Number of episodes	(2) All episodes	(3) Episodes without therapy	(4) Episodes with 1 to 5 therapy visits	(5) Episodes with 6+ therapy visits	(6) Episodes without therapy and with high non-therapy costs
Percentage dual eligible						
Top 10 percent	32,294	1.045	1.281	1.352	0.762	1.314
Bottom 10 percent	71,980	0.938	1.314	1.355	0.791	1.375
Percent with >=6 therapy visits						
Top 10 percent	44,328	0.799	1.322	1.372	0.728	1.378
Bottom 10 percent	39,320	1.203	1.284	1.331	0.761	1.288
Average non-therapy costs for Episodes without therapy						
Top 10 percent	34,982	1.060	1.312	1.361	0.802	1.335
Bottom 10 percent	49,265	0.907	1.303	1.352	0.771	1.389
Number of episodes						
Bottom quartile	19,867	0.999	1.310	1.351	0.762	1.339
2nd quartile	73,051	1.015	1.320	1.361	0.788	1.365
3rd quartile	155,783	0.995	1.303	1.361	0.781	1.349
Top quartile	522,577	1.000	1.295	1.351	0.786	1.362
N	771,278	771,278	334,589	99,493	337,196	33,458

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Note: Payment ratio = (avg. alternative model-based payment per episode)/(avg. payment per episode based on 2012 HHPPS case-mix weights).
Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and Outcome and Assessment Information Set (OASIS) data for 2008 home health non-outlier, non-LUPA episodes from 1628 agencies.

Table C-2: Payment Ratios for Alternative Model-based Payments
2008 Home Health Episodes, Excluding Payment Outliers
by Probability of Therapy and Dual-Eligibility

	(1) Number of episodes	(2) All episodes	(3) Low probability of therapy	(4) Moderate probability of therapy	(5) High probability of therapy	(6) Dual eligibles
All agencies	771,278	1.000	1.142	0.994	0.903	1.036
Free standing / hospital based						
Free Standing	661,117	0.992	1.135	0.987	0.895	1.030
Hospital-based	110,161	1.048	1.186	1.040	0.949	1.082
Ownership status (POS)						
Non-profit	247,260	1.039	1.187	1.031	0.943	1.074
Any for-profit	499,131	0.979	1.117	0.976	0.879	1.022
Govt. owned	24,887	1.034	1.185	1.028	0.916	1.064
Metro / Non-metro						
Metro	628,535	0.993	1.138	0.987	0.900	1.028
Non-metro	142,743	1.037	1.163	1.030	0.920	1.071
Division of country						
New England	44,099	1.055	1.189	1.058	0.940	1.099
Mid-Atlantic	62,292	1.046	1.168	1.033	0.966	1.087
S. Atlantic	139,298	0.983	1.125	0.976	0.893	1.003
E. South Central	32,634	0.991	1.172	0.986	0.904	1.036
W. South Central	133,100	0.962	1.152	0.950	0.867	0.977
E. North Central	77,261	0.974	1.122	0.960	0.844	1.009
W. North Central	188,550	1.006	1.107	1.005	0.902	1.055
Mountain	32,902	0.949	1.135	0.948	0.886	0.993
Pacific	61,142	1.070	1.202	1.065	0.980	1.103

Table C-2: Payment Ratios for Alternative Model-based Payments by Probability of Therapy and Dual-Eligibility (Continued)

	(1) Number of episodes	(2) All episodes	(3) Low probability of therapy	(4) Moderate probability of therapy	(5) High probability of therapy	(6) Dual eligibles
Percentage dual eligible						
Top 10 percent	32,294	1.045	1.159	1.037	0.910	1.045
Bottom 10 percent	71,980	0.938	1.135	0.935	0.865	0.980
Percent with >=6 therapy visits						
Top 10 percent	44,328	0.799	0.980	0.782	0.780	0.796
Bottom 10 percent	39,320	1.203	1.190	1.206	1.220	1.203
Average non-therapy costs for Episodes without therapy						
Top 10 percent	34,982	1.060	1.157	1.052	0.968	1.091
Bottom 10 percent	49,265	0.907	1.149	0.891	0.840	0.919
Number of episodes						
Bottom quartile	19,867	0.999	1.143	0.994	0.900	1.005
2nd quartile	73,051	1.015	1.155	1.010	0.923	1.044
3rd quartile	155,783	0.995	1.150	0.992	0.894	1.033
Top quartile	522,577	1.000	1.139	0.993	0.903	1.037
N	771,278	771,278	206,724	371,590	192,948	274,533

Note: Payment ratio = (avg. alternative model-based payment per episode) /(avg. payment per episode based on 2012 HHPPS case-mix weights). Probability of therapy is based on a logit model of whether episode had 6+ therapy visits as a function of diagnoses. Low probability had a predicted probability< 0.25; moderate, 0.25 - 0.613; and high, >0.613.

Source: Urban Institute calculations for MedPAC Home Health Payment Project, based on claims and Outcome and Assessment Information Set (OASIS) data for 2008 home health non-outlier, non-LUPA episodes from 1628 agencies.