Impacts of a Revised Payment System For SNFs

A memo by staff from the Urban Institute for the Medicare Payment Advisory Commission

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Subject: Impacts of a revised payment system for SNFs (Final Memo, Contract #MED11P0051)

Introduction

In 2008, the Medicare Payment Advisory Commission recommended that the skilled nursing facility (SNF) prospective payment system (PPS) be revised to improve the accuracy of payments for nontherapy ancillary (NTA) services and to dampen the incentive for facilities to furnish therapy services for financial, rather than clinical, reasons. Three recommended changes were: to establish a component to pay for nontherapy ancillary services (such as drugs, IV medications, and respiratory services), replace the therapy component with one that based payments on patient and stay characteristics, and adopt an outlier policy. The goal of this work is to investigate whether the recent refinements CMS has made to the SNF PPS have accomplished much of what the Commission hoped for when it recommended refinement of the PPS in 2008.

This work builds on previous work conducted for the Commission in two ways (Garrett and Wissoker 2008; Wissoker and Garrett 2010). First, the previous work involved modeling an alternative PPS in line with the recommendations of the Commission. Here we update the NTA and therapy models underlying the alternative system using more recent data and taking into account CMS criteria for a viable payment system, while remaining consistent with the Commission's recommendations. Second, previous work compared the alternative PPS payments with the Medicare payment rates and classification groups in place at the time of that work; here we compare the alternative payments to current policy, including the new classification system (RUG-IV) implemented in October 2010.

In this report, we first provide some background on the SNF PPS, the development and updating of our alternative design for the PPS, and developments in Medicare's SNF payment policy since our last memo. Next, we describe the data and methods used to design an alternative PPS and to estimate its impact on payments. Finally, we provide details on the alternative design's parameters, compare the ability of this design and current policy to predict per day costs; and estimate the aggregate impacts of the alternative design on payments to SNFs.

The key findings are as follows:

- For NTA: The alternative design continues to substantially outperform the current nursing case-mix weights in their ability to explain variation across stays in nontherapy ancillary costs. The facility-level analysis shows that the current payment weights, which are based on nursing provided, predict very little of the variation in NTA costs across facilities. Compared to current policy, the payments under the alternative design are closer to being proportional to NTA costs and explain a much greater share of the variance in these costs across facilities.

- For therapy: The revision of the case-mix categories and weights did not address the fundamental problem that the case mix for therapy is defined using services provided. Compared to current policy, the alternative PPS design would explain a higher share of variation in therapy costs and yield less overpayment of facilities with a high-case mix index.

- Overall: The alternative PPS would shift payments from facilities with high shares of rehabilitation therapy patients toward facilities with high shares of special care and clinically complex patients and toward the types of facilities that specialize in such patients. In general, the shifts are quite similar to those observed in earlier work when the alternative was compared to the PPS with the previous Medicare payment weights.

Background

Overview of the SNF PPS

The Medicare SNF benefit pays a daily rate for care in a skilled nursing facility. The daily rate is the sum of payments for three components: nursing, therapy, and room and board. The nursing component is case-mix adjusted to account for variation across cases in the costs of nursing. The therapy component is case-mix adjusted (using a separate set of relative weights) for patients that qualify as "rehabilitation cases", to account for the amounts and types of therapy provided and patient functionality.

The payments are adjusted for case mix using a classification system known as Resource Utilization Groups (RUGs). Patients are grouped into RUG categories using information gathered in an assessment conducted on or about days 5, 14, 30, 60, and 90 of a stay. The assessment instrument is the minimum data set or MDS. Assignment to a RUG category depends on the number of minutes and types of therapy, indicators of expected need for services, patient diagnoses, and ability to perform activities of daily living (such as walking or dressing).

The RUGs classification system has been updated twice since the start of the PPS in 1998. Initially, patient claims were assigned to one of 44 categories for payment. This was expanded to 53 categories in 2006 to allow for differential payments for those receiving both rehabilitation and extensive services (such as tracheostomy or ventilator

care). The 53-category system is referred to in this memo as RUG-53. Since 2010, classification is based on a revised and expanded set of category definitions. This revised classification is referred to as RUG-IV and will be described in more detail below. The RUG-IV categories can be grouped into the following major categories: rehabilitation only, rehabilitation and extensive services, extensive services only, special care, clinically complex, behavior symptoms and cognitive performance.

An alternative PPS design

In 2007, MedPAC contracted with the Urban Institute to develop and evaluate an alternative PPS design for SNFs.[1] The alternative PPS design was intended to address the two principal problems with the then existing system: First, the system did not accurately pay for nontherapy ancillary services (NTA). Instead, it paid for them as part of the payment for nursing services. Second, it encouraged facilities to provide therapy services for financial, not clinical, reasons.[2]

To address these problems, we worked with Dr. Carol Carter at MedPAC to develop a separate model-based NTA payment component to add to the SNF PPS, and a predictive model of therapy costs to replace the therapy payment component. Payments for NTA services would be carved out of the existing system's nursing daily payment and then adjusted for case mix using predicted NTA costs. The existing system's case-mix weights for therapy services would be replaced with weights based on predicted therapy costs. Predicted NTA and therapy costs per day were a function of indicators of SNF care, patient functionality, hospital diagnoses, five indicators of the broad RUG category, and duration of stay. We also developed an outlier policy based on exceptionally high ancillary costs per stay. Using a 2003 sample of beneficiaries, we found that the revised system had a better ability to predict both therapy and NTA costs than the policy that existed at the time (the RUG-53 payment weights and classification groups). The revised system increased payments to facilities with a low share of rehabilitation therapy patients, high shares of patients with extensive services and to both non-profit and hospital-based facilities.

In subsequent work (reported in Wissoker and Garrett, 2010), we updated the model of nontherapy ancillary services to meet criteria that CMS defined for a separate component for NTA services. These criteria include: use information from available administrative data; develop the component from recent data; do not promote undesirable incentives; and base the component on a limited number of payment groups or levels. In line with these criteria, we based the analysis on data from 2007. We excluded hospital diagnoses

[1] The contract followed on a multi-year study to develop SNF refinement options. That study was conducted for CMS and led by Korbin Liu at Urban Institute. Liu et al., 2007 suggested separate payment for NTA services; base payments for therapy services on predicted care needs, not service provision; and defraying the costs of exceptionally expensive stays using an outlier policy. This research concluded that a revised PPS could establish payments more accurately and afford SNFs some financial protection against exceptionally high-cost stays. If payments were more accurate, SNFs would have less incentive to avoid certain types of patients and access would improve for beneficiaries with under-reimbursed NTA care needs.

[2] See Liu, et al., 2007.

to ensure that payments would be based on data easily available to the SNF. In addition, we reframed a predictor (our length of stay proxy) to avoid requiring information that would not always be known when SNFs submit claims for payment. Finally, we made the model more parsimonious, in keeping with CMS preference that payment be based on a small number of predictors or payment groups. This updated model is used in the simulation of the alternative PPS described below.

Recent changes to the SNF PPS

CMS has made three key changes to the SNF PPS since our last report. In October 2010, CMS implemented the RUG-IV case-mix classification system. This updated classification system is based on a new assessment instrument – MDS 3.0 – and assigns categories based on services received in the SNF rather than during the 14 days prior to the assessment. MDS 3.0 replaces MDS 2.0, which was the instrument underlying the RUG-53 system. The increase in the number of payment groups under RUG-IV from 53 to 66 is intended to allow more nuanced nursing payments for special care and clinically complex patients. The new system also makes it more difficult to qualify for the extensive services payment groups by requiring these services to be furnished while a patient is in the SNF (not during the prior hospital stay, as in the previous classification system) and excludes the administration of intravenous medications from the definition of these high-payment case-mix groups.

Second, minutes of therapy furnished concurrently or in groups are no longer given full weight when assigning a patient to one of the rehabilitation case-mix group. (Recall that the case-mix group assignment depends on the number of therapy minutes.) Therapy minutes are discounted to reflect the lower amount of resources required to furnish therapy concurrently or in a group. As a result, fewer beneficiaries have sufficient minutes of therapy to be assigned to the highest therapy payment groups.

Last, in implementing changes to the classification system, CMS ensured that total payments remained the same but effectively moved spending out of the therapy component and into the nursing component. In 2010, the adjustments to the case-mix weights were done across the board for all case-mix groups; in 2011, the adjustments were applied to select groups. These adjustments are known as parity adjustments.

These changes did not (and were not intended to) address the two problems of concern to the Commission: the lack of targeting of NTA costs or the payment of therapy according to amount used.

Data and Methods

In this report, we update our alternative design for a PPS and compare its payments to those under Medicare's current (FY 2011) policy. The analysis is based on CMS internal files for a subset of 2007 Medicare SNF stays. The predictive models underlying the

model-based payments build on our previous work.[3] Separate regression equations were used for therapy and nontherapy ancillaries, to predict per-day costs based on patient conditions and stay characteristics. The predictions of each model are then used to create a set of payment weights that would raise or lower payments relative to the base payment rate. To construct the current RUG-IV classification categories, we rely on a program written by CMS staff. We estimate the impacts on payments to facilities using the same approach as described in MedPAC's June 2008 Report to Congress and Garrett and Wissoker (2008).

CMS construction of a claim-level file

The starting point for the CMS file is the set of Medicare claims for 2007 SNF stays. Medicare claims are the primary source of data on periods of service, types of procedures furnished, patient diagnoses, and the institution's charges for services. These data were submitted by Medicare-certified providers to Medicare intermediaries for reimbursement of Medicare-covered services.

For each claim, CMS attached information from as many MDS assessment records as cover the dates of the claim. The assessments are based on the MDS 2.0, which was used at the time. The MDS assessments are the source of information on a patient's cognitive and functional status, use of specific services (such as ventilation, intravenous medication, and oxygen), and assignment to the case-mix group. In addition, the assessments are a source of information on diagnoses and services furnished to SNF patients, collecting information on the services furnished during the past 14 days (the so-called "look-back" period). Recall that the MDS is administered to patients on a specified schedule approximately 5, 14, 30, 60, and 90 days from the start of the Medicare-covered SNF stay. For a given claim, no assessment, one assessment, or multiple assessments might cover some period of the claim.

CMS staff devised an approach to attach MDS information for the one or more assessments that cover the period of a claim. For each day covered by a claim, CMS staff determined whether the day was within 13 days prior to the date of a given MDS assessment. This ensures that services (such as IV medication) are counted using the days corresponding to the 14-day look back period for each assessment date. If one assessment overlapped the period of the claim, then the MDS variables for that assessment are attached to the claim. If multiple assessments were observed, the MDS variables were defined using a weighted average of the variable according to the share of days from each assessment that overlapped the period covered by the claim.

For example, to get a proportion of days with IV during a claim, CMS took all of the covered days that fall within 13 days before an assessment date and calculated the share of those days matched to an MDS indicating IV use. If a claim period overlapped a single assessment date, all of the days would be assigned the value of 0 or 1, indicating no IV use or IV use. If a claim period overlapped two assessments, the IV use would calculated

[3] Our initial models for NTA and therapy are described in the MedPAC June 2008 Report to Congress, Garrett and Wissoker (2008); the updated model for NTA is described in Wissoker and Garrett (2010).

as the proportion of the combined assessment days with IV use indicated in both assessments.

Finally, CMS used the cost report data that Medicare-participating SNFs submit annually to the fiscal intermediaries to create ancillary service cost-to-charge ratios (CCRs), which they used to convert claims data on ancillary service charges to estimated costs for those services.

Constructing a stay-level file

The analytic goal of this project is to develop models of per diem NTA and therapy costs for patient stays. Costs and predictors (e.g., SNF care, diagnoses) are measured as the day-weighted average across all the claims for each stay. Stays with a per diem NTA cost over $1500 – accounting for less than a tenth of a percent of stays – are excluded from our analyses. The variables from the claims (e.g., diagnoses) are averaged over all claims for the stay, while those from the MDS (e.g., RUG categories and measures of functionality) are averaged over those claims with matched MDS data.

To construct a stay-level file, we first dropped claims from the CMS analytic file that had zero payments, as well as a limited number of claims with claim spell end and start dates for a given patient that overlapped. We defined a stay as a group of claims for a given patient separated by fewer than 60 days, restricting the total number of days in a stay to 100 days.[4] For the cost and other variables used from claims (e.g., diagnoses and detailed charges), we weighted the values from separate claims by the number of covered days on each claim. For example, if a stay consisted of a 10 day and 30 day claim, we would construct the weighted average cost by applying a weight of one-fourth to the average cost from the first claim and three-fourths to the average cost from the second claim.

We use a separate approach to calculate the average for variables that originate on the MDS to deal with claims that have no matched MDS data. If a claim had no MDS data, we increased the weight on the nearest claim that had MDS data. For example, consider a stay with three claims with equal length, the first of which shows the patient received IV medication, the second shows no IV medication, and the third has no matched MDS assessment. In this case, we would calculate the stay average giving the second stay double the weight, since it is adjacent to a claim without MDS data. The weighted average is our best estimate of the stay-level average for the MDS variable.

The final sample for this analysis contains 627,332 stays from 9,857 facilities.

Estimating NTA and therapy costs for the alternative PPS design

The alternative PPS design bases its case-mix adjustments for therapy and nontherapy on predicted costs using log-linear regression models. The nontherapy ancillary cost and

[4] The Medicare SNF benefit covers 100 days per episode. To allow some leeway in the measurement of days of a stay, we kept stays with 101 or 102 days, but capped the number of days in the final claim to yield a maximum of 100 days. We dropped stays with 103 or more days.

therapy cost models have the same set of predictors so that increases in one cost could be offset by decreases in the other. The final set of predictors is the union of predictors in a parsimonious model of NTA costs reported in Wissoker and Garrett (2010) and a model of therapy costs developed for this project. The combined set of predictors meets most of the CMS criteria, but includes more predictors than would be used to predict either set of services alone. The means and standard deviations of the final set of predictors are reported in Table 1.

The dependent variables for the models are wage-adjusted per diem nontherapy ancillary costs and wage-adjusted per diem therapy costs. The unadjusted per diem costs were calculated by combining data on charges for each stay with cost-to-charge ratios (CCRs) for each facility. The charges per stay are from Medicare claims and the CCRs are from the SNF cost reports. The estimated costs are standardized for area wages using the 2008 wage index (pre-floor) and the labor share in place in 2007.

Predictors of NTA costs. The model of NTA costs includes measures of intravenous medications and respiratory care defined by indications on both claims and MDS data (to help validate that the service was furnished during the SNF stay), beneficiary age, an indicator of specific SNF care, diagnoses and service use from the SNF claims and the MDS, and ability to perform activities of daily living (ADL). As a length of stay proxy, we include the share of the entire stay's claim days associated with a given assessment (for example, the days covered by the 14-day stay comprise half of days of the entire stay).[5] Some characteristics were excluded because their inclusion in a payment component could create inappropriate incentives. For example, providing high payments for patients receiving tube feeding would produce an incentive to administer tube feeding when it is unnecessary.

The complete list of predictors for the parsimonious model of NTA costs is as follows.

- **Age**
  - Age - 50, capped at 45 = 95 - 50
  - (Age - 50) squared, capped at 45^2
- **SNF Care**
  - IV medication (MDS) *and* claim for IV therapy or solution
  - Oxygen (linked to conditions) or tracheotomy care or ventilator and claim for respiratory or pulmonary
  - IV medication*Oxygen/tracheotomy/ventilator Serious (stage 4) skin ulcer
  - Chemotherapy (MDS)
- **ADLs**
  - Locomotion on unit(self)-did not occur during entire 7 days
- **SNF Diagnoses (from SNF claim unless otherwise noted)**

[5] More direct measures, such as the length of stay or the final number of assessments, would require knowledge of the length of the entire stay or final number of for establishing payment for an individual claim. This proxy would allow payment of individual claims based on the share of the claim days associated with each assessment.

    - COPD
    - Diabetes (MDS)
    - HIV
    - Infectious and parasitic diseases
    - Malnutrition (MDS)
    - Pneumonia (MDS)
    - Renal failure
    - Respiratory failure
- **Length-of-stay proxy (share of stay covered days associated with each assessment)**
    - First or readmission
    - Second
    - Third
- **Medicare SNF nursing case-mix weight under RUG-53**

Predictors of therapy costs. The model of therapy costs includes beneficiary age, indicators of specific SNF care, diagnoses believed to require therapy provision in the SNF (such as hip fracture, after-care post joint replacement, and swallowing problem), the beneficiary's ability to perform ADLs and cognitive function, the length of stay proxy, and an indicator that the beneficiary qualified for a rehabilitation RUG category under the previous payment classification system.

The complete list of predictors for the parsimonious therapy model is as follows:

- **Age**
    - Age - 50, capped at 45 = 95 - 50
    - (Age - 50) squared, capped at 45^2
- **SNF Care**
    - Ulcer
    - Swallowing problem
    - Location in hospice program
- **SNF Cognitive Score**
    - Moderate severe impairment
    - Severe impairment
    - Very severe impairment
- **ADLs – measured during previous 7 days**
    - Transfer(self) – with supervision
    - Transfer(self) – with limited assistance
    - Transfer(self) – with extensive assistance
    - Transfer(self) – total dependence
    - Transfer(self) – did not occur
    - Locomotion on unit (self) – with supervision
    - Locomotion on unit (self) – with limited assistance
    - Locomotion on unit (self) – with extensive assistance
    - Locomotion on unit (self) – total dependence
    - Locomotion on unit (self) – did not occur

    - Eating – with supervision
    - Eating – with limited assistance
    - Eating – with extensive assistance
    - Eating – total dependence or did not occur
- **SNF Diagnoses (from claim unless otherwise noted)**
    - Cerebral hemorrhage and effects of stroke
    - Dementia with depression or behavioral disturbance
    - Dementia/cerebral degeneration
    - Disorders of vertebrae and spinal disks
    - Hip fracture
    - Hemiplegia
    - Joint replacement, aftercare
    - Mononeuropathy, other abnormal movement disorders
    - Musculoskeletal and connective tissue disorders, other
    - Quadriplegia, other extensive paralysis and spinal cord injuries
    - Polyneuropathy, except diabetic
    - Parkinson's disease
    - Pelvic fracture
    - Vertebral fractures without spinal cord injury
- **Length-of-stay proxy (share of stay covered days associated with each assessment)**
    - First
    - Second
    - Third
    - Readmission
- **Rehabilitation with or without extensive services (RUG-53 major categories)**

Regression approach to estimating NTA and therapy cost per day in the alternative PPS design. We estimate the models of NTA and therapy costs per day using Poisson regression. Poisson regression, like standard regression using a logged dependent variable, produces estimates that give less emphasis to the relatively rare very costly cases, better reflecting the center of the distribution. The coefficient estimates are interpreted in the same way as the coefficients from a logged standard regression model. Unlike log models, however, Poisson regression easily handles dependent variables that contain many zeros.

The r-squared statistic, which measures the proportion of variance of costs explained, is obtained by a regression of per-stay average costs on the model's prediction of average costs. This follows the procedure used in our earlier work.

Modeling a PPS outlier policy

To help defray the cost of exceptionally high-cost stays, we modeled an outlier policy focused on total ancillary cost losses per stay, with losses computed as the difference between per stay costs and per stay payments that we compute under the revised PPS. The outlier policy includes the following features:

- Outlier payments are based on per-stay losses on ancillary services (NTA and therapy services combined), where ancillary losses are defined as per-stay ancillary payments under the alternative PPS design less per-stay ancillary costs.

- Payments are made to facilities that incur a loss on a stay of more than $3,000 (wage-adjusted) in ancillary services.

- Outlier payments cover 80 percent of the per stay ancillary costs above the $3,000 (wage-adjusted) fixed loss amount.

- The outlier payment policy is financed by a 0.7 percent reduction in the base payment amounts for ancillary services for all facilities. The percentage reduction is set so that the outlier policy with a $3,000 fixed loss amount is budget neutral.

Assigning RUG-IV classification

Simulation of payments under the current PPS requires assigning a RUG-IV classification category to each assessment in our sample. This is complicated by the change in the assessment instrument: The beneficiaries in our sample were assessed using MDS 2.0 assessment instrument, while the RUG-IV payments are defined using MDS 3.0.

We used a computer program created by CMS staff to assign eligibility for RUG-IV categories with MDS 2.0 assessments. Beneficiaries who were eligible for more than one RUG-IV category were assigned to the category with the highest payment. This is in keeping with information provided by CMS staff.

CMS staff point out two weaknesses in approximating RUG-IV assignments using MDS 2.0. First, current payment rules specify that concurrent and group therapy times need to be discounted. This adjustment is not possible using MDS 2.0. Rather than impose an ad-hoc adjustment for a share of therapy provided concurrently, we treat all therapy listed in the assessment as though it was individually provided. This leads to assigning some individuals with therapy to higher paying categories, since their records indicate more therapy than is actually eligible. On the other hand, the recent parity adjustment to nursing payments, (which reduced the payment for therapy relative to nontherapy categories), means less of a differential for this shift than would be the case without the adjustment. Furthermore, after this rule was imposed, many facilities replaced concurrent and group therapy with individual therapy, so perhaps the misallocation is not as bad as it might be.

Second, the RUG-IV classification is based on conditions or services provided within the SNF stay rather than in the preceding hospital stay. This distinction is made on the MDS 3.0 assessment, but not the older form. (The older form simply indicates provision of the service within the prior 14 days.) We approximate whether the care occurred in the SNF by applying rules that depend on the condition. If the condition is unlikely to change between the hospital and SNF, we take an occurrence on the MDS as an indication that the service was provided in the SNF. Where the condition may well be different in the

SNF and hospital, we require confirmation of the service through SNF claims. For example, we assume that any indication of provision of tracheostomy care means that such care was received in the SNF (since it's unlikely to only occur in the hospital stay). On the other hand, we require confirmation from claims to conclude that intravenous medication is provided in the SNF.

In Table 2, we compare the distribution of days across major and minor RUG categories in our sample to those in fiscal year 2011. The distributions are expected to be different, both because of imprecision in our estimation and changes in the provision of services over the past several years. For example, between 2007 and 2011, the share of days classified into rehabilitation case-mix groups and within those, the share classified as ultra high and very high case-mix groups increased. The data show a lower share of rehabilitation therapy cases in our data as compared with 2011 (77 to 92 percent). Within the rehabilitation case-mix groups, more days were classified into the "very high" and "high" rehabilitation categories and fewer into the highest ("ultra") categories in 2007 than in 2011.

Calculating payments under current and previous policy and an alternative PPS design

The impact analysis is based on a comparison of Medicare's current (2012) payments and estimated payments under our alternative design. To calculate current payments, we applied the current parity-adjusted case-mix weights from the final rule for 2012 (Federal Register, August 8, 2011) to the RUG-IV categories for our sample. To calculate payments under the previous PPS policy, we applied the 2007 Federal case-mix weights to the RUG-53 categories provided on the file. To maintain comparability with the costs in the file, we applied these weights to the 2007 base rates. Payments were adjusted to include the add-on payments for HIV cases.

Payments under an alternative PPS design are calculated by multiplying the model-based payment weights for the NTA and therapy components by the components' 2007 base rates.[6] To establish an NTA base rate, we allocated a portion of the 2007 nursing base rate to NTA services using information from CMS on the share of nursing payments attributable to NTA services (43.4 percent of the urban nursing base rate and 42.7 percent of the rural nursing base rate). Adjustments were made to ensure budget neutrality within each payment category (NTA and therapy). Nursing payments in the alternative PPS design were calculated in the same manner as the current policy, except that the estimated NTA costs were removed from the nursing base rate.

Assessing whether facility-level NTA and therapy payments are proportional to these services' costs

To assess whether facilities receive payments for NTA and therapy that are proportional to their costs, we estimate models relating facility costs per day to the facility case-mix

[6] The alternative design PPS weight for NTA is equal to the model-prediction of per diem NTA costs for each stay divided by the average per diem NTA cost. The alternative design weight for therapy equals the model-prediction of per diem therapy costs for each stay divided by the average per diem therapy cost.

index (CMI). The CMI measures the average payments that would be made to a facility for a component, relative to the average payment that would be made for all facilities. Payments under the alternative PPS design would be based on the predicted costs, so the CMI is calculated as the average predicted cost for the facility's stays in the sample divided by the average predicted cost for all stays.

For both NTA and therapy, we estimated standard regressions using the natural log of the wage-deflated facility average cost per day as the outcome (i.e., dependent) variable and the following explanatory variables: the natural log of the CMI and whether the facility is in a rural area. This regression model is referred to as a "payment model" because it contains only variables that are used to adjust payments in the SNF PPS and does not include other facility characteristics that may also be related to costs (see Liu et al. 2007 for additional detail).

The focus of this analysis is the estimated relationship between facility costs per day and the CMI. The regression coefficient on the log CMI variable, which we refer to as the "CMI coefficient", measures whether the relative expected costliness of a facility's cases (for NTA or therapy) is proportional to the payments (for NTA or therapy).[7] A coefficient of one indicates that the cost of a facility's cases is proportional to payments. A coefficient above one indicates that payments are compressed relative to costs. That is, costs increase faster than payments and result in underpayment of facilities with high values of the case mix index. A coefficient below one indicates that costs are compressed relative to payments. That is payments increase faster than costs and result in overpayment of facilities with high values of the case mix index. The former situation is known as "compression of payments", while the latter situation is known as "decompression of payments".

Modeling the impacts on payments

In the impact analysis, we compare payments under our alternative payment system with payments under current Medicare policy. Having computed payments under the current and alternative systems, including outlier payments, we examined the shifts in payments across different types of cases and SNFs, as well as the distributions of the changes in payments across facilities.

Findings

Estimated effects of explanatory variables on NTA and therapy costs per day

The relationship between each explanatory variable and NTA and therapy costs per day, as estimated by the regression models, is reported in Table 3. The estimated regression coefficients are reported in bold. We convert these into percentage changes in expected

[7] Because the regression is specified as the relationship between the natural log of the average cost per day and the natural log of the CMI, the coefficient on the log CMI variable measures the percent change in average facility cost per day that is associated with one percent change in the CMI.

costs predicted by each variable, which we report to the right of each regression coefficient.[8] We also report t-statistics that show the statistical significance of the effects in italics. Variables with t-statistics less than -2 or greater than 2 indicate effects that are statistically significant (different from zero) with a confidence level of more than 95 percent.

Two sets of variables stand out as highly predictive of NTA costs per day (column 1).[9] First, the SNF care variables IV medication furnished, respiratory care, and the combination of receiving both IV medication and respiratory care, are strongly related to higher NTA costs per day. Having IV medication furnished (without also having respiratory care) increases expected NTA costs by 106 percent, implying a payment weight of 2.06. Having respiratory care (without also having IV medication) increases expected NTA costs by 80 percent, implying a payment weight of 1.80. Receiving both IV medication and respiratory care reduces the combined effect on costs of having the two services individually by about 22.4 percent. In total, the payment weight for having both IV medication and respiratory care compared to having neither is 2.87 (2.06*1.80*0.776).[10]

Second, the set of length of stay proxies is also a very important predictor. The results show that NTA costs per day are highest during the period associated with a first assessment (or a readmission) and decline during the period associated with subsequent assessments.

Other variables that notably predict higher NTA costs include: patient did not move or was totally dependent on staff to move between locations within the SNF unit; having a serious skin ulcer, chemotherapy, COPD, diabetes, an infectious and parasitic disease, pneumonia, renal failure, or respiratory failure. In addition, a higher nursing case-mix weight (RUG-53) is associated with higher NTA costs.

Other variables that predict lower NTA costs include being classified in a rehabilitation RUG or a rehabilitation and extensive services category (defined using RUG-53), requiring assistance in the transfer ADL (compared to being independent), having a diagnosis of hemiplegia, and having a very severe cognitive impairment.

Variables that strongly predict higher therapy costs per day in Table 3 include: having a swallowing problem, IV or respiratory care in the SNF; requiring supervision, limited, or extensive assistance in the transfer ADL (compared to being independent); having a diagnosis of stroke, aftercare for joint replacement, hemiplegia; and being classified in a

[8] With the exception of the age variables and the nursing case-mix index, which are continuous measures, the explanatory variables take the value of 1 (condition is present) or 0 (condition is not present). For such binary explanatory variables in Poisson regression models, the expected percent change in the outcome given that the condition is present (as compared to when it is not present) is computed as: 100%*[exp(regression coefficient) – 1].

[9] We focus on variables with high t-statistics, which relate to a variable's contribution to the model's explanatory power.

[10] Equivalently, one can calculate the exponent of the sum of the individual coefficients on IV, respiratory care, and IV*respiratory care and obtain the same impact on costs and payment weight.

rehabilitation RUG or rehabilitation and extensive services category (as defined using RUG-53).

Variables that strongly predict lower therapy costs per day include having chemotherapy, severe or very severe cognitive impairment, dementia, and being in a hospice program. In addition, a higher nursing case-mix weight (RUG-53) is associated with lower therapy costs. The length of stay proxy shows that therapy costs per day are lower later in the stay. This pattern is not as strong as for NTA costs.

Because the effects of age combine the effects of two variables, it is easier to see the pattern of expected costs by age in a graph. In Figure 1, we show how the regression models' average predictions for NTA and therapy costs per day vary with the age of the patient. Predicted NTA costs generally decline with age, from about $78 for patients age 50 and below to $47 for patients age 95 and above. Predicted therapy costs rise from about $55 for patients age 50 and below, peak at about $64 for patients 76 years old, then fall to about $60 dollars for patients age 95 and above.

Comparison of the predictive ability of payments under the alternative, current (RUG-IV), previous (RUG-53) PPS designs

Payments based on the NTA and therapy models presented in Table 3 would predict more of the variation in costs than either current (RUG-IV) or previous (RUG-53) Medicare payments. The findings are reported in Table 4 and discussed below.

Prediction of NTA costs. Payments under the alternative design would provide a substantial improvement over current policy in the share of the variation in NTA costs explained. Relative payments based on our model of NTA costs explain 21 percent of the variation in NTA costs. In contrast, the current (RUG-IV) Medicare nursing payments explain 1.2 percent of the variation in nontherapy ancillary costs in our sample of stays. The previous payments (based on RUG-53) explain 4.4 percent of the variation in NTA costs.

The finding that the current Medicare payment weights have a weaker relationship to costs than the previous payment weights could result from either a) the change in the classification system from RUG-53 to RUG-IV; or b) from changes in the weights assigned to payment groups. To better understand the role of the payment categories in the performance of the Medicare payment weights, we defined a recalibrated set of weights to equal the average NTA cost within each RUG category (as opposed to the payments weight based on nursing costs). The NTA-cost-based weights for RUG-IV categories explain 6.6 percent of the variation in NTA costs as compared with a similar 6.9 percent for the NTA-cost-based weights for RUG-53 categories. This suggests that the change in grouping is not leading to the weaker relationship between current payments and costs, but that the weak relationship is more the result of the weights attached to the categories. The predictive power of the Medicare payment groups could be improved substantially if relative weights were set based on NTA costs rather than nursing costs, but the predictive power of such weights would still be modest.

The weak predictive power of the current payment rates appears to combine three factors. First, the RUG groups themselves do not describe a lot of the variation in NTA costs. Second, the nursing payment rates are not proportionate to NTA costs and thus further weaken the ability of the RUG categories to predict NTA costs. Finally, the reduction in r-squared in moving from the previous payments (RUG-53) to current payments (RUG-IV) appears to reflect the parity adjustments in the current payment rates. Prior to the parity adjustment, the nursing payment rates at least reflected the relative nursing costs of the classification groups. After the parity adjustment, the relationship of payment rates to relative nursing costs was weakened as the parity adjustments reflected factors other than the relative nursing costs across categories.

Prediction of therapy costs. Payments under the alternative design would provide a modest improvement over current policy in their share of the variation in therapy costs explained. Relative payments based on the model of therapy costs explain 26 percent of the variation in costs. This is above the share explained by the current (RUG-IV) therapy payment rates (21 percent) and the previous (RUG-53) therapy rates (24 percent).

The finding that the current therapy payment weights have a weaker relationship to costs than the previous weights could result from either the change in the classification system or the changes in the weights assigned to payment groups. To investigate the source of the weaker relationship, we calculated the share of variance explained by therapy-cost-based weights under each system. The therapy-cost-based weights for RUG-IV categories explain 24 percent of the variation in therapy costs, substantially less than the 29 percent of the variation in costs explained by the cost-based weights for RUG-53.

The difference in predictive power for the RUG-IV and RUG-53 therapy-cost-based weights indicates that the reduced ability to predict therapy results from the reassignment of days to different payment categories. The most likely source of the weakened predictive ability is the reassignment of days that qualified under RUG-53 for case-mix-adjusted therapy payments to non-rehabilitation categories under RUG-IV that paid the non-case-mix-adjusted rate. For example, seventeen percent of stays categorized under RUG-53 as "rehabilitation therapy and extensive services" were assigned to a non-case-mix-adjusted special care category under RUG-IV. These reassignments occurred because under RUG-IV, several nontherapy case-mix groups have very high payments. Cases that could qualify for both a nontherapy and rehabilitation case-mix group will now classify into the higher-payment nontherapy case-mix group. As a result of such reassignments, the relationship between the categories and therapy costs is weaker under current policy than it was under the previous payment system.

Analysis of the Proportionality of Payments and Costs

Nontherapy ancillaries. Analysis of facility payments and costs indicates that the alternative PPS design would substantially improve the targeting of payments to costs as compared with current (RUG-IV) payments. Under the alternative PPS design, NTA payments would be nearly proportional to costs, with a CMI coefficient of 1.08 indicating that a one percent increase in the case-mix index of a facility is associated with a 1.08 percent increase in costs (Table 5). This payment equation explains 41 percent of the

variation in costs across facilities. In contrast, for the current Medicare payments, the CMI coefficient is 0.61. This indicates that the facilities receiving the highest payments tend to be overpaid and facilities receiving the lowest payments tend to be underpaid. For discussion purposes, this means that payments are decompressed relative to costs. The equation explains only 4 percent of variation in costs across facilities.

The finding of decompression of payments for the current (RUG-IV) payment system is in contrast to a finding of moderate compression of payments for the previous (RUG-53) payment system. For the previous payment system, the CMI coefficient is 1.28. This means that under the previous payment system, on average, facilities receiving the highest average payments were underpaid, while those receiving low payments facilities were overpaid. The payment equation for the previous system explains nearly 13 percent of the variation in NTA costs across facilities.[11]

The switch from compression to decompression of payments is in line with what we observe for the costs of the facilities with highest and lowest payments under each system. In the previous system, the average NTA cost per day was $109 for facilities in the top five percent of nursing payments and $48 for facilities in the bottom five percent of payments. In the current system, this has narrowed dramatically, with an average NTA cost per day of $68 for facilities in the top 5 percent of payments and $66 for facilities in the bottom five percent. Thus the payments are decompressed relative to costs.

The switch to decompression of payments results from the way in which the current payment system changed the classification group eligibility (especially the rules tightening the qualification for the categories including the highly-paid extensive services categories), the rates paid to each group (especially the parity adjustments that significantly lowered nursing payments for rehabilitation case-mix groups and raised payments for medically complex groups), and thus the payments to each facility.[12] Facilities with a large share of stays that qualified for both extensive services and rehabilitation therapy under the previous classification system tended to have their payments reduced as a result of tightened eligibility for the extensive services payment categories. Such generally high-cost facilities moved from receiving among the highest payments to receiving moderate payments, with their place in the top of the distribution of payments replaced by facilities with more moderate costs.[13, 14] As a result of this shuffling of the relative payments of facilities, the vast majority of high cost facilities

[11] Our earlier work using 2003 beneficiaries found substantially more compression of the RUG-53 payments than found using the 2007 data. In the earlier data, the coefficient on CMI for RUG-53 was 2.34 (as compared to 1.28 in Table 5).

[12] Under the previous payment system, 29 percent of stays were assigned to a rehabilitation and extensive service payment category. Under the current system, 2 percent of those stays remained in an extensive service category, 73 percent were assigned to rehabilitation only; 21 percent were assigned to a medically-complex category, and 4 percent were assigned to a reduced-function category.

[13] The rank correlation of nursing payments under the two systems is 0.52, indicating substantial shuffling of relative payments.

[14] Overall, the current payment system pays high payments (in the top 5 percent of payments to all facilities) to only 15 percent of high-cost facilities (defined as being in the top 5 percent of costs); this contrasts with 41 percent of such facilities receiving high payments under the previous system.

receive moderate payments and many of the facilities receiving high payments have only moderate costs. The statistical analysis of the relationship between payments and costs then indicates decompression of payments relative to costs: Increasing payments is associated with less than a proportionate increase in costs.

Therapy. The therapy CMI analysis indicates that therapy payments based on the alternative PPS design would substantially improve the extent to which case-mix-adjusted therapy payments would mirror facilities' therapy costs. Under the alternative PPS, therapy payments show only minor compression (CMI coefficient=1.11), with a one percent increase in the therapy case-mix index of a facility associated with a 1.11 percent increase in costs. In contrast, the CMI based on current (RUG-IV) payment rates shows substantial decompression: The CMI coefficient of 0.43 indicates that facilities with high therapy payments are overpaid for therapy in the current system. This is expected to provide an incentive for facilities to overprovide therapy. The rates from the previous (RUG-53) PPS show only slightly less decompression of payments (CMI coefficient=0.56).

Intuitively, one might expect that the r-squared statistic would be higher when the unit of analysis is the facility rather than the stay, since the facility regression is based on the averages of somewhat noisy data across the stays within each facility. However, as shown in table 4 (stay-level analyses) and table 5 (facility-level analyses), the shares of variance explained (that is, the r-squared statistics) are considerably lower in the facility equation than in the corresponding stay equation for each payment system. For example, current Medicare payments explain 21 percent of the variance in per day therapy costs across stays as compared with 5 percent of the variation of average therapy costs across facilities.

We investigated why the share of the variation in facility therapy costs explained by average facility therapy payments (i.e., the CMI) is much less than the share of stay therapy costs explained by stay therapy payments. This is equivalent to asking why the correlation between costs and payments is much lower when the unit of analysis is the facility than when the unit of analysis is the stay.

As an example, we focus on therapy payments under the current PPS. For stays, therapy costs and payments are correlated because beneficiaries with low therapy payments (and little or no therapy) tend to have low therapy costs and beneficiaries with high payments tend to have high costs. For facilities, our data are average costs per facility and average payments per facility. The correlation between facility costs and payments is partly weaker because averaging costs across stays to the facility and payments across stays to the facility eliminates much of the variation in payments that distinguished high and low cost stays. The variance of per day therapy payments across stays is $4742; the variance across facilities is $1368. In contrast, the variances in costs across stays and facilities differ by a more modest amount: $2143 across stays and $1095 across facilities. The relative stability of the variance in costs suggests that facility-specific factors – e.g., cost structure, cost-charge ratios, and extent of concurrent/group therapy, etc. – may be responsible for the relatively small reduction in the variance in costs when estimation is

at the facility level. The low r-squared in the facility cost model suggests that these factors are not strongly associated with the reasons that average payments vary across facilities.[15]

Comparison of aggregate payments under the alternative PPS design and current policy

The alternative PPS design would redistribute payments across types of cases and the facilities that treat them. Aggregate payments would be directed away from SNFs with high shares of rehabilitation patients and toward SNFs treating high shares of patients requiring special care or complex services patients and low shares of rehabilitation cases. Based on their mix of patients and services, aggregate payments to hospital-based and non-profit facilities are projected to increase substantially, accompanied by small reductions in aggregate payments to free standing and for-profit facilities.

The impacts of an alternative PPS design on payments are reported in Table 6. As reported in the first panel, under the alternative PPS design aggregate payments to the 10 percent of facilities with the highest shares of rehabilitation patients are estimated to drop by a 7.4 percent (payment ratio=0.926); payments to the 10 percent of facilities with the fewest rehabilitation patients would increase by 16.4 percent. Payments to facilities with the largest shares of rehabilitation patients classified in the two minor rehabilitation categories requiring the most therapy time (ultra-high and very high rehab) are estimated to drop by 9.6 percent, while those to facilities with the fewest ultra-high or very high rehabilitation patients would increase by 25.7 percent. Payments would increase by 17.3 percent to facilities with the largest shares of special care patients and 17.5 percent to facilities with the largest shares of clinically complex patients.

The simulated shifts in aggregate payments are strongly related to facility costs and current payments. Payments would increase by 18.3 percent for the facilities with the highest NTA costs per day, paid for by a 0.9 percent reduction in payments to facilities with lower NTA costs. Payments would also increase by 24 percent for facilities ranked in the bottom 10th percentile ranked by average current payments accompanied by a decrease of 6.5 percent in payments for facilities with above median current payments. Payment ratios for facilities grouped by average ancillary costs, and by average payments under the alternative PPS are reported in the table.

The alternative design PPS would increase payments to hospital-based facilities by 27.4 percent, accompanied by a 1.5 percent reduction in payments to free-standing facilities. Facilities in urban and rural areas would maintain their shares of payments. Non-profit facilities would have a 7.8 percent increase in payments; payments to government-owned

[15] A side analysis makes clear that the variation in payments within facility is driving our overall ability to predict stay-level costs. We estimated two regression models of therapy costs. In the first, we related per day therapy costs on the average per day payments for the facility (pbar). In the second, we regress cost on the difference between the payment for a stay and the average payment for the facility (p – pbar). Average facility payments (pbar) explain 1 percent of the variation in costs, while the deviation of payments from the facility average (p – pbar) explains 22 percent of the variation in costs.

facilities would increase by 8.3 percent; and payments to for-profit facilities would fall by 2.1 percent.

The patterns of the findings approximately match those reported to Congress in 2008, despite the more recent data, revised models, and changes CMS has made to SNF payments. Although the exact magnitudes vary, the groups of facilities with a large increase in the previous work continue to show a large increase here. For instance, in the current data, facilities with the highest NTA costs have an aggregate increase in payments of 18 percent; in the previous study, such facilities had an aggregate increase of 23 percent. The primary differences relate to the reclassification of patients from the extensive services categories to special care and clinically complex categories.

Distribution of impacts of the alternative PPS design on payments compared with current policy

The distribution of the size of the change in payments across facilities is reported in Table 7. Overall, payments to 36 percent of all facilities would increase by more than 5 percent, while payments to 26 percent of facilities would decrease by more than 5 percent (line 1).

The effect of the alternative PPS design on individual SNFs would vary depending on the SNF patient mix and treatment patterns. For example, although aggregate payments to facilities with the highest shares of rehabilitation patients would drop by 7 percent, 27 percent of those facilities would have the same or higher payments and 17 percent would have payments drop by less than 5 percent. Distributions by patient mix, facility costs and payments, and facility type and size are provided in the table, (not discussed in the text).

Summary

The work described in this memo was undertaken to assess whether the revisions CMS made to the RUG case-mix categories and weights had addressed the problems in the SNF PPS.

Nontherapy ancillary costs

Problem. Nontherapy ancillary costs were folded in with nursing costs and paid using the nursing case-mix weights. Under the previous (RUG-53) PPS, the nursing weights were only weakly related to NTA costs. In addition, facility-level analysis showed evidence of compression of the RUG-53 weights, indicating underpayment of facilities with a high case-mix index.

Effect of RUG revision. After the revision of payment categories and Medicare weights, the nursing case mix weights continue to have a weak relationship to NTA costs. The facility case-mix index analysis shows that the current nursing case-mix weights predict very little of the variation in NTA costs across facilities and that they are decompressed relative to costs. The alternative design substantially outperforms the current nursing

case-mix weights in its ability to explain variation in nontherapy ancillary costs. Compared to current policy, the payments under the alternative design are closer to being proportional to NTA costs and explain a much greater share of the variance in these costs across facilities.

Therapy costs

Problem. Medicare therapy payments were based on the level of therapy services provided. The facility-level analysis showed evidence that the RUG-53 therapy payment weights are decompressed relative to costs, indicating overpayment of facilities with a high case-mix index.

Effect of RUG revision. After the introduction of the current payment categories, the payment rates continue to be based on therapy services provided. The facility case mix index analysis shows that current therapy payments are decompressed relative to costs. Compared with current policy, the alternative PPS design would explain a slightly higher share of variation in therapy costs and would yield facility payments that are closer to being proportional to therapy costs.

Payment impacts

The alternative PPS would shift payments from facilities with high shares of rehabilitation therapy patients toward facilities with high shares of special care and clinically complex patients and toward the types of facilities that specialize in such patients. In general, the shifts are quite similar to those observed in earlier work when the alternative was compared to the PPS with the previous Medicare payment weights.

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Figure 1. Predicted Per Diem Therapy and NTA Costs by Age

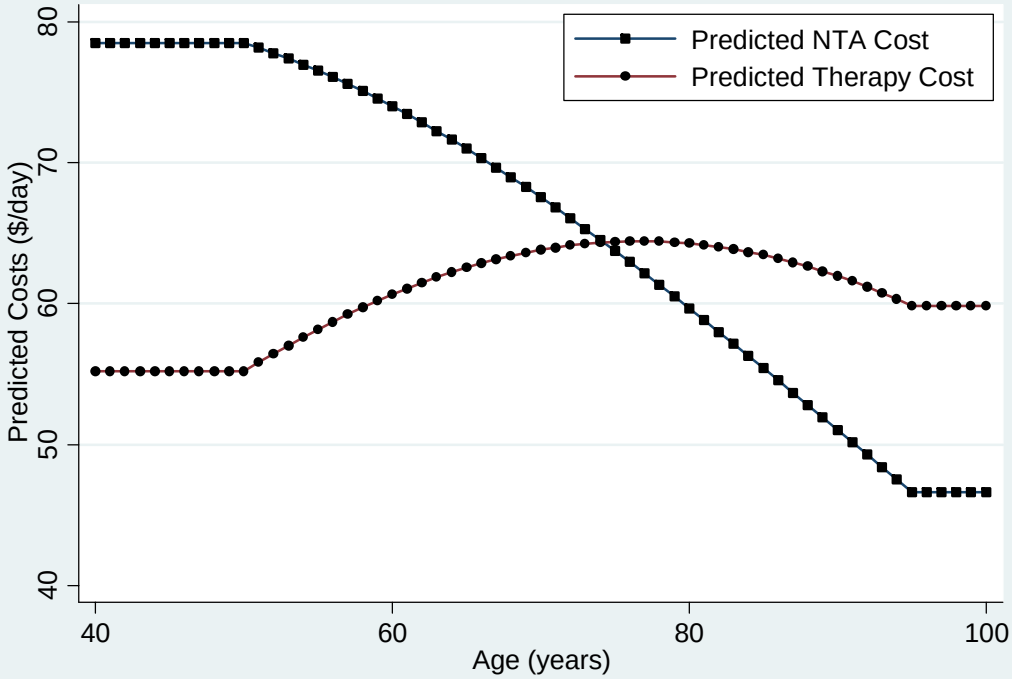

Table 1. Summary Statistics of Variables Used in the Stay-Level Regression Models

	Mean	Standard Deviation
Patient age		
Age - 50 , capped at 45 = 95 – 50,	29.78	9.96
Age - 50, capped at 45 = 95 – 50, squared	985.8	525.7
SNF care		
IV medication furnished	0.045	0.195
Respiratory care	0.020	0.135
IV medication and respiratory care	0.004	0.058
Chemotherapy	0.007	0.078
Serious skin ulcer (stage 4)	0.037	0.179
Swallowing problem	0.192	0.389
Hospice Program	0.005	0.067
Cognitive performance scale score		
Moderate severe impairment	0.052	0.213
Severe impairment	0.031	0.166
Very severe impairment	0.037	0.182
Ability to perform activities of daily living		
Locomotion on unit		
Supervision	0.110	0.296
Limited assistance	0.240	0.402
Extensive assistance	0.240	0.402
Total dependence	0.240	0.410
Did not occur	0.037	0.181
Assistance with eating		
Supervision	0.227	0.399
Limited assistance	0.102	0.282
Extensive assistance	0.083	0.259
Total dependence or did not occur	0.090	0.278
Transfer to/from bed, chair, wheelchair, or standing position		
Supervision	0.077	0.252
Limited assistance	0.292	0.427
Extensive assistance	0.414	0.466
Total dependence	0.131	0.323
Did not occur	0.010	0.095
Diagnoses		
Cerebral hemorrhage and effects of stroke	0.120	0.319
COPD	0.160	0.367
Diabetes (MDS)	0.332	0.468
Dementia with depression or behavioral disturbance	0.016	0.123

Table 1. Summary Statistics of Variables Used in the Stay-Level Regression Models (continued)

	Mean	Standard Deviation
Dementia, cerebral degeneration	0.139	0.338
Hemeplegia	0.062	0.238
Hip fracture	0.039	0.191
HIV	0.002	0.039
Infectious and parasitic diseases	0.055	0.220
Joint replacement, aftercare	0.034	0.180
Malnutrition (MDS)	0.015	0.121
Mononeuropathy, other abnormal movement disorders	0.011	0.100
Musculoskeletal and connective tissue disorders, other	0.294	0.444
Parkinson's disease	0.029	0.167
Pelvic fracture	0.011	0.100
Pneumonia (MDS)	0.100	0.282
Polyneuropathy, except diabetic	0.015	0.116
Quadriplegia, other extensive paralysis and spinal cord injuries	0.008	0.089
Renal failure	0.083	0.271
Respiratory failure	0.023	0.148
Vertebrae and spinal disk disorders	0.058	0.231
Vertebral fractures without spinal cord injury	0.012	0.106
Nursing Case Mix (RUG-53)	1.077	0.272
RUG-53 category indicates rehab. or rehab. + extensive services	0.847	0.332
Length-of-stay proxy (share of stay days with each assessment)		
First	0.381	0.435
Second	0.343	0.397
Third	0.189	0.296
Readmission	0.022	0.106
N=627,332		

Note: Length of stay proxy is the share of the stays days associated with the given assessment.
Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.

Table 2. Comparison of Modeled Assignment of Days and Actual Distributions in FY2011.

	Modeled assignment of RUG categories	Published assignment of RUG categories, FY 2011
Major RUG categories		
Rehabilitation plus extensive services	0.7%	2.4%
Rehabilitation only	76.4	89.5
Extensive services	0.6	0.6
Special care	12.6	4.0
Clinical complex care	3.3	2.1
Behavior symptoms and cognitive performance	1.3	0.3
Reduced function	5.2	1.2
Minor RUG rehabilitation categories		
Ultra-High Rehabilitation (≥ 720 therapy minutes/week)	23.2%	46.2%
Very-High Rehabilitation (500 – 719 therapy minutes/week)	28.3	27.3
High Rehabilitation (325 – 499 therapy minutes/week)	14.4	10.9
Medium Rehabilitation (150 – 324 therapy minutes/week)	11.1	7.4
Low Rehabilitation (45 – 149 therapy minutes/week)	0.1	0.1

Note: Distribution of simulated RUG-IV categories based on sample of 2007 stays.
Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.

Table 3. Coefficients in NTA and Therapy Models, with Test Statistics in Italics

	NTA Costs		Therapy Costs	
	Coefficient	% change	Coefficient	% change
Patient age				
Age - 50, capped at 45 = 95 – 50	**-0.0043**	**-0.43**	**0.0116**	**1.17**
	-6.38		*22.4*	
Age - 50, capped at 45 = 95 – 50, squared	**-0.0002**	**-0.016**	**-0.000218**	**-0.02**
	-13.17		*-24.3*	
SNF care				
IV medication furnished	**0.724**	**106.31**	**0.130**	**13.78**
	62.84		*9.43*	
Respiratory care	**0.586**	**79.69**	**0.119**	**12.61**
	32.93		*7.30*	
IV medication and respiratory care	**-0.254**	**-22.42**	**0.053**	**5.43**
	-10.34		*1.93*	
Chemotherapy	**0.320**	**37.65**	**-0.108**	**-10.25**
	18.02		*-8.97*	
Serious skin ulcer (stage 4)	**0.173**	**18.88**	**-0.034**	**-3.31**
	19.52		*-4.69*	
Swallowing problem	**0.025**	**2.49**	**0.116**	**12.34**
	4.83		*24.83*	
Hospice Program	**-0.030**	**-2.99**	**-0.249**	**-22.05**
	-1.03		*-11.49*	
Cognitive performance scale score				
Moderate severe impairment	**-0.090**	**-8.60**	**-0.060**	**-5.84**
	-10.38		*-8.40*	
Severe impairment	**-0.078**	**-7.54**	**-0.097**	**-9.23**
	-7.25		*-10.42*	
Very severe impairment	**-0.177**	**-16.22**	**-0.198**	**-17.93**
	-14.06		*-17.33*	
Ability to perform activities of daily living				
Locomotion on unit				
Supervision	**0.004**	**0.37**	**0.060**	**6.20**
	0.39		*6.43*	
Limited assistance	**0.033**	**3.35**	**0.100**	**10.54**
	3.82		*10.85*	
Extensive assistance	**0.053**	**5.41**	**0.075**	**7.78**
	5.34		*6.83*	
Total dependence	**0.135**	**14.47**	**0.056**	**5.79**
	10.41		*4.39*	
Did not occur	**0.291**	**33.81**	**0.069**	**7.18**
	16.72		*3.46*	

Table 3. Coefficients in NTA and Therapy Models, with Test Statistics in Italics (continued)

	NTA Costs		Therapy Costs	
	Coefficient	% change	Coefficient	% change
Assistance with eating				
Supervision	**-0.007**	**-0.72**	**-0.034**	**-3.33**
	-0.83		*-3.44*	
Limited assistance	**-0.005**	**-0.51**	**-0.022**	**-2.21**
	-0.51		*-2.20*	
Extensive assistance	**-0.013**	**-1.27**	**-0.059**	**-5.74**
	-1.26		*-5.73*	
Total dependence or did not occur	**0.051**	**5.23**	**-0.037**	**-3.62**
	4.74		*-3.60*	
Transfer to/from bed, chair, wheelchair, or standing position				
Supervision	**-0.013**	**-1.27**	**0.117**	**12.44**
	-1.33		*12.18*	
Limited assistance	**-0.110**	**-10.45**	**0.186**	**20.40**
	-11.48		*19.60*	
Extensive assistance	**-0.121**	**-11.39**	**0.160**	**17.36**
	-11.18		*14.30*	
Total dependence	**-0.117**	**-11.08**	**0.052**	**5.38**
	-8.40		*3.61*	
Did not occur	**-0.143**	**-13.28**	**-0.231**	**-20.64**
	-6.16		*-8.68*	
Diagnoses				
Cerebral hemorrhage and effects of stroke	**-0.056**	**-5.41**	**0.094**	**9.88**
	-9.73		*21.99*	
COPD	**0.180**	**19.69**	**-0.008**	**-0.77**
	33.87		*-2.10*	
Diabetes (MDS)	**0.162**	**17.57**	**-0.012**	**-1.24**
	47.94		*-5.57*	
Dementia with depression or behavioral disturbance	**-0.046**	**-4.45**	**-0.131**	**-12.31**
	-3.46		*-10.34*	
Dementia, cerebral degeneration	**-0.081**	**-7.76**	**-0.047**	**-4.55**
	-14.06		*-9.49*	
Hemiplegia	**-0.091**	**-8.67**	**0.068**	**7.07**
	-12.41		*10.94*	
Hip fracture	**0.050**	**5.13**	**0.074**	**7.66**
	5.47		*9.54*	
HIV	**0.306**	**35.76**	**-0.091**	**-8.71**
	6.72		*-2.98*	
Infectious and parasitic diseases	**0.184**	**20.18**	**0.034**	**3.50**
	23.95		*5.20*	
Joint replacement, aftercare	**-0.043**	**-4.20**	**0.291**	**33.82**
	-2.41		*15.81*	
Malnutrition (MDS)	**0.147**	**15.82**	**0.076**	**7.89**
	9.05		*5.64*	

Table 3. Coefficients in NTA and Therapy Models, with Test Statistics in Italics (continued)

	NTA Costs		Therapy Costs	
	Coefficient	% change	Coefficient	% change
Mononeuropathy, other abnormal movement disorders	**0.013**	**1.34**	**0.019**	**1.87**
	1.02		*2.12*	
Musculoskeletal and connective tissue disorders, other	**-0.024**	**-2.37**	**0.020**	**2.02**
	-3.97		*3.19*	
Parkinson's disease	**0.003**	**0.33**	**0.031**	**3.14**
	0.40		*5.71*	
Pelvic fracture	**-0.009**	**-0.85**	**0.053**	**5.41**
	-0.61		*6.27*	
Pneumonia (MDS)	**0.113**	**11.98**	**-0.039**	**-3.82**
	19.41		*-8.38*	
Polyneuropathy, except diabetic	**0.093**	**9.71**	**0.045**	**4.58**
	7.73		*5.73*	
Quadriplegia, other extensive paralysis and spinal cord injuries	**0.023**	**2.30**	**-0.044**	**-4.33**
	1.36		*-4.23*	
Renal failure	**0.113**	**11.97**	**-0.008**	**-0.75**
	15.60		*-1.39*	
Respiratory failure	**0.162**	**17.55**	**0.017**	**1.75**
	11.79		*1.94*	
Vertebrae and spinal disk disorders	**-0.058**	**-5.61**	**0.079**	**8.22**
	-6.76		*8.12*	
Vertebral fractures without spinal cord injury	**0.055**	**5.69**	**0.014**	**1.43**
	4.16		*1.72*	
Nursing Case Mix	**0.325**	**38.36**	**-0.218**	**-19.60**
	24.21		*-14.86*	
Broad RUG Category				
Rehab. only or rehab. plus extensive services	**-0.070**	**-6.74**	**1.696**	**445.33**
	-7.09		*64.57*	
Length-of-stay proxy (share of stay days with each assessment)				
First	**0.650**	**91.65**	**0.191**	**21.09**
	60.97		*16.02*	
Second	**0.313**	**36.78**	**0.131**	**14.01**
	31.49		*12.80*	
Third	**0.164**	**17.79**	**0.057**	**5.91**
	16.43		*6.16*	
Readmission	**0.565**	**75.98**	**-0.005**	**-0.51**
	30.69		*-0.29*	
Constant	**3.493**		**2.326**	
	197.19		*93.2*	
N = 627,332				

Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.

Table 4: Ability to Predict Per-Day Costs for Stays: Estimated R-squared Statistics of Alternative, Current (RUG-IV), and Past (RUG-53) PPS Designs

	NTA	Therapy
Alternative PPS design	0.208	0.257
Current case mix groups (RUG-IV)		
Payment rates	0.012	0.210
Average cost by case mix group	0.066	0.242
Past case-mix groups (RUG-53)		
Payment rates	0.044	0.242
Average cost by case mix group	0.069	0.289
N= 627,332 stays		

Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.

Table 5: Facility CMI Coefficients for Alternative, Current (RUG-IV) and Past (RUG-53) PPS Designs for NTA and Therapy

	Alternative PPS Design	Current (RUG-IV)	Past (RUG-53)
Non-therapy ancillaries			
Coefficient on CMI	1.079	0.608	1.283
p-value	0.0004	0.0	0.0001
R-squared	0.407	0.0379	0.1247
Number of facilities	9854	9854	9854
Therapy			
Coefficient on CMI	1.114	0.427	0.564
p-value	0.0008	0.0	0.0
R-squared	0.1339	0.0528	0.068
Number of facilities	9847	9847	9847

Notes: CMI (Case mix index). A CMI coefficient of 1.0 indicates that facility payments are proportional to facility costs. p-value is the probability that the payments are proportional to costs (i.e., coefficient=1). Coefficient R-squared indicates the share of average facility costs explained by the prediction from the log regression model.

Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.

Table 6: Aggregate Impacts of Alternative PPS Relative to Current Policy for Key Subgroups of Facilities

	Alternative PPS Payment Relative to Current Medicare Payments	N Facilities	N Stays
All facilities	**1.000**	9857	627332
Facility case mix			
% in a Rehabilitation RUG-IV category			
Lowest 10 percent of facilities	**1.164**	985	43728
10th to 25th percentile	**1.067**	1479	87203
25th to 50th percentile	**1.017**	2464	161600
50th to 75th percentile	**0.982**	2463	172737
75th to 90th percentile	**0.957**	1479	105866
Highest 10 percentile	**0.926**	986	56170
% in Rehabilitation Only RUG-IV category			
Lowest 10 percent of facilities	**1.164**	985	44329
10th to 25th percentile	**1.065**	1479	86514
25th to 50th percentile	**1.017**	2464	162973
50th to 75th percentile	**0.982**	2464	172032
75th to 90th percentile	**0.955**	1479	107766
Highest 10 percentile	**0.928**	986	53718
% in an Ultra High or Very High Rehab RUG-IV category			
Lowest 10 percent of facilities	**1.257**	985	38629
10th to 25th percentile	**1.153**	1479	82190
25th to 50th percentile	**1.039**	2464	147569
50th to 75th percentile	**0.977**	2464	168619
75th to 90th percentile	**0.938**	1479	115015
Highest 10 percentile	**0.904**	986	75310
% in a Special Care (High or Low) RUG-IV category			
Lowest 10 percent facilities	**0.930**	985	39130
10th to 25th percentile	**0.947**	1479	100304
25th to 50th percentile	**0.975**	2464	175598
50th to 75th percentile	**1.016**	2464	172855
75th to 90th percentile	**1.064**	1479	87630
Highest 10 percentile	**1.173**	986	51815
% in a Clinically Complex RUG-IV category			
Lowest 25 percent of facilities	**0.956**	2464	115693
25th to 50th percentile	**0.976**	2464	192350
50th to 75th percentile	**1.007**	2464	180558
75th to 90th percentile	**1.051**	1479	90889
Highest 10 percentile	**1.175**	986	47842

Table 6: Aggregate Impacts of Revised PPS Relative to Current Policy (continued)

	Payment Ratio	N Facilities	N Stays
Facility Costs and Payments			
Ancillary per diem costs			
Lowest 10 percent of facilities	**1.022**	985	42180
10th to 25th percentile	**0.993**	1479	79557
25th to 50th percentile	**0.985**	2464	163677
50th to 75th percentile	**0.979**	2464	168089
75th to 90th percentile	**0.985**	1479	100725
Highest 10 percentile	**1.162**	986	73104
NTA per diem costs			
Lowest 10 percent of facilities	**0.991**	985	44144
10th to 25th percentile	**0.975**	1479	88338
25th to 50th percentile	**0.976**	2464	166264
50th to 75th percentile	**0.987**	2464	165958
75th to 90th percentile	**1.016**	1479	92069
Highest 10 percentile	**1.183**	986	70559
Average current payment			
Lowest 10 percent of facilities	**1.240**	985	35992
10th to 25th percentile	**1.123**	1479	71697
25th to 50th percentile	**1.028**	2464	139499
50th to 75th percentile	**0.988**	2464	175102
75th to 90th percentile	**0.961**	1479	121408
Highest 10 percentile	**0.935**	986	83634
Average alternative PPS total payment			
Lowest 10 percent of facilities	**1.006**	985	31385
10th to 25th percentile	**0.985**	1479	63283
25th to 50th percentile	**0.981**	2464	136741
50th to 75th percentile	**0.989**	2464	177716
75th to 90th percentile	**1.012**	1479	124219
Highest 10 percentile	**1.045**	986	93988
Average alternative PPS payment for ancillary services			
Lowest 10 percent of facilities	**0.987**	985	34234
10th to 25th percentile	**0.974**	1479	69865
25th to 50th percentile	**0.976**	2464	132673
50th to 75th percentile	**0.989**	2464	166937
75th to 90th percentile	**1.006**	1479	124242
Highest 10 percentile	**1.093**	986	99381

Table 6: Aggregate Impacts of Revised PPS Relative to Current Policy (continued)

	Payment Ratio	N Facilities	N Stays
Facility Characteristics			
Free-standing /hospital-based			
Free-standing	**0.985**	9072	559942
Hospital-based	**1.274**	785	67390
Rural/urban			
Rural	**1.018**	2886	117036
Urban	**0.996**	6971	510296
Urban/rural and free-standing/hospital-based			
Rural/free-standing	**0.997**	2554	99643
Rural/hospital-based	**1.275**	332	17393
Urban/free-standing	**0.983**	6518	460299
Urban/hospital-based	**1.274**	453	49997
Ownership status (POS)			
Non-profit	**1.078**	2247	153192
For-profit	**0.979**	7177	451136
Government owned	**1.084**	433	23004
Number of SNF beds			
Fewer than 10 beds	**1.207**	56	1659
10 to 24 beds	**1.224**	495	34195
25 to 49 beds	**1.104**	1007	49635
50 to 99 beds	**0.995**	3455	146668
100 to 199 beds	**0.977**	4261	326592
200 to 399 beds	**1.009**	540	61637
More than 400 beds	**1.069**	42	6870
Division of country			
New England	**0.990**	567	39639
Mid-Atlantic	**1.035**	1125	97400
South Atlantic	**1.001**	1409	96872
E. South Central	**1.055**	1403	54785
W. South Central	**0.974**	1545	124973
E. North Central	**0.985**	462	28867
W. North Central	**0.970**	1137	54997
Mountain	**1.014**	260	12404
Pacific	**1.027**	652	42226

Note: PPS (Prospective Payment System). Revisions to the SNF PPS include a new NTA component, a revised therapy component, and an outlier policy for stays with exceptionally high ancillary costs. Payment ratio is the dollars paid to the set of facilities indicated in the row under the revised PPS divided by the dollars paid using the RUG-IV payment rates.

Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.

Table 7: Distribution of Size of Facility Ratios of Alternative PPS Payments to Current Payments, By Category

		Lower by					Higher by			
	N	>= 25%	10 to 25%	5 to 10%	1 to 5%	-1 to +1 %	1 to 5%	5 to 10%	10 to 25%	>= 25%
All	9857	0%	10%	16%	16%	8%	13%	12%	17%	7%
Facility case mix										
% in Rehab RUG-IV Category										
Lowest 10 percent	985	0%	1%	2%	5%	4%	11%	17%	36%	24%
10th to 25th percentile	1479	0%	2%	8%	11%	7%	14%	17%	30%	12%
25th to 50th percentile	2464	0%	5%	13%	18%	9%	16%	14%	20%	5%
50th to 75th percentile	2463	0%	10%	21%	20%	9%	15%	11%	11%	2%
75th to 90th percentile	1479	0%	17%	26%	21%	8%	11%	9%	7%	2%
Highest 10 percentile	986	0%	31%	26%	17%	6%	8%	6%	5%	2%
% in Rehab Only RUG-IV Category										
Lowest 10 percent	985	0%	1%	2%	5%	5%	11%	17%	36%	24%
10th to 25th percentile	1479	0%	2%	8%	11%	7%	14%	17%	30%	12%
25th to 50th percentile	2464	0%	5%	13%	18%	9%	16%	14%	19%	5%
50th to 75th percentile	2464	0%	10%	21%	19%	9%	15%	11%	12%	2%
75th to 90th percentile	1479	0%	17%	25%	21%	8%	11%	8%	7%	2%
Highest 10 percentile	986	0%	29%	26%	18%	6%	8%	6%	5%	2%
% in an Ultra High or Very High Rehab RUG-IV Category										
Lowest 10 percent	985	0%	0%	1%	1%	1%	3%	9%	51%	36%
10th to 25th percentile	1479	0%	0%	0%	1%	2%	9%	23%	49%	15%
25th to 50th percentile	2464	0%	1%	5%	15%	12%	27%	23%	16%	2%
50th to 75th percentile	2464	0%	6%	24%	30%	13%	16%	7%	3%	1%
75th to 90th percentile	1479	0%	22%	38%	25%	6%	6%	2%	1%	0%
Highest 10 percentile	986	0%	47%	32%	13%	2%	3%	1%	1%	0%

Table 7: Distribution of Size of Facility Ratios of Alternative to Current Payments, By Category (continued)

	N	Lower by >= 25%	Lower by 10 to 25%	Lower by 5 to 10%	Lower by 1 to 5%	-1 to +1 %	Higher by 1 to 5%	Higher by 5 to 10%	Higher by 10 to 25%	Higher by >= 25%
Facility case mix (continued)										
% in a Special Care (High or Low) RUG-IV Category										
Lowest 10 percent of facilities	985	0%	24%	22%	15%	6%	8%	8%	11%	6%
10th to 25th percentile	1479	0%	19%	27%	19%	7%	11%	7%	9%	2%
25th to 50th percentile	2464	0%	11%	21%	21%	9%	13%	10%	11%	3%
50th to 75th percentile	2464	0%	5%	14%	18%	10%	17%	15%	18%	5%
75th to 90th percentile	1479	0%	2%	7%	11%	7%	17%	18%	28%	9%
Highest 10 percentile	986	0%	1%	3%	6%	4%	10%	17%	35%	25%
% in a Clinically Complex RUG-IV Category										
Lowest 25th percentile of facilities	2464	0%	18%	22%	17%	7%	10%	10%	12%	4%
25th to 50th percentile	2464	0%	12%	22%	20%	9%	14%	11%	11%	2%
50th to 75th percentile	2464	0%	7%	15%	18%	9%	16%	13%	18%	5%
75th to 90th percentile	1479	0%	3%	9%	14%	8%	16%	17%	25%	8%
Highest 10 percentile	986	0%	1%	3%	5%	3%	12%	15%	36%	26%
Facility Costs and Payments										
Ancillary per diem costs										
Lowest 10 percent of facilities	985	0%	5%	11%	15%	9%	15%	17%	25%	4%
10th to 25th percentile	1479	0%	8%	17%	18%	9%	16%	14%	16%	3%
25th to 50th percentile	2464	0%	9%	18%	18%	9%	15%	13%	16%	2%
50th to 75th percentile	2464	0%	12%	19%	18%	8%	14%	12%	15%	3%
75th to 90th percentile	1479	0%	13%	18%	16%	6%	12%	12%	16%	5%
Highest 10 percentile	986	0%	6%	8%	8%	4%	7%	8%	20%	39%
NTA costs per diem										
Lowest 10 percent of facilities	985	0%	10%	15%	15%	6%	12%	13%	23%	5%
10th to 25th percentile	1479	0%	13%	19%	18%	8%	14%	12%	14%	2%
25th to 50th percentile	2464	0%	12%	20%	18%	9%	13%	12%	14%	2%
50th to 75th percentile	2464	0%	10%	19%	18%	9%	15%	12%	15%	2%
75th to 90th percentile	1479	0%	6%	13%	18%	9%	15%	13%	22%	5%
Highest 10 percentile	986	0%	2%	4%	8%	3%	8%	11%	25%	39%

Table 7: Distribution of Size of Facility Ratios of Alternative to Current Payments, By Category (continued)

		Lower by					Higher by			
	N	>= 25%	10 to 25%	5 to 10%	1 to 5%	-1 to +1 %	1 to 5%	5 to 10%	10 to 25%	>= 25%
Facility Costs and Payments (continued)										
Average current payment										
Lowest 10 percent of facilities	985	0%	0%	0%	1%	1%	5%	11%	50%	33%
10th to 25th percentile	1479	0%	0%	2%	6%	5%	14%	24%	35%	13%
25th to 50th percentile	2464	0%	2%	11%	21%	11%	20%	15%	17%	3%
50th to 75th percentile	2464	0%	12%	26%	21%	9%	13%	10%	8%	1%
75th to 90th percentile	1479	0%	21%	24%	21%	8%	13%	8%	4%	1%
Highest 10 percentile	986	0%	29%	32%	18%	5%	8%	3%	3%	2%
Average alternative PPS total payment										
Lowest 10 percent of facilities	985	0%	7%	12%	13%	7%	15%	17%	26%	4%
10th to 25th percentile	1479	0%	12%	15%	18%	8%	13%	13%	17%	4%
25th to 50th percentile	2464	0%	11%	19%	17%	8%	13%	12%	16%	4%
50th to 75th percentile	2464	0%	10%	17%	18%	9%	15%	11%	16%	5%
75th to 90th percentile	1479	0%	8%	15%	16%	8%	14%	13%	19%	8%
Highest 10 percentile	986	0%	9%	15%	13%	6%	11%	10%	13%	22%
Average alternative PPS payment for ancillary services										
Lowest 10 percent of facilities	985	0%	8%	14%	16%	8%	14%	17%	22%	1%
10th to 25th percentile	1479	0%	12%	19%	19%	8%	14%	11%	15%	2%
25th to 50th percentile	2464	0%	12%	19%	18%	8%	13%	12%	15%	3%
50th to 75th percentile	2464	0%	9%	17%	17%	9%	14%	12%	18%	4%
75th to 90th percentile	1479	0%	8%	15%	15%	8%	15%	13%	20%	7%
Highest 10 percentile	986	0%	5%	10%	11%	5%	10%	10%	17%	33%
Facility Characteristics										
Free-standing/Hospital-based										
Free standing	9072	0%	10%	18%	18%	8%	14%	13%	16%	3%
Hospital based	785	0%	0%	1%	3%	2%	5%	8%	30%	52%
Rural/Urban										
Rural	2886	0%	9%	12%	12%	6%	12%	13%	25%	10%
Urban	6971	0%	10%	18%	18%	9%	14%	12%	14%	5%

Table 7: Distribution of Size of Facility Ratios of Alternative to Current Payments, By Category (continued)

		Lower by					Higher by			
	N	>= 25%	10 to 25%	5 to 10%	1 to 5%	-1 to +1 %	1 to 5%	5 to 10%	10 to 25%	>= 25%
Facility Characteristics (continued)										
Urban/Rural and Free Standing/Hospital-based										
Rural/Free-Standing	2554	0%	10%	14%	14%	7%	13%	14%	23%	6%
Rural/Hospital-based	332	0%	0%	1%	3%	2%	4%	8%	38%	45%
Urban/Free-Standing	6518	0%	11%	19%	19%	9%	15%	12%	13%	1%
Urban/Hospital-based	453	0%	0%	0%	2%	2%	5%	8%	25%	58%
Ownership status (POS)										
Non-profit	2247	0%	5%	10%	11%	7%	12%	13%	27%	16%
For-Profit	7177	0%	12%	19%	18%	8%	14%	12%	14%	3%
Government Owned	433	0%	1%	8%	9%	6%	12%	14%	29%	21%
Number of SNF beds										
10 to 24 beds	495	0%	3%	7%	6%	3%	8%	8%	20%	45%
25 to 49 beds	1007	0%	5%	9%	12%	6%	11%	12%	27%	18%
50 to 99 beds	3455	0%	10%	15%	15%	7%	13%	14%	20%	5%
100 to 199 beds	4261	0%	12%	21%	20%	9%	14%	11%	12%	1%
200 to 399 beds	540	0%	7%	15%	17%	8%	17%	17%	18%	1%
More than 400 beds	42	0%	0%	10%	7%	7%	17%	19%	38%	2%
Division of Country										
New England	567	0%	7%	19%	20%	11%	17%	12%	13%	2%
Mid-Atlantic	1125	0%	5%	12%	17%	6%	12%	15%	27%	6%
South Atlantic	1409	0%	9%	17%	16%	8%	15%	11%	16%	8%
E. South Central	1403	0%	2%	8%	9%	6%	13%	16%	35%	12%
W. South Central	1545	0%	14%	19%	17%	9%	15%	11%	9%	4%
E. North Central	462	0%	17%	26%	19%	7%	11%	7%	5%	8%
W. North Central	1137	0%	16%	22%	21%	8%	11%	9%	9%	4%
Mountain	260	0%	8%	11%	11%	8%	9%	14%	24%	15%
Pacific	652	0%	8%	14%	13%	7%	15%	13%	19%	11%

Note: PPS (Prospective Payment System). Revisions to the SNF PPS include a new NTA component, a revised therapy component, and an outlier policy for stays with exceptionally high ancillary costs. Facility payment ratio is the dollars paid to a facility divided by the dollars paid using the current (RUG-IV) payment rates.

Source: Source: Urban Institute analysis of 2007 skilled nursing facility claims, cost reports and MDS records.