Medicare's Prospective Payment System for Inpatient Psychiatric Facilities at 15 Years

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

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Favorable Cost and Utilization Trends but It's Time for an Update

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Inpatient psychiatric facilities (IPFs) are freestanding hospitals or units within acute care hospitals that provide specialized psychiatric services. Medicare beneficiaries with serious mental illness or alcohol and drug-related problems may be admitted to IPFs for treatment of an acute mental illness crisis. The Medicare IPF benefit is intended to treat patients considered to be at risk to others or to themselves, either intentionally or because they are unable to care for themselves. For IPF services to be eligible for Medicare payment, a physician must certify that inpatient psychiatric services are required for treatment that could reasonably be expected to improve the patient's condition or for diagnostic study. According to the Medicare Payment Advisory Commission (MedPAC), in 2017, the total cost of IPF services for beneficiaries paid under traditional Medicare (i.e., excluding Medicare Advantage) was $3.9 billion. There were about 393,600 IPF stays made by Medicare beneficiaries, with 1,589 facilities submitting cost reports (MedPAC 2019).

Under the IPF prospective payment system (IPF-PPS), Medicare pays for IPF stays on a per diem basis. A per diem base rate is adjusted up or down depending on several factors, including principal diagnosis, certain medical comorbidities, patient age, and the day of stay. Payments are also adjusted for facility characteristics, including teaching status, rural location, the presence of an emergency department in the facility, and area wages.[1]

The IPF-PPS was implemented in 2005. Before 2005, IPFs has been paid according to reasonable costs at discharge, subject to limits established by the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). The introduction of the IPF-PPS may have altered the incentives faced by providers and potentially affected patterns of care. As compared with cost-based reimbursement, a per diem system would encourage providers to reduce their per diem costs but would not necessarily encourage longer or shorter stays since the IPF would receive additional payment (though at a declining rate) for each additional day of stay.

In this report, we use data from three years—2004, 2009, and 2014—to examine how Medicare enrollees' use of IPF services and the characteristics of IPFs have changed since the introduction of the IPF-PPS. We also examine whether there have been changes in events that occur before or after IPF stays that may indicate potential changes in the quality of services: use of acute inpatient services, emergency department use, and use of other IPF stays.

Also, we use the 2014 data to estimate an updated version of the regression model that Centers for Medicare and Medicaid Services (CMS) used to calculate its payment adjustment factors for the IPF-PPS. With limited exceptions, these payment adjustments have not been changed since the IPF-PPS was introduced. Although CMS has expressed interest in updating its regression model on several occasions, no update has occurred. One complicating factor, which CMS raised and we also observe, is that a large share of stays in recent data (20 percent or more) are missing information on ancillary charges and/or costs. We examine missing-value patterns for these data and consider what implications the missing data have for estimation of per diem cost models. Finally, we conduct analyses aimed at better understanding the relatively low variability of predicted costs across diagnosis related groups (DRGs) and comorbidity groups.

Our main findings are as follows:

- We find little sign of substantial changes in IPF costs or utilization from 2004 to 2014 following implementation of the IPF-PPS. IPF service costs increased by less than overall medical price inflation, and the number of IPF stays and providers decreased somewhat.
- We do not observe any adverse trends in the number of acute inpatient stays or IPF readmissions following the shift to the IPF-PPS. Use of emergency department (ED) visits increased before and after IPF stays, but this could reflect a broader trend of increased use of ED visits for Medicare enrollees.
- As CMS has also reported, we find evidence of substantial irregularities in the reporting of charges and costs for ancillary services. We show that estimates of updated payment weights vary somewhat depending on how likely erroneous ancillary cost data are treated.
- Our attempt to replicate the IPF cost regression model with more recent (2014) data shows meaningful differences between the payment weights that continue to be used based on 2002 data and what the payment weight would be based on more recent data.
- Specific issues with the payment weights that had been raised in earlier work continue to raise concerns including underestimation of the payment weight for oncology treatment, misapplication of length-of-stay payment adjusters to day-of-stay, and compression in payment weights resulting from routine costs being measured as facility-level average rather than at the patient level.

The findings suggest that CMS should consider updating the IPF payment system to reflect the relationships between patient characteristics and IPF costs per day using current data. We consider

alternative ways of treating cases with problematic ancillary cost data and discuss potential ways CMS could address the problem of payment weight compression.

Data Sources

Our analysis of IPF payment system trends uses Medicare claims and beneficiary and provider information for IPF patient stays with discharges in 2004, 2009, and 2014. Standard Analytic File (SAF) records are the source of data on IPF admission and discharge dates, payment amounts, DRGs for the stay, charges by revenue center, and diagnoses for claims associated with the stay. These diagnoses are used to construct comorbidity groups. Indicators of acute hospital inpatient stays preceding and following the IPF stay were obtained from the SAF. Indicators of emergency department stays were obtained from outpatient claims.

We match IPF stay records to beneficiary characteristics available in the Medicare Denominator Files, including date of birth, sex, original reason for Medicare eligibility, race, and indicators of HMO use (i.e., Medicare Advantage enrollment). We used both cost report and Provider of Service files to obtain provider characteristics, including ownership type, control type, and whether the provider is located in an urban or rural area.

Calculation of Ancillary and Routine Costs

As was done in developing the IPF-PPS, we estimate ancillary costs by multiplying stay-level charges from the SAF by a facility-level cost-to-charge ratio calculated from Medicare cost reports. Where possible, we applied the cost-charge ratios by type of service (radiology, laboratory, drugs, therapy, and other). If, however, the service cost-charge ratio was quite small (below 0.05) or quite large (above 10 for hospital-based and above 30 for freestanding facilities), we used the overall ancillary cost-charge ratio for the facility.

Unfortunately, an analogous measure of routine costs is not available because claims for individual routine services are not reported. We estimate routine costs per day using total routine costs and total Medicare days from the cost report. Thus, our measure of routine cost, like that used in developing the IPF-PPS, only varies at the facility level. All costs were adjusted to remove variation in labor costs across geographic areas using the MedPAC wage index.

Sample Exclusions

Table 1 reports the sample exclusions we made from the data files for each year. The initial number of IPF stays in 2004 was about 538,000 in 2004. This number fell in subsequent years and was 461,000 in 2014. We excluded cases with no match to a cost report and cases that were in a health maintenance organization (HMO) during the calendar year (i.e., cases with Medicare Advantage). We also excluded cases that were problematic because beneficiaries were missing a discharge date and because they had claims for separate inpatient stays that had claims with end dates that overlapped

with the start dates of subsequent stays. After exclusions, our samples for summary analyses included approximately 475,000 IPF stays in 2004, 436,000 in 2009, and 414,000 in 2014.

TABLE 1

Sample Exclusions for Summary Analyses, by Year

	2004	2009	2014
Initial number of IPF stays	537,560	470,830	461,274
No match-to-cost report	20,825	12,671	11,907
In HMO during calendar year	7,656	15,009	27,283
Beneficiary with missing discharge date	34,381	6,054	7,320
Beneficiary with overlapping claims	175	721	977
Number of IPF stays after exclusions	474,523	436,375	413,787

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Note: HMO = health maintenance organization; IPF = inpatient psychiatric facility.

Findings on IPF Service Trends from 2004 to 2014

Changes in IPF Utilization and Payments

We describe the utilization and payment characteristics of IPF stays in table 2. The number of beneficiaries with any IPF stay fell somewhat from about 306,000 in 2004 before the IPF-PPS was implemented to 273,000 in 2014. A small fraction of IPF stays did not include Medicare-covered days, but the share was stable at about 4 percent in each of the years. There was little trend in average length of stay or the distribution of length of stay over the period, whether measured over full stays or Medicare-covered days of stays with at least one Medicare-covered day. The average length of Medicare-covered stays was 11.2 days in 2004, 11.8 in 2009, and 12.0 in 2014.

TABLE 2

Utilization and Payment Characteristics of IPF Stays, by Year

	2004	2009	2014
Number of beneficiaries with any IPF stay	305,529	286,891	273,095
Number of IPF stays	474,523	436,375	413,787
Number of stays with Medicare-covered days	455,911	418,545	397,040
IPF stays per beneficiary			
Mean	1.55	1.52	1.52
90th percentile	3.00	3.00	3.00
99th percentile	6.00	6.00	6.00
Percent of stays without Medicare-covered days	**3.92%**	**4.09%**	**4.05%**
Length of Medicare covered stay if Medicare-covered days >0 (days)			
Mean	11.21	11.79	11.97
10th percentile	3	3	3
90th percentile	22	23	23
99th percentile	54	59	57
Length of full stay (days)			

Mean	13.80	14.45	13.81
10th percentile	3	3	3
90th percentile	23	24	24
99th percentile	77	86	74
Medicare payment per stay if Medicare-covered days >0 (dollars)			
Mean	6,476.36	8,167.82	8,834.46
10th percentile	1,021.88	1,506.92	1,724.13
90th percentile	13,677.00	16,713.12	17,977.52
99th percentile	30,331.50	41,726.27	44,095.93
Medicare payment per day if Medicare-covered days >0 (dollars)			
Mean	563.53	660.39	704.44
10th percentile	288.86	444.68	478.98
90th percentile	862.57	872.91	929.64
99th percentile	1,244.92	1,210.07	1,241.44

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Note: IPF = inpatient psychiatric facility.

Average payments per IPF stay with Medicare-covered days increased from $6,476 in 2004 to $8,168 in 2009 and $8,834 in 2014. Examination of the 10th, 90th, and 99th percentiles shows that the increases occurred over the range of payment levels and was not simply due, say, to an increase in payments for high-cost cases. Consistent with the relatively stable lengths of stay, the pattern of increased payments over time can be observed for payments per day. Average per day payment for stays with Medicare-covered days increased from $564 in 2004 to $660 in 2009 and $704 in 2014. The cumulative percent increase from 2004 to 2014 was 25 percent, which represents slower growth than the 40 percent increase in medical Consumer Price Index (CPI) for urban areas over the same 10-year period.[2]

Table 3 shows the demographic characteristics of Medicare enrollees with IPF stays, by year. The distributions of demographic characteristics held relatively stable over the period. Whether measured according to the beneficiary race code from fee-for-service claims or race/ethnicity classifications produced by Research Triangle Institute, there was little shift in racial or ethnic composition. The most notable change is that the share of patients under age 45 fell from 33.7 percent of cases in 2004 to 28.2 percent in 2014. The share of patients ages 45 to 64 increased from 31.0 percent to 37.2 percent in 2014, and the share over age 79 fell from 13.6 percent to 12.2 percent. The share eligible for Medicare by reason of disability increased from 70.8 in 2004 to 74.1 in 2014. There was small shift in the mix of patients by gender, with the share of patients who are female falling from 51.8 percent in 2004 to 49.8 percent in 2014.

TABLE 3

Demographic Characteristics of IPF Patient Stays, by Year

	2004	2009	2014
Age			
<45	33.73%	28.98%	28.16%
45–64	31.00%	36.38%	37.16%
65–79	21.71%	20.96%	22.53%
>79	13.55%	13.68%	12.15%
Race			
Non-Hispanic white	78.18%	77.41%	76.63%
Black	17.10%	17.33%	17.13%
Asian/Pacific Islander	0.78%	0.92%	1.01%
Hispanic	2.43%	2.64%	2.93%
American Indian/Alaska Native	0.58%	0.70%	0.79%
Unknown	0.19%	0.15%	0.71%
Other	0.73%	0.84%	0.79%
RTI race			
Non-Hispanic white		74.69%	73.96%
Black		17.10%	16.96%
Asian/Pacific Islander		1.11%	1.24%
Hispanic		5.51%	5.89%
American Indian/Alaska Native		0.68%	0.78%
Unknown		0.23%	0.65%
Other		0.69%	0.52%
Original reason for Medicare eligibility			
OASI	28.82%	26.70%	25.54%
Disability	70.77%	72.92%	74.13%
ESRD	0.17%	0.15%	0.12%
Disability and ESRD	0.24%	0.23%	0.21%
Sex			
Male	48.17%	49.17%	50.25%
Female	51.83%	50.83%	49.75%
Number of stays	**474,368**	**436,272**	**413,739**

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: ESRD = end-stage renal disease; IPF = inpatient psychiatric facility; OASI = Old-Age and Survivors Insurance; RTI = Research Triangle Institute. A small number of stays were excluded from this table because they were missing demographic information from the denominator file.

There were distinct shifts in the distribution of IPFs and IPF stays by facility and ownership type, as shown in table 4. Overall, the share of IPFs that are hospital based fell steadily from 77.0 percent in 2004 to 70.2 percent in 2014, and the share that are freestanding increased. But the trends differed by ownership status. For-profit hospital-based facilities increased from 11.3 percent in 2004 to 15.6 percent in 2014. Non-profit hospital-based facilities fell over the same period from 52.0 percent to 42.0 percent. The growth in freestanding facilities was almost entirely due to a rise in the share of for-profit facilities, increasing from 8.0 percent in 2004 to 15.6 percent in 2014. This was accompanied by little change in the shares of freestanding nonprofit and government facilities. Measured as a share of IPF stays, the percent of cases served in nonprofit hospital facilities fell from 51.4 percent in 2004 to 36.6 percent in 2014. The percent of cases served in for-profit freestanding facilities increased from

12.0 percent in 2004 to 27.0 percent in 2014. These distributional shifts occurred as the number of IPFs fell by approximately 7 percent (from 1,689 to 1,576).

TABLE 4

Distribution of IPFs and IPF Stays, by Facility, Ownership Type, and Year

	2004	2009	2014
Number of IPFs	**1,689**	**1,596**	**1,576**
Hospital-based	*76.97%*	*72.99%*	*70.18%*
Nonprofit	51.92%	47.37%	42.01%
For-profit	11.31%	11.78%	15.55%
Government	13.74%	13.85%	12.63%
Freestanding	*23.03%*	*27.01%*	*29.82%*
Nonprofit	4.56%	4.70%	4.76%
For-profit	7.99%	11.59%	15.55%
Government	10.48%	10.71%	9.52%
Number of IPF stays	**474,523**	**436,375**	**413,787**
Hospital-based	*75.70%*	*68.70%*	*62.49%*
Nonprofit	51.43%	44.40%	36.56%
For-profit	13.22%	12.58%	15.53%
Government	11.05%	11.72%	10.40%
Freestanding	*24.30%*	*31.30%*	*37.51%*
Nonprofit	6.53%	6.97%	6.34%
For-profit	12.03%	18.72%	26.92%
Government	5.74%	5.61%	4.25%

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Note: IPF = inpatient psychiatric facility.

Table 5 shows how utilization and payment measures changed over time, by facility and ownership type. Average covered length of stay was somewhat higher in freestanding facilities than in hospital-based facilities (by about 2 days), but this pattern has remained stable over time. The observed shifts in length of stay are modest, with the largest being for freestanding government facilities where length of stay increased from 19.0 days in 2004 to 21.1 days in 2014.

TABLE 5

IPF Utilization and Payment Characteristics, by Facility, Ownership Type, and Year

	2004	2009	2014
Number of stays	**455,911**	**418,545**	**397,040**
Covered length of stay (mean, in days)			
Hospital-based	*10.66*	*11.04*	*11.13*
Nonprofit	10.44	10.76	10.77
For-profit	10.96	11.29	11.47
Government	11.34	11.83	11.92
Freestanding	*13.03*	*13.55*	*13.42*
Nonprofit	10.86	10.92	11.61
For-profit	11.81	12.55	12.87
Government	18.99	21.86	21.05
Payment per covered stay (mean, in dollars)			
Hospital-based	*6,746*	*7,962*	*8,566*
Nonprofit	6,628	7,762	8,283
For-profit	6,916	7,940	8,605
Government	7,086	8,744	9,502
Freestanding	*5,584*	*8,646*	*9,299*
Nonprofit	5,773	7,672	8,679
For-profit	5,259	8,020	8,866
Government	6,149	12,828	13,849
Payment per Medicare-covered day (mean, in dollars)			
Hospital-based	*605*	*677*	*723*
Nonprofit	607	676	718
For-profit	600	674	719
Government	601	682	748
Freestanding	*426*	*622*	*672*
Nonprofit	501	645	693
For-profit	417	619	668
Government	348	600	663

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: IPF = inpatient psychiatric facility. Measures are for stays with Medicare-covered days greater than 0.

Payments per stay increased the most for freestanding government facilities, from $6,149 in 2004 to $13,849 in 2014. For-profit freestanding facilities also experienced relatively high payment growth ($5,259 in 2004 as compared with $8,866 in 2014). The main reason for the growth in payments to freestanding government facilities is that their per diem payments were relatively low ($348 per day) in 2004 before the PPS was introduced. Their payments per day doubled yet remain the lowest ($663 per day) in 2014. Their payments per stay are high relative to other facility groups because their average length of stay is longer.

Excluding government facilities, hospital-based and freestanding facilities have similar payments per stay, with hospital-based facilities having a somewhat higher payment per day but lower length of stay on average.

Use of Inpatient and Emergency Department Services before and after IPF Stays

In the next three tables, we examine events that can occur two months before or two months after IPF stays to get a sense of possible shifts in the types of patients who are being admitted to an IPF or trends in how patients enter IPFs, and to examine any trends in the likelihood of adverse events that may occur after an IPF stay. To allow us to observe at least two months before and two months after IPF stays within each calendar year, we limit the sample to stays that take place between March and October of a given year.

Table 6 examines use of acute inpatient services before and after IPF stays by facility and ownership type in each year. Across all facilities, 34 percent of patients in 2004 and 2009, and 31 percent of patients in 2014 had an acute hospital stay in the two months preceding the IPF stay. We see a similar pattern within each facility and ownership type, except for freestanding government facilities, where we see an increase from 27 percent in 2004 to 30 percent in 2014.

TABLE 6

Use of Acute Inpatient Services before and after IPF Stays, by Facility, Ownership Type, and Year

	2004	2009	2014
Number of stays	**307,182**	**282,472**	**269,639**
Average number of acute inpatient stays in two months before IPF stay			
All facilities	*0.34*	*0.34*	*0.31*
Hospital-based	0.36	0.36	0.34
Nonprofit	0.36	0.36	0.33
For-profit	0.41	0.40	0.38
Government	0.31	0.31	0.29
Freestanding	0.28	0.28	0.26
Nonprofit	0.29	0.29	0.26
For-profit	0.28	0.28	0.25
Government	0.27	0.26	0.30
Average number of acute inpatient stays in two months after IPF stay			
All facilities	*0.25*	*0.25*	*0.23*
Hospital-based	0.26	0.27	0.25
Nonprofit	0.26	0.26	0.24
For-profit	0.30	0.30	0.29
Government	0.23	0.23	0.22
Freestanding	0.21	0.21	0.21
Nonprofit	0.22	0.22	0.21
For-profit	0.23	0.23	0.21
Government	0.16	0.15	0.16

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: IPF = inpatient psychiatric facility. Statistics are based on the subset of stays that take place between March and October of a given year.

Looking forward two months after IPF stays end, we find that the rate of acute inpatient stays following IPF stays fell from 25 percent in 2004 (and 2009) to 23 percent in 2014. We see nearly the same pattern across all types of facility and ownership.

Table 7 reports on the use of emergency department visits in the two months before and two months following an IPF stays. The ED use measure includes any ED visit that may have immediately preceded the admission to the IPF. Over all facilities, IPF patients had 0.79 ED visits prior to the IPF stay in 2004, 0.94 visits in 2009, and 1.12 visits in 2014. This pattern may suggest that emergency departments have become a more important gateway to IPFs. It may also simply reflect a broader trend in ED use—MedPAC has reported that outpatient emergency department visits per Medicare Part B beneficiary increased from 2010 to 2016 by 14.1 percent (MedPAC 2018). Within each facility and ownership type, we see a similar trend. Within each year, IPF patients in freestanding facilities had somewhat higher use of ED visits than patients in hospital-based facilities.

TABLE 7

Use of Emergency Department before and after IPF Stays, by Facility, Ownership Type, and Year

	2004	2009	2014
Number of stays	**307,182**	**282,472**	**269,639**
Average number of emergency department visits in two months before IPF stay			
All facilities	*0.79*	*0.94*	*1.12*
Hospital-based	0.71	0.85	1.01
Nonprofit	0.73	0.88	1.04
For-profit	0.64	0.74	0.97
Government	0.70	0.82	0.95
Freestanding	1.02	1.17	1.33
Nonprofit	1.02	1.20	1.33
For-profit	1.00	1.15	1.34
Government	1.07	1.18	1.25
Average number of emergency department visits in two months after IPF stay			
All facilities	*0.54*	*0.63*	*0.75*
Hospital-based	0.52	0.60	0.72
Nonprofit	0.53	0.63	0.74
For-profit	0.47	0.49	0.68
Government	0.53	0.60	0.70
Freestanding	0.62	0.70	0.80
Nonprofit	0.60	0.70	0.79
For-profit	0.63	0.71	0.81
Government	0.62	0.68	0.73

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: IPF = inpatient psychiatric facility. Statistics are based on the subset of stays that take place between March and October of a given year.

The average number of ED visits in the two months after the IPF stay are lower than the number of visits in the two months before the IPF stay. Over all facilities, IPF patients had 0.54 ED visits on

average in 2004, 0.63 visits in 2009, and 0.75 visits in 2014. We see a similar increasing trend within each facility and ownership type. An increase in the number of ED visits following IPF stays after the implementation of the IPF-PPS could indicate a potential problem with the quality of IPF care related to the payment system change. But the rise in the number of ED visits before the IPF stays suggests there is an overall positive background trend in the number of ED visits for these patients, as does the broader increase in ED use MedPAC found for Part B beneficiaries overall. Accordingly, the increase in ED use following IPF stays may simply reflect broader trends in ER use and may have little to do with the implementation of the IPF-PPS, but the trend may warrant further monitoring and analysis.

In table 8, we examine the use of other IPF stays in the two months before and two months after the reference IPF stay. Over all facilities, the average number of IPF stays in the two months before the reference IPF stay was 0.39 in 2004 and 0.35 in both 2009 and 2014. We generally see declining or flat patterns in the more detailed results by facility and ownership type as well. Patients in freestanding government facilities had the highest rate of use of prior IPF stays (0.51 in 2014 as compared with 0.35 overall).

TABLE 8

Use of IPF before and after IPF Stays, by Facility, Ownership Type, and Year

	2004	2009	2014
Number of stays	**307,182**	**282,472**	**269,639**
Average number of IPF stays in two months before IPF stay			
All facilities	*0.39*	*0.35*	*0.35*
Hospital-based	0.37	0.32	0.33
Nonprofit	0.37	0.32	0.31
For-profit	0.38	0.31	0.35
Government	0.34	0.35	0.34
Freestanding	0.45	0.40	0.38
Nonprofit	0.39	0.37	0.35
For-profit	0.44	0.37	0.37
Government	0.57	0.54	0.51
Average number of IPF stays in two months after IPF stay			
All facilities	*0.38*	*0.34*	*0.34*
Hospital-based	0.38	0.34	0.34
Nonprofit	0.38	0.33	0.33
For-profit	0.39	0.32	0.35
Government	0.35	0.37	0.35
Freestanding	0.41	0.36	0.35
Nonprofit	0.40	0.38	0.34
For-profit	0.43	0.37	0.36
Government	0.36	0.33	0.32

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: IPF = inpatient psychiatric facility. Statistics are based on the subset of stays that take place between March and October of a given year.

The average number of IPF stays in the two months following the reference IPF stay over all facilities was 0.38 in 2004, 0.34 in 2009, and 0.34 in 2014. We see no evidence then that the implementation of the IPF-PPS was associated with an increase in the rate of IPF readmissions. Instead, we see small decreases in IPF readmissions.

Findings from Updated IPF Cost Regressions using 2014 Data

Estimating Updated Stay-Level Payment Adjustments

In the next set of analyses, we use 2014 data to reestimate the regression model of IPF costs per day that is the basis of the IPF-PPS weights. That CMS regression was estimated using FY 2002 data (CMS 2004). Although the diagnoses that map into particular payment groups have changed somewhat since the PPS was first implemented (due to transition from DRGs to MS-DRGs and more recently in the transition from ICD-9 to ICD-10 codes), the same payment weights are used today (in FY 2020) as were used in 2005. By estimating a regression model (and variations) with a similar specification to what CMS estimated, we can compare the payment weights that would be implied by more recent data to current weights based on data from before the PPS was implemented.

A SUBSTANTIAL NUMBER OF IPF STAYS LACK ANCILLARY COST DATA

In the process of constructing analogous measures of IPF costs per day in our 2014 data, we observed that a fairly large number of facilities and stays lacked one or more data elements typically needed to construct a cost measure for each stay. First, aggregate charges and/or costs for ancillary services were often missing from cost reports, and second, claims for IPF stays were often missing data for ancillary charges or had their values set to zero. We might expect all-inclusive facilities not to report the charges and costs by category on cost reports and not to report separate ancillary charges on claims. We would expect full reporting of these data items in cost reports and claims for facilities that are not all-inclusive. CMS noted this data problem in FY 2016 IPF PPS final rule.[3] It has since issued a number of transmittals on the matter to IPF providers.[4] The latest guidance issued in October 2018 is that cost reports will be rejected if they do not include certain ancillary costs, excepting all-inclusive facilities.

Overall, we find that nearly 82,000 stays (19.8 percent) were missing cost report data needed to compute ancillary cost-to-charge ratios (table 9). Nearly 31,000 stays (7.5 percent) have data for computing ancillary cost-to-charge ratios but do not have ancillary charge data from claims. Altogether, only 72.8 percent of stays have the data needed to compute stay ancillary costs.

TABLE 9

Number of IPF Stays Lacking Data to Compute Ancillary Cost-to-Charge Ratios or Lacking Ancillary Charge Data by Facility All-Inclusive Status

	All-inclusive facility stays	Not-all-inclusive facility stays	Total
Missing cost report data to compute ancillary cost-to-charge ratios	24,646 (6.0%)	57,192 (13.8%)	81,838 (19.8%)
Has ancillary cost-to-charge ratio but no ancillary charges from claims	3,503 (0.8%)	26,339 (6.6%)	30,842 (7.5%)
Has cost-to-charge ratio and ancillary charge data	3,057 (0.7%)	298,050 (72.0%)	301,107 (72.8%)
Total	31,206 (7.5%)	382,581 (92.5)	413,787 (100%)

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: IPF = inpatient psychiatric facility.

The proportion of stays with missing data differs by whether the facility is all-inclusive. Of the roughly 31,000 stays in all-inclusive facilities, a large majority (more than 24,600) were missing data to compute cost-to-charge ratios. About 3,500 of these cases have cost-to-charge ratios but are missing ancillary charge data.

For stays in facilities that are not all-inclusive (more than 90 percent of stays), there are smaller shares with missing data. But even for these facilities, the extent of missing data is higher than we would expect since these data items are supposed to be reported. More than 57,000 stays in facilities that are not all-inclusive lacked cost report data for cost-to-charge ratios, and more than 26,000 cases had cost-to-charge ratios but had no ancillary cost data.

It is unclear why any of the stays in non-all-inclusive facilities would lack ancillary cost or charge data. Most of the stays should have at least some pharmacy use (for example) that ought to be reported. Cases in all-inclusive facilities with no ancillary cost data we consider to be valid because it is understood they would report all their charges and costs together in their cost reports. We would expect these costs to be accounted for in their reported routine costs and charges. For cases not in all-inclusive facilities, we question whether the data are valid. From an analytic standpoint, it is either valid to treat the missing ancillary cost data as appropriately zero (for reasons we do not understand) or invalid, in which case filling in the missing data with zero dollars would be incorrect.

For CMS to update its IPF payment models in the absence of relatively complete data, it would need to decide how best to treat the cases with missing data. To examine whether the approach taken makes any difference to the resultant payment adjustment factors, we define three alternative analysis samples that vary in their treatment of the missing data. If the estimated payment adjustment factors are all quite similar, then presence of missing ancillary cost/charge data and how it is handled would be of little consequence. If instead there are meaningful differences, it would suggest that the implications of missing data are more serious, and more effort would be needed to decide which approach to treating the missing data would be most appropriate.

DEFINING ANALYSIS SAMPLES

In table 10, we define three samples used for estimating regressions of IPF log cost per day: a replication sample (most similar to the sample CMS used to examine 2002 data), our main sample (which makes a few additional exclusions), and a restricted sample that drops cases that are possibly invalid.

TABLE 10

Additional Sample Exclusions and Sample Sizes for 2014 Analysis Samples Used in Regression Analyses

	Number of stays	Sample size after excluding outliers (*N*)
Starting sample after exclusions in table 1	413,787	
Exclude stays in facilities zero beds and stays without utilization days	16,923	
Replication sample	396,864	393,906
Exclude stays with ancillary charges but without cost-to-charge ratios and stays with no payments	4,972	
Main analysis sample	391,892	389,038
Exclude cases with invalid zero ancillary charges (stays without ancillary charges in not-all-inclusive facilities)	69,016	
Restricted analysis sample	322,876	320,479

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2004, 2009, and 2014.
Notes: IPF = inpatient psychiatric facility.

To define the replication sample, we start with the sample of 413,787 stays in 2014 data after making the exclusions already described in table 1. We further exclude cases in facilities with zero beds and stays without utilization days (16,923 additional cases dropped). After excluding statistical outliers, our "replication sample" includes 393,906 stays. With this set of exclusions, we approximate the sample restrictions CMS used in its analysis of 2002 data and/or the replication of that analysis reported in Garrett et al. (2009), which obtained results very similar to those of CMS. This sample retains a relatively small number of cases with ancillary charges, but without ancillary cost-to-charge ratios, by imputing cost-to-charge ratios to the median values for facilities with available data by hospital-based/freestanding status.

We define a second sample that excludes cases with ancillary charges, but without ancillary cost-to-charge ratios (thereby dropping cases that required imputed ratios in the replication sample), and excludes stays for which no IPF-PPS payments were made. These two exclusions result in an additional 4,972 cases being dropped. After further excluding statistical outliers, our "main analysis sample" includes 389,038 cases. The main analysis sample is only slightly smaller than the replication sample, but it avoids imputation of cost-to-charge ratios, and with the IPF-PPS now in place, we think it is reasonable to exclude stays that have no payments under that system.

Because cases reported as having zero ancillary charge data in not-all-inclusive facilities are possibly invalid, we define a "restricted sample" that excludes 69,016 such cases. With the exclusion of statistical outliers, the restricted sample has 320,479 cases.

TYPES OF IPFS LACKING ANCILLARY CHARGE DATA

Table 11 provides additional description about the types of cases lacking ancillary charge data based on the main analysis sample. The table reports (at the facility level) the mean share of stays lacking ancillary charge data by all-inclusive status and facility/ownership type. For hospital-based facilities, ancillary charge data is almost always reported. There were only 11 hospital-based IPFs that were all-inclusive facilities, and each of these was a government facility. The mean share of stays in these facilities with ancillary charge data was 97.0 percent. Among hospital-based facilities that were not all-inclusive, the mean share with ancillary charge data ranges from 96.7 to 99.7 percent.

TABLE 11

Mean Facility-Level Share of Stays with Ancillary Charge Data, by All-Inclusive Status and Facility and Ownership Type

	All-Inclusive Facility Stays		Not-All-Inclusive Facility Stays	
	Mean	*N*	Mean	*N*
Hospital-based				
Nonprofit	n/a	0	0.997	657
For-profit	n/a	0	0.967	239
Government	0.970	11	0.983	185
Freestanding				
Nonprofit	0.335	3	0.764	69
For-profit	0.181	42	0.396	203
Government	0.033	66	0.908	82
All	0.176	122	0.866	1,435

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2014.
Note: Statistics are computed at the facility-level for stays in the main analysis sample.

For all-inclusive freestanding facilities, the mean shares of stays with ancillary charge data are low and range from 3.3 percent (government owned) to 33.5 percent (nonprofit, only 3 facilities of this type). For freestanding facilities that are not all-inclusive, the mean share with ancillary charge data was quite low at for-profit facilities (39.6 percent), but also far from complete in nonprofit facilities (76.4 percent), and mostly complete (90.8 percent) in government facilities. The low shares of stays with ancillary costs are expected for all-inclusive facilities. But for facilities that are not all inclusive, it is a mystery why so many facilities (particularly freestanding for-profit facilities) lack ancillary charge data. On this matter, CMS states in the FY 2020 final rule that "[it] will continue to analyze data from claims and cost reports that do not include ancillary charges or costs, and will be sharing our findings with CMS Office of the Center for Program Integrity and CMS Office of Financial Management for further investigation, as the results warrant."

SUMMARY STATISTICS FOR IPF COST MEASURES

Table 12 provides summary statistics by analysis sample for total IPF costs per day, as well as its component routine and ancillary costs per day. For the replication sample, mean total IPF costs were $860 per day. Most of this total ($749 per day) was for routine cost and remainder ($111 per day) was ancillary costs. Costs per day are similar for the main sample. Costs per day are somewhat higher for the restricted sample ($932 total, $801 routine, and $131 ancillary cost per day). With cases with questionable ancillary costs of zero removed from the sample, ancillary costs per day will necessarily be higher in the restricted sample. If actual ancillary costs in the excluded cases had been loaded onto their reported routine costs, we would expect, all else equal, to see lower routine costs in the restricted sample, but they are higher.

TABLE 12

Summary Statistics for Total, Routine, and Ancillary Costs per Day for IPF Stays by Analysis Sample

	Replication sample	Main sample	Restricted sample
Total cost per day			
Mean	860	856	932
Standard deviation	330	326	306
CV	0.38	0.38	0.33
Routine cost per day			
Mean	749	749	801
Standard deviation	261	261	251
CV	0.35	0.35	0.31
Ancillary cost per day			
Mean	111	107	131
Standard deviation	142	135	139
CV	1.28	1.26	1.06
N	393,906	389,038	320,479

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2014.
Notes: CV = coefficient of variation (mean/SD); IPF = inpatient psychiatric facility; SD = standard deviation.

Ancillary costs are a key source of overall cost variability and the only source of individual-level cost variability. In absolute terms, routine costs have more variability than ancillary costs. For example, in the replication sample, the standard deviation of routine costs is $261 as compared with a standard deviation of $142 for ancillary costs. Relative to their mean values, as measured by the coefficient of variation (or CV, which is standard deviation divided by the mean), routine costs are less variable with a CV of 0.35 as compared with 1.28 for ancillary costs per day. The same pattern holds in the other samples. Routine costs for each stay are measured as facility-level averages and so have no individual-level variability. Lacking valid data on ancillary costs, even if it is absorbed on average into routine cost, is therefore problematic for regression analysis because it reduces the amount of true variability in costs that may be explained by the patient characteristics included in the cost model.

SUMMARY STATISTICS FOR EXPLANATORY VARIABLES

Summary statistics for the explanatory variables used in the regression models of IPF costs per day are reported in table 13. Data are reported for the main and restricted samples—data for the replication

sample was very similar to those of the main sample and are not shown. Focusing on the main sample, Psychosis (DRG 885) remains the most prevalent and makes up 72.5 percent of stays (as compared with 72.8 in FY 2002). Organic disturbances are the second most common group (7.1 percent), followed by degenerative nervous system disorders without MCC (6.2 percent). The same pattern was seen in the FY 2003 replication data.

TABLE 13

Mean of Explanatory Variables Used in IPF Payment Model Regression by Analysis Sample

Variable	Main sample	Restricted sample
DRGs		
056 - Degenerative nervous system disorders, w MCC	0.005	0.006
057 - Degenerative nervous system disorders, w/o MCC	0.062	0.071
080 - Non-traumatic stupor and coma, w MCC	0.000	0.000
081 - Non-traumatic stupor and coma, w/o MCC	0.001	0.001
876 - O.R. procedure w principle diagnosis of mental illness	0.001	0.001
880 - Acute adjustment reaction and psychosocial dysfunction	0.008	0.008
881 - Depressive neuroses	0.033	0.034
882 - Non-depressive neuroses	0.012	0.012
883 - Personality disorders & impulse control	0.005	0.005
884 - Organic disturbances & mental retardation	0.071	0.077
885 - Psychoses	0.725	0.725
886 - Behavior & developmental disorders	0.004	0.004
887 - Other mental disorder diagnoses	0.001	0.0004
894 - Alcohol/drug abuse or dependence, left AMA	0.003	0.002
895 - Alcohol/drug abuse or dependence, w rehab therapy	0.011	0.006
896 - Alcohol/drug abuse or dependence, w/o rehab w MCC	0.002	0.001
897 - Alcohol/drug abuse or dependence, w/o rehab w/o MCC	0.049	0.037
Non-Psychiatric	0.008	0.010
Comorbidities		
Developmental disabilities	0.028	0.029
Coagulation protein deficit	0.001	0.001
Tracheotomy	0.000	0.001
Renal failure, acute	0.014	0.017
Renal failure, chronic	0.053	0.061
Oncology treatment	0.000	0.000
Uncontrolled type I diabetes mellitus	0.015	0.016
Severe protein calorie malnutrition	0.002	0.002
Eating and conduct disorders	0.007	0.007
Infectious diseases	0.047	0.043
Drug/alcohol induced mental conditions	0.044	0.038
Cardiac conditions	0.0001	0.0001
Gangrene	0.0002	0.0003
Chronic obstructive pulmonary disease	0.005	0.005
Artificial openings: digestive and urinary	0.005	0.006
Musculoskeletal and connective tissue disease	0.006	0.006
Poisoning	0.002	0.002
Age categories		
<45	0.278	0.255
45 - 49	0.088	0.083
50-54	0.106	0.102
55-59	0.098	0.096
60-64	0.074	0.076
65-69	0.093	0.097

Variable	Main sample	Restricted sample
70-74	0.074	0.080
75-79	0.063	0.069
80-120	0.127	0.142
Length of stay		
Days: 1	0.025	0.026
Days: 2	0.040	0.043
Days: 3	0.057	0.062
Days: 4	0.065	0.069
Days: 5	0.068	0.071
Days: 6	0.074	0.075
Days: 7	0.078	0.079
Days: 8	0.065	0.064
Days: 9	0.053	0.053
Days: 10	0.049	0.048
Days: 11	0.043	0.042
Days: 12	0.040	0.039
Days: 13	0.041	0.040
Days: 14	0.044	0.043
Days: 15	0.031	0.031
Days: 16	0.023	0.022
Days: 17	0.020	0.019
Days: 18	0.017	0.017
Days: 19	0.016	0.015
Days: 20	0.015	0.015
Days: 21	0.015	0.014
Days: 22	0.120	0.114
Facility-level adjusters		
All inclusive	0.072	0.088
Rural	0.144	0.160
Ln Teaching	0.021	0.025
Occupancy rate	0.743	0.733
N	**389,038**	**320,479**

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2014.
Notes: IPF = inpatient psychiatric facility. Means for replication sample are not shown because they are very close to those for the main sample (available from authors on request).

The three most common comorbidities in the 2014 data are chronic renal failure (5.3 percent), infectious diseases (4.7 percent), and drug/alcohol-induced mental conditions (4.4 percent). Each of these is substantially higher than in FY 2003 data (1.2 percent, 2.7 percent, and 1.6 percent, respectively). In FY 2003, the most commonly indicated comorbidity was developmental disability (2.9 percent), which continues to have a similar rate in the 2014 data (2.8 percent). The distribution of age groups shows somewhat fewer cases in the under 45 group and 80 and over group relative to FY 2003, following the trends also observed in table 3. The distribution of stays by length of stay shows little change relative to FY 2003 data. The modal length of stay is 7 days (7.8 percent of stays), and 12.0 percent of stays last 22 days or more.

For the facility-level variables included in the model as controls (facility-level adjusters), 7.2 percent of IPFs were designated as all inclusive in the main sample, 14.4 percent were rural, and the

mean occupancy rate was 74.3 percent. Unfortunately, levels for these variables from the FY 2003 replication analysis were not reported, so we are not able to make comparisons to the earlier data.

The distribution of patient and facility characteristics in the restricted sample is similar to those in the main sample. Most differences are less than a percentage point. Cases in the restricted sample are somewhat less likely to be under age 45 (25.5 percent as compared with 27.8 percent) and more likely to be age 80 or older (14.2 percent as compared with 12.7 percent).The percent of cases in all-inclusive facilities is a little higher in the restricted sample (8.8 percent as compared with 7.2 percent), as we would expect. A higher share of stays in the restricted sample are treated in rural facilities (16.0 percent as compared with 14.4 percent).

UPDATED IPF COST REGRESSION ESTIMATES

Table 14 reports the coefficients from regression models of log total IPF costs per day using the 2014 analysis samples. These regressions are analogous to the cost regression estimated by CMS for use in the IPF payment system. The new estimates are designed to be comparable with the prior estimates. We first describe the patterns of results and how they vary across samples, and in the next section, we discuss how the implied payment adjusters by the current models differ from those still in use by CMS that had been estimated with FY 2002 data. We focus our discussion on the main sample.

For the DRG variables, with the most common DRG (885-psychoses) serving as the reference category, we find that the DRG with the largest positive effect by far is 876–O.R. procedure with principle diagnosis of mental illness. Most of the other effects with positive coefficients are relatively small. The DRGs with the largest negative effects are 894 and 895, both of which relate to alcohol/drug abuse or dependence. The effects for some of the DRG variables are not statistically significant at conventional levels. These include DRGs 057, 080, 081, 880, 881, 882, 884, 886, and 887. In other words, the average costs of patients in these categories are not statistically different from the costs of patients with DRG 885–psychoses.[5]

The comorbidities with the largest effects are oncology treatment, poisoning, gangrene, and tracheotomy. Six of the comorbidities, which receive positive adjustments in the current payment system, have effects in our data that are statistically insignificant. These are developmental disabilities, eating and conduct disorders, infectious diseases, drug/alcohol-induced mental conditions, cardiac conditions, and chronic obstructive pulmonary disease.

TABLE 14

Regression Models of Log Total IPF Cost per Day by Analysis Sample

	Replication Sample		Main Sample		Restricted Sample	
Variables	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
DRGs						
056 - Degenerative nervous system disorders, w MCC	0.071	(0.019)	0.076	(0.018)	0.041	(0.016)
057 - Degenerative nervous system disorders, w/o MCC	0.022	(0.012)	0.022	(0.012)	-0.004	(0.011)
080 - Non-traumatic stupor and coma, w MCC	0.090	(0.053)	0.090	(0.053)	0.091	(0.044)
081 - Non-traumatic stupor and coma, w/o MCC	0.049	(0.025)	0.047	(0.025)	0.040	(0.024)
876 - O.R. procedure w principle diagnosis of mental illness	0.325	(0.021)	0.323	(0.021)	0.233	(0.018)
880 - Acute adjustment reaction and psychosocial dysfunction	0.001	(0.016)	0.005	(0.016)	0.011	(0.015)
881 - Depressive neuroses	-0.006	(0.011)	-0.005	(0.011)	-0.002	(0.010)
882 - Non-depressive neuroses	-0.011	(0.023)	-0.009	(0.023)	0.019	(0.014)
883 - Personality disorders & impulse control	0.098	(0.022)	0.099	(0.022)	0.066	(0.021)
884 - Organic disturbances & mental retardation	-0.004	(0.013)	-0.004	(0.013)	-0.005	(0.011)
885 - Psychoses (reference category)						
886 - Behavior & developmental disorders	0.032	(0.019)	0.030	(0.019)	0.015	(0.018)
887 - Other mental disorder diagnoses	0.023	(0.043)	0.027	(0.044)	0.019	(0.061)
894 - Alcohol/drug abuse or dependence, left AMA	-0.277	(0.029)	-0.269	(0.029)	-0.128	(0.033)
895 - Alcohol/drug abuse or dependence, w rehab therapy	-0.287	(0.040)	-0.284	(0.040)	-0.166	(0.035)
896 - Alcohol/drug abuse or dependence, w/o rehab w MCC	-0.089	(0.036)	-0.083	(0.036)	0.049	(0.023)
897 - Alcohol/drug abuse or dependence, w/o rehab w/o MCC	-0.139	(0.024)	-0.138	(0.024)	-0.021	(0.020)
Non-Psych	0.103	(0.019)	0.097	(0.019)	0.060	(0.018)
Comorbidities						
Developmental disabilities	0.016	(0.011)	0.016	(0.011)	-0.010	(0.012)
Coagulation protein deficit	0.096	(0.022)	0.097	(0.022)	0.071	(0.020)
Tracheotomy	0.122	(0.028)	0.116	(0.026)	0.075	(0.022)
Renal failure, acute	0.094	(0.011)	0.093	(0.011)	0.045	(0.009)
Renal failure, chronic	0.093	(0.007)	0.090	(0.006)	0.058	(0.005)
Oncology treatment	0.472	(0.130)	0.473	(0.129)	0.367	(0.123)
Uncontrolled type I diabetes mellitus	0.037	(0.015)	0.037	(0.014)	0.026	(0.012)
Severe protein calorie malnutrition	0.078	(0.032)	0.075	(0.032)	0.030	(0.027)
Eating and conduct disorders	0.014	(0.015)	0.017	(0.015)	0.023	(0.012)
Infectious diseases	-0.006	(0.009)	-0.007	(0.009)	0.008	(0.007)
Drug/alcohol induced mental conditions	-0.023	(0.014)	-0.019	(0.014)	0.004	(0.009)
Cardiac conditions	0.059	(0.055)	0.057	(0.056)	0.056	(0.051)
Gangrene	0.141	(0.031)	0.144	(0.031)	0.100	(0.027)
Chronic obstructive pulmonary disease	0.062	(0.060)	0.061	(0.060)	0.097	(0.012)

	Replication Sample		Main Sample		Restricted Sample	
Variables	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Artificial openings: digestive and urinary	0.070	(0.010)	0.069	(0.010)	0.035	(0.009)
Musculoskeletal and connective tissue disease	0.031	(0.010)	0.028	(0.010)	0.040	(0.008)
Poisoning	0.174	(0.015)	0.174	(0.015)	0.093	(0.014)
Age categories						
<45 (reference category)						
45 - 49	0.026	(0.004)	0.027	(0.004)	0.015	(0.004)
50-54	0.038	(0.004)	0.038	(0.004)	0.020	(0.004)
55-59	0.058	(0.005)	0.058	(0.005)	0.028	(0.005)
60-64	0.093	(0.007)	0.093	(0.007)	0.048	(0.007)
65-69	0.103	(0.009)	0.104	(0.009)	0.055	(0.008)
70-74	0.124	(0.010)	0.126	(0.010)	0.064	(0.010)
75-79	0.140	(0.012)	0.141	(0.011)	0.071	(0.010)
80-120	0.149	(0.012)	0.151	(0.012)	0.074	(0.011)
Length of stay						
Days: 1	0.226	(0.012)	0.220	(0.011)	0.210	(0.009)
Days: 2	0.192	(0.011)	0.182	(0.010)	0.140	(0.009)
Days: 3	0.158	(0.010)	0.150	(0.009)	0.100	(0.008)
Days: 4	0.123	(0.008)	0.117	(0.008)	0.073	(0.006)
Days: 5	0.091	(0.007)	0.088	(0.007)	0.053	(0.006)
Days: 6	0.065	(0.006)	0.063	(0.006)	0.038	(0.005)
Days: 7	0.045	(0.005)	0.045	(0.005)	0.028	(0.004)
Days: 8	0.022	(0.004)	0.021	(0.004)	0.012	(0.004)
Days: 9	0.015	(0.004)	0.015	(0.004)	0.011	(0.003)
Days: 10 (reference category)						
Days: 11	-0.008	(0.004)	-0.008	(0.004)	-0.007	(0.004)
Days: 12	-0.017	(0.005)	-0.017	(0.005)	-0.012	(0.005)
Days: 13	-0.015	(0.005)	-0.015	(0.005)	-0.010	(0.005)
Days: 14	-0.030	(0.007)	-0.029	(0.007)	-0.026	(0.007)
Days: 15	-0.022	(0.007)	-0.021	(0.007)	-0.018	(0.006)
Days: 16	-0.029	(0.007)	-0.030	(0.007)	-0.019	(0.007)
Days: 17	-0.032	(0.007)	-0.031	(0.007)	-0.024	(0.007)
Days: 18	-0.031	(0.007)	-0.030	(0.007)	-0.022	(0.007)
Days: 19	-0.039	(0.008)	-0.038	(0.008)	-0.026	(0.009)
Days: 20	-0.037	(0.008)	-0.036	(0.008)	-0.028	(0.008)
Days: 21	-0.045	(0.009)	-0.042	(0.009)	-0.032	(0.008)
Days: 22	-0.026	(0.010)	-0.024	(0.010)	-0.010	(0.009)
Facility-level adjusters						
Rural	0.098	(0.023)	0.103	(0.022)	0.051	(0.019)

	Replication Sample		Main Sample		Restricted Sample	
Variables	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Teaching	1.189	(0.155)	1.218	(0.147)	0.820	(0.109)
Occupancy rate	-0.602	(0.060)	-0.608	(0.060)	-0.458	(0.054)
All inclusive	-0.235	(0.037)	-0.249	(0.035)	-0.397	(0.034)
Constant	7.008	(0.044)	7.009	(0.044)	7.060	(0.041)
R^2	**0.272**		**0.282**		**0.300**	
N	**393,906**		**389,038**		**320,479**	

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2014.

Notes: IPF = inpatient psychiatric facility. Coef. = regression coefficient from log-linear OLS model. SE = standard error.

Coefficients on the age categories show uniformly increasing per diem costs as patient age increases. For length of stay, we find a pattern of uniformly decreasing per diem costs from day 1 to day 9. After day 10 (the reference category), per diem costs continue to decline as length of stay increases but not always in a uniform manner (likely reflecting statistical noise due to smaller sample size for these groups). Per diem costs are higher for rural IPFs relative to urban ones and increase with teaching intensity. Per diem costs decrease with higher occupancy rates and are lower in all-inclusive IPFs.

The R^2 statistic of the main sample model is 0.282. Coefficients and the R^2 of the replication sample are very similar to those in the main sample. The R^2 in the restricted sample model is 0.300, and there are some differences in coefficients. Many of the coefficients are closer to zero in the restricted sample as compared with the main sample.[6] For example, the age effects in the restricted sample are about half of what they are in the main sample. The negative effects of DRGs 894 and 895 are substantially closer to zero in the restricted sample. The effect of all-inclusive status is larger (more negative) in the restricted sample, which is expected and because the not-all-inclusive cases with zero ancillary costs are dropped.

The differences in the coefficients depending on the treatment of the cases with missing ancillary costs suggests that the missing data are problematic for estimating IPF cost regressions. Ideally, data reporting will improve, given CMS's attention to the issue and communications with providers. If not, if it proceeds with an update, CMS will need to decide how to best handle the missing data, given that the approach taken will likely affect the resultant payment adjustments as our findings indicate.

COMPARING ESTIMATED PAYMENT ADJUSTMENTS BASED ON FY 2014 DATA TO CURRENT PAYMENT ADJUSTERS BASED ON FY 2002 DATA

Table 15 compares the payment adjustment factors implied by the regressions in table 14 to the actual payment adjusters that are currently used in the IPF payment system based on pre-PPS data. The implied payment adjustment factors are calculated by exponentiating the coefficient values of each variable. Starting with the main sample results and focusing on the largest differences, we find that the adjustment factor for DRG 876 (O.R. procedure with principal diagnosis of mental illness) is higher in our data as compared with the current payment adjuster (1.38 versus 1.22). The adjustment factor for DRG 887 (other mental disorder diagnoses) is also higher (1.03 versus 0.92) and would imply a payment increase relative to psychoses rather than a payment decrease. The adjustment factors for DRGs 894 and 895 are substantially lower in our main sample as compared with the current payment adjuster (0.76 versus 0.97) and (0.75 versus 1.02). Among the comorbidities, the largest differences is for oncology treatment, with an implied adjustment factor of 1.61 as compared with 1.07 in the current payment system. A substantial discrepancy for oncology was reported by Garrett et al. (2009), and it appears to have grown larger over time. The adjustment factor for eating and conduct disorders implied by the more recent data is smaller than in the current payment system (1.02 versus 1.12).

TABLE 15

Comparison of FY 2014 Payment Adjustment Factors to Those Implied by IPF Payment Models Estimated with 2014 Data

	FY 2014 IPF payment adjustment factor	Main Sample		Restricted Sample	
		Implied adj. factor	Difference from FY 2014 value	Implied adj. factor	Difference from FY 2014 value
DRGs					
056 - Degenerative nervous system disorders, w MCC	1.05	1.08	0.03	1.04	-0.01
057 - Degenerative nervous system disorders, w/o MCC	1.05	1.02	-0.03	1.00	-0.05
080 - Non-traumatic stupor and coma, w MCC	1.07	1.09	0.02	1.10	0.03
081 - Non-traumatic stupor and coma, w/o MCC	1.07	1.05	-0.02	1.04	-0.03
876 - O.R. procedure w principle diagnosis of mental illness	1.22	1.38	0.16	1.26	0.04
880 - Acute adjustment reaction and psychosocial dysfunction	1.05	1.00	-0.05	1.01	-0.04
881 - Depressive neuroses	0.99	1.00	0.01	1.00	0.01
882 - Non-depressive neuroses	1.02	0.99	-0.03	1.02	0.00
883 - Personality disorders & impulse control	1.02	1.10	0.08	1.07	0.05
884 - Organic disturbances & mental retardation	1.03	1.00	-0.03	1.00	-0.03
885 – Psychoses (reference category)					
886 - Behavior & developmental disorders	0.99	1.03	0.04	1.02	0.03
887 - Other mental disorder diagnoses	0.92	1.03	0.11	1.02	0.10
894 - Alcohol/drug abuse or dependence, left AMA	0.97	0.76	-0.21	0.88	-0.09
895 - Alcohol/drug abuse or dependence, w rehab therapy	1.02	0.75	-0.27	0.85	-0.17
896 - Alcohol/drug abuse or dependence, w/o rehab w MCC	0.88	0.92	0.04	1.05	0.17
897 - Alcohol/drug abuse or dependence, w/o rehab w/o MCC	0.88	0.87	-0.01	0.98	0.10
Comorbidities					
Developmental disabilities	1.04	1.02	-0.02	0.99	-0.05
Coagulation protein deficit	1.13	1.10	-0.03	1.07	-0.06
Tracheotomy	1.06	1.12	0.06	1.08	0.02
Renal failure, acute	1.11	1.10	-0.01	1.05	-0.06
Renal failure, chronic	1.11	1.09	-0.02	1.06	-0.05
Oncology treatment	1.07	1.61	0.54	1.44	0.37
Uncontrolled type I diabetes mellitus	1.05	1.04	-0.01	1.03	-0.02
Severe protein calorie malnutrition	1.13	1.08	-0.05	1.03	-0.10
Eating and conduct disorders	1.12	1.02	-0.10	1.02	-0.10
Infectious diseases	1.07	0.99	-0.08	1.01	-0.06
Drug/alcohol induced mental conditions	1.03	0.98	-0.05	1.00	-0.03
Cardiac conditions	1.11	1.06	-0.05	1.06	-0.05
Gangrene	1.10	1.15	0.05	1.11	0.01

	FY 2014 IPF payment adjustment factor	Main Sample		Restricted Sample	
		Implied adj. factor	Difference from FY 2014 value	Implied adj. factor	Difference from FY 2014 value
Chronic obstructive pulmonary disease	1.12	1.06	-0.06	1.10	-0.02
Artificial openings: digestive and urinary	1.08	1.07	-0.01	1.04	-0.04
Musculoskeletal and connective tissue disease	1.09	1.03	-0.06	1.04	-0.05
Poisoning	1.11	1.19	0.08	1.10	-0.01
Age categories					
<45 (reference category)					
45 - 49	1.01	1.03	0.02	1.02	0.01
50-54	1.02	1.04	0.02	1.02	0.00
55-59	1.04	1.06	0.02	1.03	-0.01
60-64	1.07	1.10	0.03	1.05	-0.02
65-69	1.10	1.11	0.01	1.06	-0.04
70-74	1.13	1.13	0.00	1.07	-0.06
75-79	1.15	1.15	0.00	1.07	-0.08
80-120	1.17	1.16	-0.01	1.08	-0.09
Length of stay					
Days: 1	1.19	1.25	0.06	1.23	0.04
Days: 2	1.12	1.20	0.08	1.15	0.03
Days: 3	1.08	1.16	0.08	1.11	0.03
Days: 4	1.05	1.12	0.07	1.08	0.03
Days: 5	1.04	1.09	0.05	1.05	0.01
Days: 6	1.02	1.07	0.05	1.04	0.02
Days: 7	1.01	1.05	0.04	1.03	0.02
Days: 8	1.01	1.02	0.01	1.01	0.00
Days: 9	1.00	1.01	0.01	1.01	0.01
Days: 10 (reference category)					
Days: 11	0.99	0.99	0.00	0.99	0.00
Days: 12	0.99	0.98	-0.01	0.99	0.00
Days: 13	0.99	0.99	0.00	0.99	0.00
Days: 14	0.99	0.97	-0.02	0.97	-0.02
Days: 15	0.98	0.98	0.00	0.98	0.00
Days: 16	0.97	0.97	0.00	0.98	0.01
Days: 17	0.97	0.97	0.00	0.98	0.01
Days: 18	0.96	0.97	0.01	0.98	0.02
Days: 19	0.95	0.96	0.01	0.97	0.02
Days: 20	0.95	0.97	0.02	0.97	0.02

	FY 2014 IPF payment adjustment factor	Main Sample		Restricted Sample	
		Implied adj. factor	Difference from FY 2014 value	Implied adj. factor	Difference from FY 2014 value
Days: 21	0.95	0.96	0.01	0.97	0.02
Days: 22	0.92	0.98	0.06	0.99	0.07
N			**389,038**		**320,479**

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2014.

Notes: IPF = inpatient psychiatric facility. Implied adjustment factors are exponentiated coefficients from Table

The implied adjustment factors for the age categories are similar in the main sample to what they are in the current payment system. The adjustment factors for length of stay decline somewhat more steeply in the 2014 data than they do in the current payment system.

As explained in Garrett et al. (2009), CMS applies the model coefficients in calculating payments in a way that is not consistent with what the coefficients measure. The model coefficients represent how the average cost per day changes over patients with different stay lengths. Longer stays are associated with lower average cost per day over the stay. CMS applies the LOS (length of stay) adjustments to each day of stay within a stay, as if the factors represented the marginal change in expected cost for each additional day. As a result, the profile of declining payments with length of stay falls less steeply as the coefficients are applied in the payment system than the regression the coefficients are based on would suggest it should. A numerical example is provided in table 9 of Garrett et al. (2009), which highlights the payment error that is caused by the misapplication of the LOS coefficients.

Turning attention to the restricted sample in table 15, we no longer see the large difference for DRG 876 that we observed with the main sample. We find a somewhat different pattern of results for the set of DRGs related to alcohol/drug abuse or dependence. The large differences observed for DRGs 894 and 895 are somewhat attenuated, but we observe larger differences for DRGs 896 and 897. The large discrepancy for the oncology treatment comorbidity is present in the restricted sample as in the main sample. The pattern of payment adjustments by age group show larger differences to current payments in the restricted sample as compared with the main sample, but the pattern of payment adjustments by length of stay shows more similarity to current payments than the main sample.[7]

There are two main takeaways from this analysis. First, using the more recent data, there are meaningful differences relative to the current adjustments, regardless of which analysis sample we use, which suggests an update to the payment weights is warranted. Second, the implied payment adjustment factors differ some depending on how we treat the cases with zero or missing ancillary costs in the more recent data. Unfortunately, it is difficult to assess which method of treating cases with zero or missing ancillary costs is best. With the exception of all-inclusive facilities, cases with zero ancillary costs are likely to be invalid. Because such cases occur more in some types of facilities than others, including these cases (as in the main sample) would clearly lead to errors in the estimated coefficients. On the other hand, excluding these cases (as in the restricted sample) leads to a less representative sample of IPF cases being used to estimate the coefficients, which can also lead to bias. We suspect that the bias in the second case (restricted sample) is less severe than in the first. One way to test this in future work would be to statistically impute ancillary cost with patient and facility characteristics when it is missing or reported as zero outside all-inclusive facilities and test whether the restricted sample results are indeed closer to results with imputed ancillary costs. The results with imputed ancillary costs might also be considered to be the preferred approach to estimating model coefficients short of improving the reporting of ancillary costs.

LACK OF PATIENT-LEVEL VARIATION IN THE ROUTINE COST MEASURE LIKELY RESULTS IN A COMPRESSED DISTRIBUTION OF PAYMENT ADJUSTERS

A prominent feature of the IPF payment system is that there is relatively little systematic variation in per diem rates captured by the risk adjusters in the system. The largest payment adjustment is 22 percent (for DRG 876), and most amount to a payment adjustment of less than +/- 10 percent. By contrast, in the newly implemented Patient Driven Payment Model for skilled nursing facilities, the payment factors for the nursing component range greatly, from 0.66 to 4.06 (Acumen 2018, 99).

One theory for the low variation in payments is that routine cost per day is measured as a facility-level average rather than at the patient level. And as we saw in table 12, $749 of the $856 mean cost per day of IPF stays (87.5 percent) is routine cost. If there is considerable variation in routine costs across patients within facilities, the payment adjustment factors would be biased toward 1, with the magnitude of the bias depending on the extent that true routine cost per day varies across patients within a facility.[8]

We produce some suggestive evidence of the potential importance of this bias in table 16 by estimating regression models for routine cost per day and ancillary cost per day separately, and by estimating a version of the ancillary-cost-per-day model in which we artificially aggregate (collapse) ancillary costs per day to the facility level. The idea here is to see the consequence on the coefficients of collapsing the dependent variable in a case where we actually have the underlying individual-level data. The sample used for all the models in table 16 is the restricted analysis sample, which is further limited to exclude stays from all-inclusive facilities so that all cases in the analysis have ancillary costs greater than zero.

The first column of results in table 16 shows the coefficients and standard errors from a model of log total cost per day for this sample. This model is analogous to the models presented in table 14, but it is estimated with a more limited sample. Not surprisingly, the coefficients for the log total cost per day model in table 16 are similar to those reported in table 14 for the restricted sample. The second column shows results for the log of routine cost per diem, and the third column shows results for the log of ancillary costs per diem. In each case, the coefficients when multiplied by 100 approximate the percent change in cost per diem of a given explanatory variable for each respective cost measure (the quality of the approximation is good if the absolute value of the coefficient is less than 0.2 and degrades above that). Similar coefficients in routine and ancillary cost models would correspond to similar percent changes but different changes in dollar costs.

The routine cost model coefficients are typically smaller in absolute value than the corresponding ancillary cost model coefficients. There is generally more percent variation in cost across the explanatory variables for the ancillary cost model than for the routine cost model, as indicated by the higher standard deviation of the predicted values (0.298 versus 0.109) reported in the bottom row of table 16. The aggregation of the routine cost measure could contribute to the lower degree of variability in predicted values, but it could also simply reflect a high-fixed-cost component to routine costs that is adequately captured in our facility-level measure.

TABLE 16

Regression Models of Log Total, Routine, Ancillary IPF Cost per Day for Restricted Analysis Sample Further Limited to Exclude Stays from All-Inclusive Facilities

	Total cost (log)		Routine cost (log)		Ancillary cost (log)		Ancillary cost collapsed to facility-level mean (log)	
Variables	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
DRGs								
056 - Degenerative nervous system disorders, w MCC	0.039	(0.016)	0.013	(0.019)	0.206	(0.037)	0.045	(0.030)
057 - Degenerative nervous system disorders, w/o MCC	-0.006	(0.011)	0.005	(0.012)	-0.059	(0.028)	0.013	(0.025)
080 - Non-traumatic stupor and coma, w MCC	0.087	(0.045)	-0.086	(0.037)	0.667	(0.148)	0.163	(0.077)
081 - Non-traumatic stupor and coma, w/o MCC	0.033	(0.024)	-0.002	(0.022)	0.185	(0.081)	0.066	(0.052)
876 - O.R. procedure w principle diagnosis of mental illness	0.237	(0.018)	0.061	(0.017)	1.040	(0.049)	0.175	(0.030)
880 - Acute adjustment reaction and psychosocial dysfunction	0.009	(0.016)	0.015	(0.016)	-0.058	(0.034)	-0.012	(0.026)
881 - Depressive neuroses	-0.004	(0.010)	0.009	(0.010)	-0.113	(0.031)	-0.043	(0.026)
882 - Non-depressive neuroses	0.014	(0.015)	0.026	(0.016)	-0.114	(0.036)	-0.030	(0.027)
883 - Personality disorders & impulse control	0.059	(0.023)	0.055	(0.026)	0.107	(0.043)	0.089	(0.031)
884 - Organic disturbances & mental retardation	-0.009	(0.011)	-0.013	(0.013)	0.038	(0.023)	0.041	(0.019)
885 – Psychoses (reference category)								
886 - Behavior & developmental disorders	0.004	(0.019)	-0.007	(0.020)	0.060	(0.058)	0.085	(0.047)
887 - Other mental disorder diagnoses	-0.023	(0.048)	-0.052	(0.066)	0.287	(0.116)	0.097	(0.051)
894 - Alcohol/drug abuse or dependence, left AMA	-0.068	(0.031)	-0.055	(0.033)	-0.047	(0.074)	-0.054	(0.063)
895 - Alcohol/drug abuse or dependence, w rehab therapy	-0.130	(0.040)	-0.138	(0.057)	-0.133	(0.248)	-0.068	(0.163)
896 - Alcohol/drug abuse or dependence, w/o rehab w MCC	0.057	(0.019)	0.014	(0.018)	0.242	(0.062)	0.025	(0.033)
897 - Alcohol/drug abuse or dependence, w/o rehab w/o MCC	-0.024	(0.018)	-0.030	(0.027)	-0.067	(0.071)	-0.013	(0.055)
Non-Psych	0.057	(0.019)	0.003	(0.019)	0.243	(0.040)	0.116	(0.024)
Comorbidities								
Developmental disabilities	-0.011	(0.012)	-0.019	(0.013)	0.076	(0.022)	0.027	(0.023)
Coagulation protein deficit	0.083	(0.020)	0.068	(0.021)	0.191	(0.058)	0.042	(0.035)
Tracheotomy	0.083	(0.023)	0.031	(0.022)	0.376	(0.067)	0.057	(0.035)
Renal failure, acute	0.044	(0.009)	0.021	(0.009)	0.216	(0.018)	0.075	(0.015)
Renal failure, chronic	0.058	(0.005)	0.018	(0.006)	0.293	(0.013)	0.062	(0.011)
Oncology treatment	0.374	(0.127)	0.079	(0.120)	1.542	(0.292)	0.213	(0.080)
Uncontrolled type I diabetes mellitus	0.033	(0.012)	-0.008	(0.012)	0.317	(0.032)	0.042	(0.027)
Severe protein calorie malnutrition	0.037	(0.027)	0.006	(0.029)	0.219	(0.044)	0.150	(0.033)
Eating and conduct disorders	0.033	(0.013)	0.018	(0.014)	0.141	(0.039)	0.115	(0.035)
Infectious diseases	0.016	(0.007)	0.000	(0.007)	0.131	(0.020)	0.015	(0.016)
Drug/alcohol induced mental conditions	0.017	(0.010)	0.014	(0.010)	0.080	(0.029)	-0.012	(0.023)

Variables	Total cost (log)		Routine cost (log)		Ancillary cost (log)		Ancillary cost collapsed to facility-level mean (log)	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Cardiac conditions	0.051	(0.052)	0.023	(0.049)	0.210	(0.137)	-0.046	(0.053)
Gangrene	0.094	(0.028)	0.056	(0.024)	0.210	(0.109)	0.102	(0.046)
Chronic obstructive pulmonary disease	0.103	(0.012)	-0.001	(0.013)	0.613	(0.029)	0.096	(0.028)
Artificial openings: digestive and urinary	0.039	(0.009)	0.005	(0.010)	0.261	(0.024)	0.061	(0.015)
Musculoskeletal and connective tissue disease	0.053	(0.009)	0.015	(0.009)	0.264	(0.026)	0.050	(0.016)
Poisoning	0.089	(0.014)	0.069	(0.014)	0.162	(0.045)	0.092	(0.024)
Age categories								
<45 (reference category)								
45 - 49	0.019	(0.004)	0.009	(0.004)	0.094	(0.010)	0.018	(0.007)
50-54	0.028	(0.005)	0.012	(0.004)	0.145	(0.012)	0.033	(0.009)
55-59	0.038	(0.006)	0.019	(0.006)	0.174	(0.013)	0.048	(0.010)
60-64	0.060	(0.007)	0.034	(0.008)	0.243	(0.017)	0.085	(0.013)
65-69	0.070	(0.009)	0.044	(0.009)	0.266	(0.020)	0.099	(0.017)
70-74	0.078	(0.010)	0.051	(0.011)	0.297	(0.023)	0.116	(0.019)
75-79	0.087	(0.011)	0.057	(0.011)	0.328	(0.025)	0.132	(0.021)
80-120	0.089	(0.011)	0.064	(0.012)	0.305	(0.027)	0.130	(0.023)
Length of stay								
Days: 0	0.215	(0.010)	0.034	(0.010)	0.851	(0.029)	0.086	(0.020)
Days: 1	0.146	(0.009)	0.051	(0.009)	0.585	(0.024)	0.092	(0.018)
Days: 2	0.105	(0.008)	0.051	(0.008)	0.387	(0.021)	0.078	(0.016)
Days: 3	0.077	(0.007)	0.044	(0.007)	0.266	(0.017)	0.068	(0.012)
Days: 4	0.056	(0.006)	0.037	(0.006)	0.170	(0.014)	0.047	(0.011)
Days: 5	0.040	(0.005)	0.029	(0.005)	0.116	(0.013)	0.038	(0.010)
Days: 6	0.029	(0.004)	0.020	(0.004)	0.092	(0.011)	0.030	(0.008)
Days: 7	0.014	(0.004)	0.009	(0.004)	0.060	(0.011)	0.016	(0.006)
Days: 8	0.013	(0.003)	0.010	(0.003)	0.035	(0.010)	0.015	(0.006)
Days: 9								
Days: 10 (reference category)	-0.009	(0.004)	-0.008	(0.004)	-0.018	(0.012)	0.003	(0.009)
Days: 11	-0.016	(0.006)	-0.012	(0.006)	-0.046	(0.013)	-0.013	(0.008)
Days: 12	-0.016	(0.005)	-0.011	(0.005)	-0.056	(0.013)	0.000	(0.008)
Days: 13	-0.030	(0.008)	-0.030	(0.008)	-0.038	(0.018)	0.000	(0.013)
Days: 14	-0.022	(0.006)	-0.023	(0.007)	-0.032	(0.016)	0.003	(0.012)
Days: 15	-0.025	(0.007)	-0.021	(0.007)	-0.081	(0.017)	-0.005	(0.011)
Days: 16	-0.029	(0.008)	-0.022	(0.008)	-0.085	(0.017)	-0.005	(0.012)
Days: 17	-0.029	(0.007)	-0.021	(0.008)	-0.111	(0.020)	-0.018	(0.014)
Days: 18	-0.036	(0.009)	-0.028	(0.010)	-0.109	(0.020)	-0.015	(0.014)

Variables	Total cost (log)		Routine cost (log)		Ancillary cost (log)		Ancillary cost collapsed to facility-level mean (log)	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Days: 19	-0.033	(0.008)	-0.025	(0.009)	-0.111	(0.021)	-0.029	(0.015)
Days: 20	-0.041	(0.008)	-0.035	(0.010)	-0.108	(0.024)	0.001	(0.016)
Days: 21	-0.031	(0.008)	-0.010	(0.008)	-0.244	(0.030)	-0.079	(0.022)
Facility-level adjusters								
Rural	0.043	(0.019)	0.026	(0.021)	0.172	(0.039)	0.133	(0.036)
Teaching	0.769	(0.104)	0.822	(0.109)	0.432	(0.201)	0.609	(0.189)
Occupancy rate	-0.463	(0.056)	-0.483	(0.059)	-0.352	(0.124)	-0.422	(0.117)
Constant	7.059	(0.042)	6.953	(0.045)	4.497	(0.097)	5.030	(0.090)
R^2	0.172		0.141		0.101		0.072	
N	292,306		292,306		292,306		292,306	
Mean of prediction	6.826		6.666		4.584		4.856	
SD of prediction	0.123		0.109		0.298		0.134	

Source: Urban Institute analysis of Medicare claims, cost-report, and denominator-file records for 2014.

Notes: IPF = inpatient psychiatric facility. Coef. = regression coefficient from log-linear OLS model. SE = standard error.

Without knowing how much true variation there is in routine costs per day, we can see by analogy how much bias there could be in the coefficients if routine costs had individual-level variability similar to what we observe for ancillary costs. When we collapse the ancillary-cost-per-day measure to the facility level and then use its log as the dependent variable in the same regression specification (last column of table 16), we find that the coefficients are in most cases greatly pulled in toward zero (compressed) relative to the estimates with the true ancillary cost measure in column three. With the collapsed dependent variable, the standard deviation of the predicted values is 0.134 as compared to 0.298 before collapsing the dependent variable. This shows that having collapsed data can severely limit the variability of the coefficients and therefore the payment adjustments—we just cannot tell how much individual-level variability there is in true routine costs that is missed when we must rely on the individual-level measure.[9]

Discussion

Our analysis of IPF claims data from 2004 to 2014 shows little sign of substantial changes. IPF service costs increased, but they increased less than medical CPI. The number of traditional Medicare enrollees using IPF services and the number of IPFs has decreased somewhat. We do not observe any adverse trends in the number of acute inpatient stays or IPF readmissions following IPF stays following the shift to the IPF-PPS. Although the use of emergency department visits before and after IPF stays has increased, it could simply reflect a broader trend of increased ED use for Medicare enrollees.

We find evidence of substantial irregularities in the reporting of ancillary charges and costs by IPFs similar to what CMS has reported. Nearly 20 percent of IPF stays in 2014 lacked cost report data to compute cost-to-charge ratios, and a further 7.5 percent of stays with cost-to-charge ratios lack ancillary charges from claims. While such a pattern may be expected in all-inclusive facilities, it also occurs to a substantial degree in facilities that are not all-inclusive.

Our attempt to replicate the IPF payment model with recent (2014) data shows meaningful differences between the payment weights that continue to be based on 2002 data and what the implied payment weights would be based on recent data. This suggest that CMS should consider updating the payment regression model and revising the IPF payment system weights to reflect the relationships between patient characteristics and IPF costs per day that exist in current data.

Over many years, CMS has postponed making refinements to the IPF-PPS. In the latest (FY 2020) IPF-PPS final rule, it indicates that refinement analysis is dependent on "recent precise data for costs, including ancillary costs." If CMS's efforts to require IPF to provide the necessary ancillary cost data is successful, the question of how to deal with missing values will be moot. But if the data issues are not sufficiently resolved, it should still consider proceeding with an update, as our analyses suggest that the original payment weights differ substantially from those estimated with current data, regardless of how missing data are treated.

Some specific issues with the payment weights that had been raised in earlier work continue to be relevant. First, the payment weight for the oncology treatment comorbidity severely underestimates the additional expected cost of IPF patients receiving such treatment. The degree of underestimation has grown over time. While the current weight for this comorbidity is 1.07, analysis with 2003 data suggested it should have been 1.28, and the factor is 1.61 in 2014 according to the current analysis using the main analysis sample.

Second, the IPF-PPS applies the effects for length of stay as if they apply to individual days of stay. This is a misinterpretation/misapplication of the LOS coefficients of the payment regression model as discussed on pages 40–42 in Garrett et al. (2009) and demonstrated numerically in table 9 of that document. The current approach results in systematic overpayment for longer stays. An approach to solving this problem would be to make payments based on final length of stay. Payment could also be based on a provisional expected length of stay with a subsequent reconciliation for longer stays that require multiple claims.

Finally, the measurement of routine costs (the largest component of IPF cost by far) as a facility-level average cost per day for each patient results in payment weights that are artificially pulled in toward one (i.e., compressed). Without knowing degree of individual-level variability of these costs, we cannot directly gauge how compressed the payment weights are, but we have shown that the potential for substantial compression is real. Garrett et al. (2009) estimated that the degree of compression in the payment weights was severe. Rather than facility-level costs being proportionate with its case-mix index (CMI), a 10 percent higher CMI was associated with 33 percent higher costs. In other words, average payment per day would be increased by 10 percent for an IPF when expected costs were 33 percent higher than average.[10]

Several possible approaches to addressing the problem of measuring routine costs and payment weight compression warrant consideration. First, a pilot study for a small number of facilities could be used to gather data on the degree of variation in routine costs across IPF patients and which types of patients have lower or higher routine service needs. This study could be parallel to the approach used by Research Triangle Institute in the Post-Acute Care Payment Reform Demonstration, which provided detailed data elements underlying routine costs for post-acute facilities (Gage et al. 2012). If the pilot study finds that there is substantial systematic variation in patient routine costs within facilities, a next step would be to investigate deploying a patient assessment instrument to measure routine (and ancillary) costs for payment purposes. Second, as Thorpe, Cretin, and Keeler (1988) have suggested, relative weights could be expanded (i.e., decompressed) by a factor to counter the effects of compression. Relative weights greater than one could be scaled up and relative weights less than one scaled down, with the scaling factor determined on the basis of facility-level compression analyses such as those presented in Garrett et al. (2009). This approach would need to estimate the decompression factor, and it has not been applied elsewhere for payment purposes to our knowledge, but it could improve payment accuracy without requiring a new patient assessment instrument. Finally, it may be possible to estimate facility-level regressions of routine costs as a function of patient characteristics that provide more accurate estimates of how routine costs are associated with patient

DRG and comorbidities. Although it may not be possible to estimate effects for all individual factors in this way, it may be possible to obtain less biased estimates of important patient factors that affect routine costs when facilities vary substantially in their mix of patients with these factors. Such analyses were beyond the scope of the current study but could be a useful direction for future work.

Notes

1 IPFs receive additional payment for each electroconvulsive therapy (ECT) treatment provided to patient ($344 in FY 2020). The IPF-PPS also makes outlier payments, with a 2 percent outlier pool.

2 U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: Medical Care in U.S. City Average [CUUS0000SAM], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CUUS0000SAM, December 17, 2019.

3 In its FY 2020 IPF-PPS final rule, CMS states the following: "Some providers have very low labor costs, or very low or missing drug or laboratory costs or charges, relative to other providers. As we noted in the FY 2016 IPF-PPS final rule (80 FR 46693 through 46694), our preliminary analysis of 2012 to 2013 IPF data found that over 20 percent of IPF stays reported no ancillary costs, such as laboratory and drug costs, in their cost reports, or laboratory or drug charges on their claims. Because we expect that most patients requiring hospitalization for active psychiatric treatment will need drugs and laboratory services, we again remind providers that the IPF PPS federal per diem base rate includes the cost of all ancillary services, including drugs and laboratory services."

4 The FY 2020 IPF-PPS final rule states, "On November 17, 2017, we issued Transmittal 12, which made changes to the hospital cost report form CMS-2552-10 (OMB No. 0938-0050), and included the requirement that cost reports from psychiatric hospitals include certain ancillary costs, or the cost report will be rejected. On January 30, 2018, we issued Transmittal 13, which changed the implementation date for Transmittal 12 to be for cost reporting periods ending on or after September 30, 2017. For details, we refer readers to see these Transmittals, which are available on the CMS website at https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/index.html. CMS suspended the requirement that cost reports from psychiatric hospitals include certain ancillary costs effective April 27, 2018, in order to consider excluding all inclusive rate providers from this requirement. CMS issued Transmittal 15 on October 19, 2018, reinstating the requirement that cost reports from psychiatric hospitals, except all-inclusive rate providers, include certain ancillary costs."

5 The median ratio of standard errors with and without clustering is 2.4 for coefficients of variables that vary by individual and 18 for variables that vary by facility.

6 In addition to being substantively meaningful, approximate (conservative) tests indicate that many of the differences in coefficients between the main sample and restricted sample are statistically significant.

7 The flatter pattern of age effects in the restricted sample results largely from those under age 45 having a relatively high share without reported ancillary costs and thus higher total costs (after excluding those with zero ancillary costs) in the restricted sample. Since those under age 45 is the reference group, this leads to smaller coefficients for the remaining age groups. The ratio of the coefficients for those over 80 and those ages 46 to 50 remains nearly the same in the restricted and main models.

8 This bias is a form of aggregation bias that stems from the partial aggregation to the facility-level of the per diem cost measure that is used (in log form) as the dependent variable of the payment regression.

9 Table 16 also provides some insight on some main findings presented above. The relatively large effect on total cost of DRG 876 (O.R. procedure with principal diagnosis of mental illness) results from positive effects on both routine and ancillary costs. The negative effect on total cost of DRG 895 (Alcohol/drug abuse or dependence with rehabilitation therapy) results largely from a negative effect on routine cost (the effect on ancillary cost is not statistically significant). There are also cases where the effects on routine and ancillary costs are substantial, but offsetting, resulting in a modest effect on total cost (e.g., DRG 080–Non-traumatic

stupor and coma, with MCC). For the oncology treatment comorbidity, we find that the effect on total cost is driven by a large effect on ancillary cost. The effect of this comorbidity on routine cost (0.079) is not statistically significant, though it is one of the larger coefficients in the routine cost model. Consistent with the total cost model, we generally see patterns of increasing costs with age and declining (per day) costs with length of stay in both the routine and ancillary cost models.

[10] See table 15 on page 58 of Garrett et al. (2009). The CMI coefficient in column 1 for the payment model is 3.31.

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