
BBA Impacts on Hospital Residents, Finances, and Medicare Subsidies

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Concern over rapidly rising Medicare expenditures prompted Congress to pass the 1997 Balanced Budget Act (BBA) that included provisions reducing graduate medical education (GME) payments and capped the growth in residents for payment purposes. Using Medicare cost reports through 2001, we find that both actual and capped residents continued to grow post-BBA. While teaching hospital total margins declined, GME payment reductions of approximately 17 percent had minimal impact on revenue growth (-0.5 percent annually). Four years after BBA, residents remained a substantial line of business for nearly one-half of teaching hospitals with Medicare effective marginal subsidies exceeding resident stipends by nearly \$50,000 on average. Coupled with an estimated replacement cost of over \$100,000 per resident, it is not surprising that hospitals accepted nearly 4,000 residents beyond their allowable payment caps in just 4 years post-BBA.

INTRODUCTION

In 1984, Congress passed landmark legislation converting acute general hospitals from cost-based to inpatient prospective payment system (IPPS) payment (Prospective Payment Advisory Commission, 1986). In calibrating the system's payments, CMS (formerly HCFA) staff estimated a cost equation in order to quantify any systematic cost differences by hospital type (Pettengill and Vertrees, 1982). A teaching effect was

found on patient costs when measured in terms of residents per bed even after controlling for the direct payroll and other specific costs of teaching. Higher patient care costs in teaching hospitals were covered using an indirect medical education (IME) payment after Congress doubled the estimated intern and resident-to-bed (IRB) coefficient to assure that providers would not suffer financially from the new risk they would be assuming under Medicare's IPPS. Lump-sum payments were also made to cover Medicare's share of direct medical education resident stipends and teaching-related faculty costs. Together IME and direct medical education comprise total GME payments from Medicare.

A number of authors have identified the teaching subsidy as a strong incentive to train additional residents. Newhouse (1983, 1996), the U.S. Congressional Budget Office (1995), the Institute of Medicine (1996), the Council of Graduate Medical Education (1998), and Iglehart (1999) all argue that the Medicare teaching subsidy had been too generous, causing the number of residents to be excessive and rising, especially since the 1980s. In addition, since 1984, it has been well documented that GME payments have been partially responsible for Medicare operating margins in teaching hospitals well in excess of other hospital groups (Medicare Payment Advisory Commission, 2001). Finally, Lee and Hadley (1985) estimated resident shadow wages incorporating the utility that hospital managers and physicians derive from residents. These non-pecuniary returns reinforce subsidies in driving resident demand.

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In 1997, when Congress was struggling with Medicare's growing share of Federal spending (Medicare Payment Advisory Commission, 1998), it passed the BBA that contained several key changes in the level and manner in which Medicare paid for GME. Most important was the legislated reduction in the IME multiplier factor from 1.89 established in the 1987 Omnibus Budget Reconciliation Act (OBRA) to 1.35 in October 2000. Residents, both in total and per bed, were also capped using 1996 hospital-specific baseline counts and a 3-year moving average used to count residents, thereby creating short-run GME transition payments for hospitals downsizing their teaching programs.

Believing that the initial reductions in teaching payments were too severe, Congress, in the 1999 Balanced Budget Refinement Act (BBRA), postponed the decline in the multiplier factor to October 2001. At the same time, Congress redressed perceived inequalities in direct medical education payments by establishing payment floors and ceilings on allowable per resident amounts. BBRA also eliminated the resident caps for rural teaching hospitals. Then, again, under the 2000 Benefits Improvement and Protection Act (BIPA), Congress further postponed the 1.35 IME factor to October 2002. Finally, the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003 postponed the 1.35 factor until October 2007.

In light of the concerns over Medicare spending growth and attempts to rein in outlays to teaching hospitals, our principal goals in this article are to:

- Quantify the BBA and BBRA impacts on the secular growth in the size of hospital residency programs through changes in actual, allowed, and capped residents.
- Highlight the major reasons why legislative attempts to slow the growth in residents have had so little effect.

We will show that Medicare GME subsidies may be so large for some hospitals that direct medical education and IME revenues exceed the costs of hiring residents, who remain a line-of-business of their own besides providing patient care. We also show that GME payment reductions only trivially lowered revenues and margins for most teaching hospitals. Moreover, the BBA cap on new residents was not rigid and allowed many hospitals to continue receiving extra direct medical education and IME payments when expanding their programs.

The article is presented in five sections. First, we summarize our principal data sources. Next, we present trends in resident counts showing the effectiveness of the congressional cap on residents used for payment purposes. This is followed by an analysis of BBA financial impacts on teaching hospital revenues and margins. We then estimate reductions in GME payments (the so-called GME bite) over the first four post-BBA years, 1997-2001, both in total and as a percent of hospital revenues. In the last empirical section, we calculate the Medicare marginal teaching subsidy from hiring one more resident in 2001, and show how much it offsets the wage that teaching hospitals must actually pay a new resident. In conclusion, we will summarize how Medicare subsidies and low hourly stipends of residents provide on-going incentives to expand resident training in the U.S.

DATA SOURCES

To quantify trends in residents, Medicare cost reports (MCRs) were assembled for all prospective payment system (PPS)—PPS-eligible teaching hospitals over the 1985-2001 period using the Hospital Cost Report Information System (HCRIS) Minimum Data Sets (1985-1995) and Hospital Cost

Report Files (1996-2001). Missing data elements prevented use of the data for 1985-1989 while the 2002-2003 files were unavailable. Sixty-six teaching hospitals were missing either 2000 or 2001 reports, and resident and bed counts were imputed using the subsequent or previous year's data. Another 18 teaching hospitals were deleted from the entire 1990-2001 period because of missing MCRs or resident counts for multiple years. These deletions included all 11 New York Health & Hospital Corporation (HHC) hospitals plus a few other major teaching hospitals, e.g., Duke University Hospital.

Prior to 1997, full-time equivalent (FTE) resident counts were taken from MCR Worksheet S-3, Part I. Worksheet E, Part A was the source of resident data after 1997 when hospitals began reporting capped (line 3.04), actual (line 3.08), and allowed residents (line 3.14), adjusted for the 3-year rolling average (line 3.17), new residency programs (line 3.05), and other factors not in effect prior BBA.

Total facility, patient, IPPS, and GME revenues are taken from Worksheets E and G-3 for teaching hospitals over the entire 1985-2001 period. Total facility margins differ from operating margins by including non-operating revenues (e.g., parking, investment income) net of related costs. For the financial analyses, we deleted 4 percent of teaching hospitals with reported operating margins less than -50 percent and the top 1-percent with margins greater than +34 percent. Slightly over 1,000 teaching hospitals remained for analysis.

PRE/POST-BBA TRENDS IN RESIDENTS

Overall Trends

Except for 1995, actual FTE residents in PPS-eligible hospitals increased every year from 1990 (65,371) through 2001

(79,527), for a compound annual growth rate of 1.8 percent (Figure 1).¹ The number of residents increased every year after the passage of BBA (1997) at a compound growth rate of 2.0 percent through 2001—a rate slightly higher than over the previous 1990-1996 period (1.8 percent). Meanwhile, hospital bed counts declined, resulting in an increase in the actual IRB ratio from 0.181 to 0.243, or 2.9 percent annual growth. Since the 1997 BBA, the actual IRB increased by 16 percent from 0.208 (1997) to 0.243 (2001). As with residents, the IRB trend accelerated slightly in the post-BBA period.

Capped, Actual, and Allowed Residents

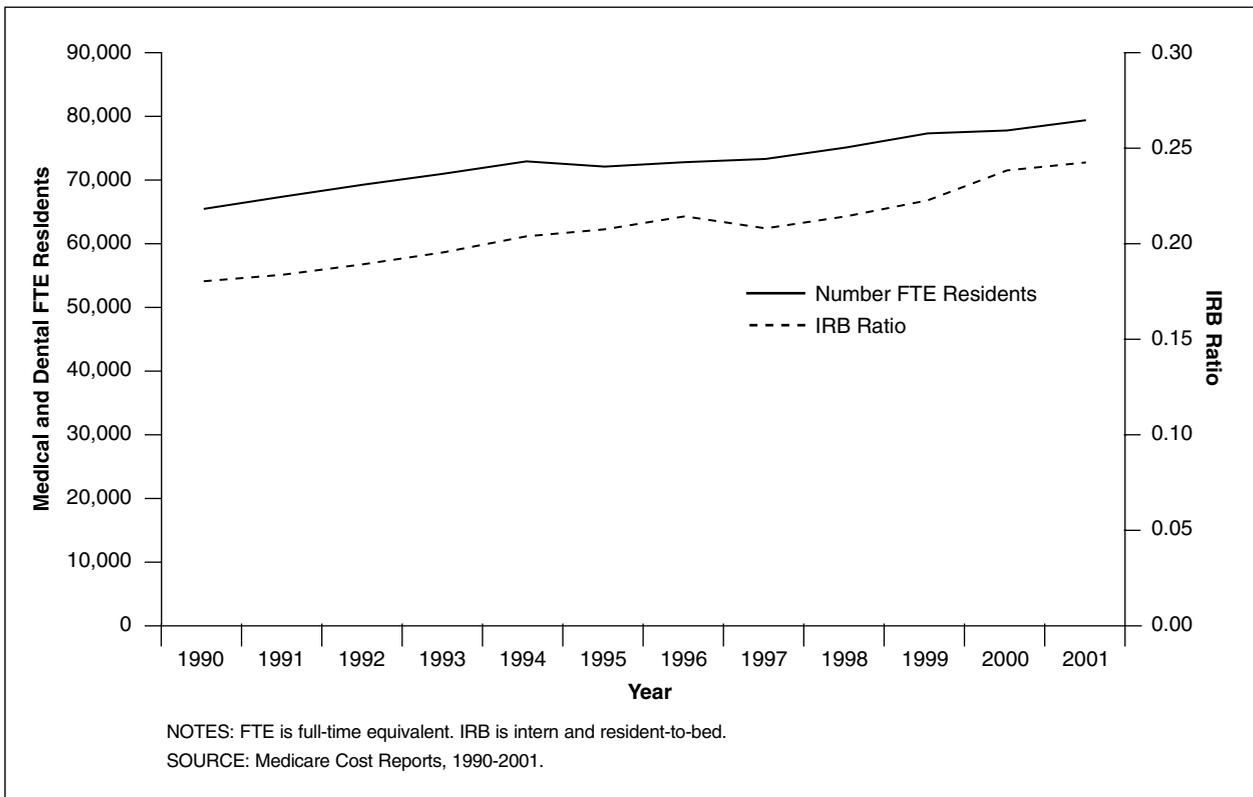
Between 1996, the baseline year for the BBA cap, and 2001, the aggregate U.S. medical (allopathic and osteopathic) resident cap, adjusted for new programs, increased by 6,484, a 9-percent overall increase (Table 1). The baseline 1996 cap amount actually increased by 3,825 residents, almost all in urban teaching hospitals. Hospitals were allowed to adjust their cap over time to account for residents on leave during 1996, for successful appeals of their baseline counts, as well as for new residents in expanded rural hospital programs. New residency programs, almost all in urban hospitals, added another 2,036 residents. The adjusted resident cap appears to have leveled off by 2000 after significant increases in the early post-BBA period.

Allowed resident counts used for payment purposes, including dental and podiatric, grew by 3,151, or 4 percent, an increase slightly less than one-half the growth in the adjusted resident cap for medical residents

¹ CMS resident count (2001) is 17,000 less than reported by the American Medical Association (2004). CMS excludes residents in the Veterans Administration, Department of Defense, and PPS-exempt units.

Figure 1 -

Actual FTE Medical and Dental Residents and IRB Ratio in Teaching Hospitals: 1990-2001 -



alone. The discrepancy is primarily due to teaching hospitals either not filling or losing their allowable resident slots. In part because their programs were not capped, allowed resident counts in rural teaching hospitals grew at four times the rate of urban counts, but still accounted for only 1-in-20 new residents post-BBA. The average allowed IRB ratio used for payment purposes increased 8 percent between 1996-2001.

Actual total FTE residents increased by 7,034 between baseline year 1996 and 2001, and by 5,545 for the capped medical residents. Uncapped dental and podiatric residents nearly doubled in just 4 years. The difference between actual and allowed residents, adjusted for uncapped dental and podiatric residents, gives an estimated 3,883 (5,545 - [3,151-1,489]) medical residents that were taken on by teaching hospitals who were not eligible for Medicare GME payment. Non-reimbursed new resi-

dents had increased to roughly 5 percent of all medical residents by 2001. Even though allowed residents for rural teaching hospitals increased 16 percent from 1996-2001, 20 new residents were added to urban hospitals for every resident added to rural teaching hospitals. To put this in perspective, prior to the BBA, there were 70 FTE urban residents in PPS hospitals for every rural resident in the U.S.

Three-Year Rolling Average Residents

For hospitals with consistently declining resident counts, their 3-year rolling average IRB ratio remained 1 percentage point higher (0.15 versus 0.14) for payment purposes than without the adjustment. By contrast, for hospitals with consistently rising resident counts, their allowable IRB ratio was 3 points lower (0.28 versus 0.31) under the 3-year averaging method. We estimate

**Table 1 -
Change in Medicare Resident Caps and Allowed and Actual Residents: 1996-2001 -**

Cap	Resident Counts					Change Between 1996 and 2001	
	1996	1998	1999	2000	2001	Number	Percent
Residents¹							
Baseline Residents	70,061	71,804	73,240	73,565	73,890	3,825	5.0
New Residency Programs	0	1,572	2,372	1,869	2,036	2,036	(²)
Adjusted Residents	70,065	73,603	75,938	75,934	76,549	6,484	9.0
Allowed Residents³ and IRB							
Total Allowed Residents	71,813	71,706	73,531	73,694	74,964	3,151	4.0
Urban	70,888	70,671	72,434	72,528	73,780	2,992	4.0
Rural	1,025	1,034	1,097	1,166	1,184	159	16.0
Allowed IRB	0.212	0.205	0.212	0.226	0.230	0.018	8.0
Actual Residents							
Allopathic and Osteopathic	70,065	72,156	73,763	74,289	75,610	5,545	8.0
Dental and Podiatric	1,748	2,182	2,443	2,846	3,237	1,489	85.0
Total Actual Residents	71,813	74,337	76,207	77,134	78,847	7,034	10.0

¹ Applies only to allopathic and osteopathic residents. -

² Not calculated because denominator equals zero. -

³ Includes medical, dental, and podiatric residents. -

NOTES: 1997 data deleted because of conflicting resident counts from two worksheet Es used during the Balance Budget Act transition year. IRB is intern and resident-to-bed ratio.

SOURCE: Medicare Cost Reports, Worksheets E, Part A, 1996-2001.

that in 2001, when the rolling average was fully implemented, Medicare actually saved 2.6 percent on its IME payments, or \$91 million, due to the larger resident drag on growing versus declining programs.

BBA FINANCIAL IMPACTS

Overall Trends

Teaching hospitals as a whole experienced consistently high revenue growth during the 16 years between the introduction of Medicare PPS and 2001. Total patient and facility revenues, net of insurer discounts and disallowances, increased 3.3-fold at an annual growth rate of 7.8 percent (Table 2). Patient and total facility revenue growth slowed in the post-BBA period, declining from about 8.5 percent annually from 1985-1996 to 6.3-6.6 percent between 1996-2001. Teaching hospital patient operating margins have been consistently negative with the largest percentage losses coming immediately after the BBA was enacted. Average total facility margins for

teaching hospitals, by contrast, have been strongly positive, but declined from about 5.5 percent in the mid-1990s to 3.0 percent in 2001. Also during the post-BBA period, total PPS patient revenues grew much more slowly than other patient revenues, implying that BBA legislation, among other factors, was having a constraining effect on otherwise strong financial growth.

Financial Trends by Hospital Characteristic

Financial performance differed systematically across groups of teaching hospitals (Table 3). Highly dependent Medicare hospitals, those with over 40 percent Medicare discharges (i.e., the top one-third), exhibited less negative patient operating margins and total facility margins equivalent to other hospitals. Rural teaching hospitals performed even better than their urban counterparts. This is in contrast to major teaching hospitals (IRB ratios in excess of 25 percent) that incurred negative patient operating margins between -6 percent and -8 percent in the

**Table 2 -
Trends in Average Revenues and Margins Per Teaching Hospital: 1985-2001 -**

Year	Net PPS Revenues ¹	Net Total Patient Revenues ¹	Net Total Facility Revenues ²	Patient Operating Margin ¹	Total Facility Margin ²
		In Millions		Percent	
1985	—	\$61.6	\$66.2	1.4	6.2
1990	—	104.7	112.5	-3.0	3.1
1996	\$42.4	149.4	162.3	-1.5	5.5
1997	42.4	156.4	171.8	-2.5	5.2
1998	42.7	166.1	182.2	-4.1	3.7
1999	43.9	175.8	192.2	-4.8	3.2
2000	46.8	190.5	206.7	-4.0	3.4
2001	49.9	205.9	220.4	-3.6	3.0
Annual Growth Rates (Percent)					
1985-2001	—	7.80	7.80	—	—
1985-1996	—	8.40	8.50	—	—
1996-2001	3.30	6.60	6.30	—	—

¹ Excludes top 1 percent and bottom 4 percent where -0.5 > operating margin > 0.34. -

² Excludes top and bottom 1 percent where -0.40 > total margin > 0.33. -

NOTE: PPS is perspective payment system. -

SOURCE: Medicare Cost Reports, Worksheets E and G-3, 1985-2001.

**Table 3
Trends in Teaching Hospital Margins, by Medicare Dependency, Program Size, Rural Location, and Ownership: 1990-2001**

Margin	1990	1996	1997	1998	1999	2000	2001
Patient Operating¹							
				Percent			
Overall	-3.0	-1.5	-2.5	-4.1	-4.8	-4.0	-3.6
Highly Dependent ²	-1.4	0.7	0.0	-2.0	-2.0	-1.5	-0.9
Major Teaching ³	-7.2	-5.8	-6.3	-7.3	-8.1	-8.1	-8.2
Rural	-0.8	2.1	1.0	0.9	0.6	0.4	-0.9
Proprietary	-1.2	4.7	1.7	-1.2	1.8	5.0	7.0
Government	-11.4	-7.6	-5.8	-6.8	-9.8	-7.8	-9.5
Private Voluntary	-2.3	-1.7	-2.2	-4.1	-5.0	-4.4	-4.0
Total Facility⁴							
Overall	3.1	5.5	5.2	3.7	3.2	3.4	3.0
Highly Dependent ²	3.5	6.3	6.6	3.9	3.4	3.6	2.8
Major Teaching ³	1.6	3.5	4.3	2.9	2.4	1.8	1.1
Rural	5.0	7.5	7.8	6.7	6.6	7.3	4.6
Proprietary	2.9	7.0	3.7	2.6	5.1	8.0	8.0
Government	1.4	2.1	6.0	4.1	0.7	1.8	-0.4
Private Voluntary	3.3	5.7	5.8	3.7	2.9	2.9	2.6

¹ Excludes to 1 percent and bottom 4 percent where -0.5 > operating margin > 0.34. -

² 40 percent Medicare discharges. -

³ Intern and resident-to-bed ratio = 0.25. -

⁴ Excludes top and bottom 1 percent where -0.40 > total margin > 0.33. -

SOURCE: Medicare Cost Reports, Worksheets E and G-3, 1985-2001. -

post-BBA period which were far lower than smaller teaching hospitals. Government teaching hospitals incurred by far the greatest operating losses and the lowest average total margins—even after excluding New York City HHC hospitals. Proprietary teaching hospitals, as expected, averaged the highest operating and total facility margins.

BBA REDUCTIONS IN GME PAYMENTS

A common way of calculating the effects of BBA-GME payment reductions on hospital revenues and margins requires estimating what teaching hospitals would have received from Medicare if there had been

Table 4

Trends in Current Year GME Payment Reductions¹, or Bite, Per Teaching Hospital as a Percent of Revenues and Per Resident: 1998-2001 -

Year	Hospital Average Reduction ² (Thousand Dollars)	Average Reduction as Percent of ³			
		Patient Revenues	Total Facility Revenues	PPS Revenues ⁴	Average Reduction Per Resident ⁵
			Percent		
1998	-1,046	-0.60	-0.53	-2.40	-\$12,834
1999	-1,187	-0.63	-0.54	-2.70	-14,060
2000	-1,184	-0.58	-0.51	-2.70	-13,307
2001	-1,290	-0.58	-0.52	-2.50	-14,005
Cumulative	-4,707	—	—	—	—

¹ GME reduction calculated as difference between reported annual actual GME payments minus expected GME payments based on current period Medicare volumes and case mix, but no Balanced Budget Act rollbacks.

² Based on approximately 800-900 hospitals depending on year. Excludes hospitals with reported patient operating margins below -50 percent or above +34 percent (5 percent of hospitals), as well as hospitals with extreme direct medical education values.

³ Percents weighted by hospital patient on total facility revenues.

⁴ Includes outlier and pass-through payments.

⁵ Hospital reductions weighted number of hospital residents.

NOTE: GME is graduate medical education.

SOURCE: Medicare Cost Reports, Worksheets S-3, and G, 1985-2001.

no legislated payment changes. Between 1996 and 2001, the IME multiplier fell from 1.89 to 1.60, implying a 15-percent decline in GME payments if Medicare volumes and case mix had not changed. Also, after October 1997, teaching hospitals no longer received GME adjustments to their outlier payments. Offsetting these two negative changes was the gradual increase from 20 percent in January 1998 to 80 percent by January 2001, in the proportion of GME payments made directly to teaching hospitals for their Medicare managed care patients. The difference between actual GME payments in a given year and what teaching hospitals might have expected to receive without the BBA, BBRA, and BIPA changes is called the current year GME bite (Zwanziger and Melnick, 1988; Gruber, 1994; Cutler, 1998). The *current* year bite evaluates differences in legislated GME payments using actual allowed residents, a count that could be lower than actual residents for capped hospitals. Calculated in this way, the bite does not include GME revenue losses from unreimbursed residents. Average bites would have been 5-percent greater if unreimbursed residents were included. Formulas

for calculating the expected direct medical education and IME payments in lieu of the legislated changes are available on request from the author.

The average annual loss (bite) in GME revenues per teaching hospital was slightly over \$1 million in the post-BBA period (Table 4). While not insignificant, the reduction implied an average decline in patient or total revenues of only slightly more than one-half of 1 percent. As Medicare represents only a fraction of total patient revenues, the GME bite out of PPS revenues averaged about 2.6 percent. The reduction averaged \$13,000-\$14,000 on a per resident basis.

We further decomposed the legislated change in IME payments by changes in the multiplier, the capped IRB, and by the shift to direct GME managed care payments. We computed the log of the post/pre-BBA IME payment ratio for each hospital for each year between 1998 and 2001, as well as the logs of the ratios of changes in the PPS base payments, IME multiplier, and actual versus capped IRB. The geometric mean bite ratio averaged between 0.80 and 0.833 over the 1998-2001 period, implying a 17 to 20 percent reduction in IME payments.

As of 2001, GME managed care payments made directly to teaching hospitals actually increased GME payments 3.3 percent, but were offset by roughly a 15-percent reduction due to a declining IME multiplier, and a 5-percent reduction due to a lower IRB than if no cap had been in place.

MEDICARE MARGINAL SUBSIDY AND EFFECTIVE RESIDENT WAGE

In the early post-BBA years, hospitals continued to increase their actual resident counts in spite of legislated rollbacks in GME payments. One might have expected less demand for residents from lower subsidies. To determine why this did not happen, we calculated the net marginal subsidy provided by the program from adding another resident. We then adjusted the nominal resident stipend by the subsidy to produce a net marginal wage, or cost, to the hospital. The marginal direct medical education and IME subsidies, $\partial DME/\partial R$ and $\partial IME/\partial R$, for a given hospital are based on the derivatives of the total subsidy formulas with respect to residents (R), i.e.,

$$(1) \partial DME/\partial R = W_r(1+s)PDS_m$$

$$(2) \partial IME/\partial R = (PPS)(D_m/B)[0.765(1+IRB)^{-.595}]$$

where (1+s) is the effect on DME payments of the loading factor, s, which is the ratio of resident fringe benefits and faculty teaching-related costs to residents' salaries; PDS_m is the Medicare share of patient days; PPS is the hospital's average DRG Federal PPS payment; D_m/B is the number of Medicare discharges per bed; and $[0.765(1+IRB)^{-.595}]/B$ equals the derivative of the IME payment formula with respect to residents ($0.765 = 1.89 \times 0.405$ using the pre-BBA multiplier). We assumed that faculty teaching costs and patient care costs do not rise with the addition of one new additional resident. For the average teach-

ing hospital with 92 residents, one more resident should add minimally (possibly 1-2 percent) to direct medical education and IME costs. Dalton, Norton, and Kilpatrick (2001) re-estimated the IRB coefficient using a time-series instead of the cross-hospital approach used by Pettengill and Vertrees (1982), and found the teaching coefficient on patient costs to be zero. Another resident in a much smaller program (e.g., less than 10 residents) could significantly raise direct medical education facility costs, but IME patient care costs should be less sensitive given numerous fixed hospital overhead and nursing costs. Starting up a whole new program would be costly, and our results would overstate gains in these instances. Together, the direct medical education and IME marginal subsidies produce an overall [bracketed] adjustment factor of $[1 - \partial DME/\partial R - \partial IME/\partial R]$ to the resident's nominal wage paid by the hospital, i.e.,

$$(3) \text{ Net Marginal Wage} = W_r[1 - (1+s)PDS_m - (PPS/W_r)(D_m/B)(0.745(1+IRB)^{-.595})]$$

Multiplying this bracketed adjustment factor by the nominal wage of approximately \$40,000 plus 25 percent fringes in 2004 (Association of American Medical Colleges, 2004) gives the resident's effective wage, net of marginal Medicare GME subsidies, that a hospital must pay in taking on another resident.

A simulation² of the overall adjustment factor based on different Medicare patient day shares, faculty loadings, average PPS payment-to-stipend ratios, and IRB ratios showed that marginal wage rates remain slightly positive (ranging from 4-23 percent of the nominal wage) only at relatively low shares of Medicare patient days. Resident

²We assumed that a 300-bed teaching hospital had a 75-percent occupancy rate with an 8-day Medicare length of stay. Facility loading factors were varied from 0.3 to 0.7; PPS/ W_r ratios ranged from 1/8 to 1/4; $0.2 < PDS_m < 0.6$; $0.10 < IRB < 0.50$; and IME multiplier = 1.89.

**Table 5 -
Direct Medical Education and IME Marginal Subsidies and Net Marginal Wage Per Uncapped
Resident, by Hospital Characteristic: 2001 -**

Hospital Characteristic	GME Subsidy			Net Marginal Wage ³	Average Actual Residents
	DME ¹	IME ²	Total		
Overall (421)	\$28,948	\$70,143	\$99,091	-\$49,091	92.0
Medicare Share of Days					
<20% (36)	8,133	34,241	42,374	7,626	124.0
40+% (210)	36,454	84,665	121,119	-71,119	42.6
IRB Ratio					
<0.05 (94)	29,360	79,885	109,245	-59,245	7.2
0.10-0.25 (117)	30,801	72,301	103,102	-53,102	47.3
0.40+ (92)	24,896	54,675	79,591	-29,571	275.4
Ownership					
Private Voluntary (345)	31,243	75,800	107,043	-57,043	90.1
Government (21)	14,269	29,574	43,843	6,157	155.6
Proprietary (52)	23,708	60,049	83,757	-33,757	54.5
Location					
Urban (425)	27,786	69,781	97,567	-47,567	76.2
Rural (41)	36,139	70,300	106,439	-56,439	9.1
State					
Rhode Island (1)	25,682	131,734	157,416	-107,416	63.9
South Dakota (2)	58,172	84,811	142,983	-92,983	14.2
South Carolina (2)	23,556	40,931	64,487	-14,487	18.6
Arizona (5)	16,575	42,218	58,793	-8,793	94.7
New York (58)	35,717	66,030	101,747	-51,747	163.2

¹ Direct medical education subsidy is the Medicare share inpatient days x direct medical education allowable payment (including teaching costs) per resident (constrained to allowable/resident <\$160,000). Means based on slightly smaller sample than for IME subsidy.

² IME subsidy equals the Medicare inlier DRG and Medicare+Choice carve-out payments x the IRB derivative with respect to number of residents (and using 1.66 IME multiplier for 2001).

³ Net marginal wage equals \$40,000 + 25 percent fringes - direct medical education subsidy - IME subsidy.

NOTES: IME is indirect medical education. GME is graduate medical education. Numbers in parenthesis are the number of uncapped hospitals with both direct medical education and IME trimmed subsidies.

SOURCES: Simulated based on Medicare Cost Reports for Teaching Hospitals 2001; resident salaries taken from Association of American Medical Colleges (2004).

net marginal wage rates are quite negative (reaching -3.7 times W_p) for teaching hospitals that are highly dependent on Medicare with high case-mix indexes and sizable faculty cost loading factors. In fact, Medicare's direct medical education subsidy alone, pays all of the additional resident's fringe-loaded stipend for hospitals with a 70-percent add-on payment for teaching-related faculty costs and with a Medicare's share of days greater than 60 percent.

Table 5 shows average marginal subsidies and net resident wages using actual hospital MCR data in 2001 for uncapped hospitals.³ Hospitals with their allowable residents

³ A given hospital's residents may or may not be capped in any year (Table 1). For hospitals meeting our reporting thresholds in Table 5, 421 were uncapped in 2001 and 438 were capped.

capped in 2001 (slightly more than 50 percent of hospitals) must pay the full \$40,000 resident stipend plus 25 percent fringes out of non-Medicare revenues (Association of American Medical Colleges, 2004). The direct medical education subsidy has been constrained to \$160,000 so not to overstate the effects of teaching hospitals with very high faculty loading factors. The Medicare overall marginal subsidy to uncapped teaching hospitals averaged \$99,091 per resident, 7-tenths of which was due to the IME subsidy. The average net marginal wage was -\$49,091, implying that a typically sized teaching hospital adding one more resident not only covered all of that resident's fringe loaded stipend from Medicare

payments, alone, but returned over \$49,091 in additional revenue as well. The marginal subsidy was 2.9-fold greater for hospitals with over 40 percent Medicare days versus those under 20 percent Medicare. Low Medicare-dependent teaching hospitals, as well as government hospitals, were the only two groups facing positive resident wages at the margin. Subsidies were relatively insensitive to the hospital's IRB ratio except at the highest level (0.40+) where it was much lower due to the non-linear IRB effect on IME payment. Medicare subsidies are low for government teaching hospitals primarily because of their relatively low share of Medicare days and discharges. Urban and rural teaching hospitals face similar marginal subsidies and negative resident net wages in part because rural teaching hospitals are much more Medicare dependent than urban hospitals while the latter enjoy much higher average PPS payments per discharge. Nominal resident stipends are similar across urban and rural areas. Rhode Island and South Dakota with one or two uncapped hospitals enjoyed the largest average marginal subsidies of all States, resulting in negative resident net wage rates of approximately \$100,000. South Carolina's two and Arizona's five uncapped teaching hospitals experienced the lowest average marginal subsidies; yet, teaching hospitals in even these two States still made a profit on average of \$9,000–\$14,000 after paying all of the resident's salary. New York, with 58 uncapped teaching hospitals and the greatest number of residents per provider of any State, experienced average subsidies and negative net wage rates similar to other States.

DISCUSSION

Based on audited information reported by teaching hospitals to Medicare, the number of residents in training continued

to increase, and possibly even accelerate, after the passage of the BBA despite the congressional cap on residents and reductions in GME payment rates. That Congress relaxed the caps through special exceptions and restored most of the payment reductions in subsequent legislation explains a portion of the continued strong 2 percent annual growth in FTE residents. The net effect of these changes reduced overall revenue growth in teaching hospitals by only \$5 per \$1,000 in total revenues.

Nevertheless, despite a modest rise in resident net cost to hospitals as GME subsidies fell, they remained a very profitable line of business. Four years after the passage of the BBA, the Federal Medicare GME subsidy, alone, generated approximately \$50,000 in extra revenues after fully paying for a new resident's stipend and fringe benefits. This does not even account for GME subsidies in States that provide Medicaid and other teaching program funding tied to resident counts.⁴ Implicitly recognizing residents as a line of business and paying far more in GME than the wage of the marginal resident, the Medicare Program distorts the allocation of scarce, expensive health resources towards producing more physicians with little evidence of a national physician shortage (Mullan, 2002; Reinhardt, 2002; Weiner, 2002; Cooper et al., 2002). Geographic and specialty shortages likely persist, but the GME subsidy formulas reward many teaching hospitals that have little, if any, financial need for continued subsidies when expanding their programs. In sharp contrast, government teaching hospitals, especially in urban areas, average far lower GME subsidies at the margin because of their smaller Medicare caseloads.

⁴ According to the Council on Graduate Medical Education (2000), State Medicaid Programs spent \$2.3 billion, or 7 percent of their budgets, on either explicit or implicit GME payments (Henderson, 2000; 2003).

In addition, the low annual stipends and long work hours make residents an extremely cost effective input to patient care. Even before subtracting the Medicare subsidy, the first-year resident costs only about \$13 per hour (assuming an 80-hour week, 48 weeks per year, and a \$50,000 stipend including fringes). Based on Knickman's (1992) replacement model, Green and Johnson (1995) estimated the average staff replacement cost per resident to be about \$105,000 in 1995 dollars. This is well more than double the resident's fringe-loaded stipend and before netting out any subsidies.

Persistent negative marginal resident wages facing teaching hospitals highlight the key role of supply constraints on the growth in resident training and GME spending. According to Medicare regulations, residency programs must be accredited by the Accreditation Council for Graduate Medical Education in order for participating hospitals to receive Medicare GME payments. The Accreditation Council for Graduate Medical Education specialty-specific Residency Review Committees (RRCs) set limits on the number of residents in each hospital's program based on the hospital's case mix, the ratio of patients to residents, and institutional resources available to the program (Accreditation Council for Graduate Medical Education, 2005). Programs that exceed their maximum resident counts jeopardize their accreditation. Absent RRC constraints, Medicare subsidies and low hourly wages would generate even faster growth in residents—possibly from international medical schools.

Besides imposing caps and limited payment rollbacks, Congress has begun to address the maldistribution of residents under the 2003 MMA. Rural teaching hospitals, and those starting unique teaching programs in their State, are being given preference in reallocating unused slots.

Given desirable reallocations in resident slots to physician shortage areas, and the somewhat arbitrary nature of a soft cap, we recommend abandoning the cap in favor of reducing the marginal financial incentives of adding new residents. Current subsidy levels support inefficient, oversized programs that add to Medicare's escalating costs. We emphasize, however, that very sizable rollbacks in GME payments (both direct medical education and IME) will be necessary to counteract line-of-business incentives under current subsidy levels. Moreover, any changes should be grounded in more explicit policies that consider the geographic maldistribution of physicians and which specialties (such as primary care) to promote. Public discussion is also needed on the shared responsibility between Medicare and private insurers in supporting resident training programs.

LIMITATIONS

Our analysis was limited in ways that might have over- or understated the total and marginal subsidy facing teaching hospitals. For example, adding more residents could increase faculty-related DME teaching costs that we assumed were unchanged when adding a single new resident. For hospitals with 20 or more residents, adding one or two residents, especially in existing programs, should add little to teaching-related costs. Also, because we focused on the marginal IME subsidy, we assumed no increase in patient care costs from adding one (or a few) new residents. For small teaching hospitals, this assumption needs to be validated in future research. Furthermore, our data focused on the decade 1990-2001. Recent MMA legislation that further postponed the reduction in the multiplier factor while allowing unused teaching slots to be reallocated should reinforce the notion of residents as a line

of business making some teaching hospitals even more dependent on them at the margin.

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