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Final Report on the Sixth Update of the Geographic Practice Cost Index for the Medicare Physician Fee Schedule

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TABLE OF CONTENTS

LIST OF TABLES

1 INTRODUCTION

As required by Section 1848(e) of the Social Security Act (the Act), the Centers for Medicare and Medicaid Services (CMS) establish geographic indices as part of the Resource-Based Relative Value Scale (RBRVS) method for paying physicians. Called the Geographic Practice Cost Indices or GPCIs, geographic adjustment was first implemented as part of the Medicare physician fee schedule in 1992 and is required to be updated at least every three years.

1.1 Background

Like the relative value units (RVUs), which are designed to provide physicians with higher payments for more costly services, there are three component GPCIs: the physician work GPCI, the practice expense GPCI and the malpractice insurance GPCI. While the RVUs distinguish among services, the GPCIs adjust payments for geographic variation in the costs of providing services.

Equation 1 below demonstrates how these three GPCI components combine with the RVUs and a conversion factor (CF) translating between the adjusted RVUs and dollars to establish physician payments under Medicare for service *K* in locality *L*:

$$(1)\quad Payment_{K,L} = \{[GPCI_{PW,L} * RVU_{W,K}] + [GPCI_{PE,L} * RVU_{PE,K}] + [GPCI_{MP,L} * RVU_{MP,K}]\} * CF$$

Physician Work | Practice Expense | Malpractice Insurance

The practice expense and malpractice GPCIs are designed to reflect the full differences in relative costs across the 89 physician payment localities. However, the Act requires that the physician work GPCI reflect only one-quarter of the relative cost differences, compared to the national average.

Note that the GPCIs do not adjust for cost inflation overall. Instead, changes in the GPCIs reallocate payment rates by locality to reflect changes in these relative costs, while maintaining budget neutrality. To ensure budget neutrality, the final step in developing the core GPCIs is to scale them up or down to yield the same weighted sum of RVUs as the previous update.

1.2 The Sixth Update

This report describes the proposed methodology for the basic calculation of the Sixth Update of the GPCIs, which are scheduled to be fully implemented in 2012. As with the previous updates, this Sixth GPCI Update reflects an update to each of the three component indices: physician work, practice expense, and malpractice or professional liability insurance.

We also update the Geographic Adjustment Factor (GAF), which provides a summary of the differences in costs across localities.

The methodology for the Sixth Update draws on new data sources for all of the GPCIs. In part, this reflects the regular inclusion of updated data whenever available for the GPCIs. However, section 3102(b) of the Affordable Care Act of 2010 (ACA) requires the Secretary to "evaluate data that fairly and reliably establishes distinctions in the cost of operating a medical practice in different fee schedule areas" for the purpose of the practice expense GPCI. In light of this requirement, CMS asked Acumen to assess alternative data sources in the development of the GPCIs. As discussed in Section 2 below, this review resulted in the selection of a new data source for the occupational data used in both the practice expense and physician work GPCIs: the Occupational Employment Data developed by the Bureau of Labor Statistics. Acumen also applied cost share weights calculated from the American Medical Association's (AMA) Physician Practice Information Survey (PPIS); however, CMS chose to continue using the weights applied to the previous two updates. Finally, this update uses malpractice premium data collected for the recent update of the malpractice RVUs. Table 1.1 compares the data sources for the Sixth Update to those used in the Fourth and Fifth updates of the GPCIs.

CMS plans to continue an examination of the cost share weights during the CY 2012 rulemaking process. Additionally, CMS will review the complete findings and recommendations from the Institute of Medicine's study of geographic adjustment factors for physician payment, the Secretary's Medicare Geographic Payment Summit, and the MEI technical advisory panel, and will continue to study the issues as required by section 1848(e)(1)(H)(iv) of the Act (as added by section 3102(b) of the ACA).

This report details the calculations of the GPCIs *before final adjustments.* As described in the CY 2011 proposed rule for the physician fee schedule, CMS implements a number of required adjustments after the core calculations. These adjustments include the permanent 1.5 floor for the physician work GPCI in Alaska; CY 2010 and 2011 adjustments to the practice expense GPCI; and the creation of a permanent 1.0 floor for the practice expense GPCI for frontier states. These adjustments, as well as the methodology for transitioning from the existing GPCIs to the updated GPCIs, are described in the final rule.

The report is organized as follows. Section 2 describes the data sources reviewed as required by the ACA and the basis for our selected data sources. Sections 3, 4 and 5 present the methodology for calculating the physician work, practice expense and malpractice GPCIs, respectively. After describing the methodology, these sections then note which localities were most affected under the new update. Finally, Section 6 uses the GAFs to summarize the overall impacts of the changes in the GPCIs.

Table 1.1: Data Sources for the Sixth GPCI Update, Compared to the Fourth and Fifth

Component	Fourth Update 2006	Fifth Update 2009	Draft Sixth Update 2012
Physician Work GPCI	2000 Census	2000 Census	2006-2008 BLS Occupational Employment Data
Practice Expense GPCI			
Employee Wage	2000 Census	2000 Census	2006-2008 BLS Occupational Employment Data
Office Rent	FY2004 HUD Fair Market Rent	FY2007 HUD 50th Percentile Rent	FY2010 HUD 50th Percentile Rent
Equipment, Supplies, Other	Uniformly set to 1.00 for all counties	Uniformly set to 1.00 for all counties	Uniformly set to 1.00 for all counties
Malpractice GPCI	2001-2003 Malpractice Premiums	2004-2006 Malpractice Premiums	2006-2007 Malpractice Premiums
Cost Share Weights	2004 MEI weights	2004 MEI weights	2004 MEI weights
County RVU Weights	2002 RVUs	2005 RVUs	2008 RVUs

2 EVALUATION OF PRACTICE EXPENSE DATA SOURCES

The practice expense GPCI is built from four underlying elements:

1. An index of the relative costs for employee wages;
2. An index of the relative costs for office rents;
3. A common measure of cost (equal 1.0) for equipment and supplies; and
4. Cost share weights to combine these elements into the practice expense GPCI.

Pursuant to the requirements added by the ACA as Section 1848(e)(1)(H)(iv), CMS requested that Acumen review alternative data sources for employee wages and office rents. In addition, CMS evaluated the new AMA PPIS data for use in calculating cost share weights. In this section, we summarize our review of alternative data sources and provide information on the data chosen for this update.

2.1 Occupational Data

In both the Fourth and Fifth Updates, the physician work GPCI and employee wage component of the practice expense GPCI were based on data from a special tabulation of the 2000 Decennial Census long form. For this update, we considered three federal data sources: the 2000 Census data, the 2006-2008 American Community Survey (ACS) also produced by the Census Bureau, and the 2006-2008 Occupational Employment Statistics (OES) survey data published by the Bureau of Labor Statistics (BLS).

The Decennial Census offered unique benefits for the GPCI. In particular, because the one-in-six sample covered around 17 million households, it is one of the few data sources with sufficient sample size to develop estimates for non-metropolitan areas. The special tabulation provided numbers of workers, total annual hours, and annual median earnings for a set of selected occupations. Unfortunately, the special tabulation included top-coding of median annual earnings at $100,000, which is problematic for the physician work GPCI. More importantly, the 2000 Census data are quite out of date, and the long form was not included as part of the 2010 Census.

The American Community Survey is an ongoing annual survey that replaces the Census long form. Each year, the ACS samples about 3 million housing units. Over time, the annual data are aggregated into three-year estimates, and eventually, the data will also be aggregated into five-year estimates. The Census Bureau has indicated that it will not produce special tabulations on the three-year ACS data, holding special tabulations until after the release of five-year estimates. The Census website reports that the five-year estimates are currently scheduled

to be released later in 2010. Once the full ACS data are available, CMS will reassess the occupational groups used to determine the employee compensation component of the PE GPCI.

Without the availability of a special tabulation, ACS data are currently available in two forms: published tables and public use microdata sample (PUMS) files. The published data do not provide the specific information required for the GPCIs and do not report findings for many non-metropolitan areas. For example, published data now include 59 percent of U.S. counties and 97 percent of metropolitan or micropolitan areas.

The ACS PUMS files provide microdata on a 40 percent sample of the ACS, or about 3 percent of households for the three-year estimates. The microdata are provided for public use microdata areas (PUMAs), as the only sub-state level information for the microdata. There are 2,101 PUMAs, where a PUMA must have at least 100,000 people and cannot cross state boundaries. They are usually designed not to cross metropolitan area boundaries, but can represent parts of counties (for large urban counties) or multiple contiguous counties (for less populated counties). To estimate occupational wages using the PUMS, we had to probabilistically allocate all observations to counties in the multiple county PUMAs. We then aggregated observations for all counties in a GPCI locality. Even at this level of aggregation, some occupations had fewer than 10 observations in the microdata sample for the locality. In particular, we had fewer than 10 observations of pharmacists in Manhattan, Beaumont TX and Southern Maine. Thus, while it is technically feasible to calculate GPCI values using the ACS, the three-year sample is too small to provide stable estimates.

The third data source we considered was the 2006-2008 OES. As an establishment survey (surveying non-farm businesses), the OES is a substantially different survey. The OES collects wage and salary data to estimate employment and wages by occupation, covering about 800 occupations. It excludes self-employed persons. The full survey covers 1.2 million establishments over three years. Because establishments are substantially larger than households, this represents a larger number of employees than does the ACS. The smallest levels of geographic detail for publicly available estimates are metropolitan areas and non-metropolitan rest of state. Unlike the PUMS, the OES provides an aggregate median occupational wage for each area.

Because of the large sample size, recent data, and public reporting of median wages, we determined that the OES data provided the best currently available occupational data for the purpose of the GPCI calculations. Its main limitation is the fact that public data are not available at the county level. Since GPCI boundaries are determined by counties rather than by metropolitan areas, we needed a value for each county. To address this, we assigned the metropolitan (or non-metro rest of state) value for a given area to all counties in the area. In a few cases, this resulted in no differences in the occupational data across different GPCI payment

localities. For example, San Francisco and San Mateo Counties in California are distinct payment localities but part of the same metropolitan area. Using the OES data, these two localities have the same employee wage data.

Historically, the employee wage index and the physician work GPCI have used occupational data from the same source and, in fact, have some overlap in the included occupations. Therefore, we drew on the OES data for both the physician work and practice expense GPCIs. For consistency, our calculations used the same set of occupations as previous updates. These occupations are shown in Table 2.1 below, with more detailed information provided in the appendix.

Table 2.1: Occupation Groups Included in Wage Calculations

	Occupation	Physician	Employee
1	Architecture & Engineering	✓	
2	Computer, mathematical, life & physical science	✓	
3	Social science, community & soc service, & legal	✓	
4	Education, training, & library	✓	
5	Registered nurses	✓	✓
6	Pharmacists	✓	
7	Art, design, entertainment, sports, & media	✓	
8	Office, admin support		✓
9	Licensed practical & licensed vocational nurses		✓
10	Health care technical & medical assistants & other health care		✓

2.2 Office Rent Data

We conducted a scan of housing and office rent literature and data resources, as well as consulting with a housing and urban development expert. We were unable to locate a data resource that would tie closely to physician office rent costs AND include coverage of non-metropolitan areas. For example, one of the most comprehensive commercial property datasets is maintained (for a fee) by Reis Inc. However, it covers only 169 metropolitan areas, and office rent estimates are only available for 82 metropolitan areas. A relatively new commercial real estate survey by the National Association of Realtors tracks state level changes.

Not surprisingly, the Medical Group Management Association (MGMA), which fields well-established practice cost and physician compensation surveys, offers the data that most closely track with physician office rents (as well as employee and physician compensation). These data are extremely rich in the detail provided on physician practices, and MGMA was generous in discussing their data and survey methodology with Acumen staff. There are potential issues with public availability of these proprietary data, although MGMA did indicate a

willingness to work with CMS. However, based on our preliminary review of published reports, we believe there are two more critical issues in using these data for the office rent or other components of the GPCIs.

First, just as CMS has elected not to use physician wages for the physician work GPCI, we are concerned that use of the MGMA data would create circularities in the calculation of payments to cover differences in office rents. In other words, by reporting higher costs on these surveys, physicians could increase the practice expense GPCI. Since the GPCIs are intended to reflect regional cost differences outside the physicians' control, a data source less susceptible to influence would better serve the goals of the GPCI methodology.

Second, we are concerned about both sample size and representativeness of the MGMA data. The MGMA invites about 11,000 medical practices to complete each of the two surveys it conducts, including all MGMA member practices. The MGMA reports response rates of about 20 percent for the compensation survey and 15 percent for the cost survey (Table 2.2), which are consistent with typical response rates for surveys of businesses. The completed surveys represent over 50,000 physician and non-physician providers, capturing practices in each of the 50 states, with about a quarter of the completed surveys coming from non-metropolitan areas. But while the responses capture a large number of providers nationally, they represent only about 2,250 practices. Additionally, disproportionate samples by state suggesting very uneven response rates geographically. For example, almost twice as many Colorado practices completed the survey compared to California, and the surveys account for more providers in Minnesota and West Virginia than in any other states. The uneven response rate could be tied in part to different likelihood of response from MGMA members. MGMA members were twice as likely to have participated in the survey, with member practices representing 60 percent of responses but less than one-third of invited respondents. Based on these concerns, we cannot conclude that all localities would be equally served if we drew on the MGMA data.

Table 2.2: Response/Completion Rates for 2008 MGMA Cost and Compensation Surveys

	Practices Completing Compensation Survey		Practices Completing Cost Survey	
	Count	**Percent**	**Count**	**Percent**
Invitations to survey	10,683	100.0%	11,342	100.0%
Responses	2,312	21.6%	1,788	15.8%
Completed surveys in report	2,246	21.0%	1,732	15.3%

Source: 2008 MGMA Cost Survey and 2008 Compensation Survey reports

Because we have not yet been able to identify a better alternative, we used 2010 data published by U.S. Department of Housing and Urban Development (HUD) as a proxy for office rent expenses as part of the practice expense GPCI. Although the data are more up to date, this

is the same approach as used in the previous update. CMS will also continue to explore the use of commercial rent data as part of an ongoing analysis of the GPCIs.

The Fifth Update for the first time moved from Fair Market Rents (FMR) to HUD's 50th percentile rent estimates. Both sets of estimates use the same data sources and methodology. FMR is a blend of 40th and 50th percentile rents; shifting to the 50th percentile rent ensured that median rents are used in all areas. HUD rental estimates by geographic areas start with base rents from the 2000 Census long form. These rents are updated with one-year and three-year ACS rent estimates, adjusted using CPI rent and utilities price indices. Where available, local CPI data are used; otherwise regional CPI data are used.

Rents are gross rent estimates inclusive of utilities. The HUD data captures the rent for recent movers (renter households who moved to their present residence within the past 15 months), so it may not represent the actual rent paid currently by all renters. Estimates are provided for different sizes of housing units. We have used the two-bedroom measures as the norm, consistent with earlier GPCI calculation and common practice in using HUD rental data.

2.3 Cost Share Weights

For the proposed rule, CMS provided the cost share weights for the Sixth Update of the GPCIs, which were primarily calculated from the 2006 AMA PPIS. The PPIS represents self-employed physicians and other selected providers. The cost share weights are applied to the individual components comprising the PE GPCI, as well for calculating the GAF. Compared to the 2004 Medicare Economic Index (MEI), PPIS-derived weights shifted from weight from the office rent component, which is based on relative costs, and toward equipment, supplies and other costs, which are set to 1.0 for all localities. After evaluating the impact of using cost share weights calculated from the PPIS, CMS chose to apply the weights from the 2004 MEI (Table 4.1) to the updated GPCI calculations.[1] CMS stated in the final rule that they will address the GPCI cost share weights once again in the CY 2012 PFS proposed rule.

[1] Weights derived from the PPIS are used in the employee wage component of the PE GPCI, in conjunction with the 2004 MEI weights. See Section 4.1, Step 4.

Table 2.3: 2004 MEI Cost Share Weights

Expense Category	Cost Share Weight
Physician Work	52.466%
Practice Expense	43.669%
Employee Compensation	*18.654%*
Office Rent	*12.209%*
Equipment, Supplies, Other	*12.806%*
Malpractice Insurance	3.865%

3 PHYSICIAN WORK GPCI UPDATE

The physician work GPCI is designed to capture the relative cost of physician labor by Medicare locality. To develop a labor cost index for the physician's own work, the physician work GPCI draws on regional variation in the earnings of professionals: architecture and engineering; computer, mathematical and natural sciences; social scientists, social workers and lawyers; education, training and library; registered nurses and pharmacists; and writers, editors and artists. These earnings are drawn from the BLS Occupational Employment Statistics program (OES), which conducts mail surveys of employers, collecting information on wages and salaries for about 800 occupations. The OES wage data are drawn from a sample of 200,000 establishments, collected over a three-year period, and wage data are presented at various geographic levels. For the calculation the physician work GPCI, we used Metropolitan- and Nonmetropolitan-level wage data from three panels spanning 2006-2008.

The comparison occupational groups are selected to represent highly educated, professional employee categories, whose wages would be expected to reflect the overall geographic differences in living costs and amenities for other professional workers. By selecting a range of categories, the regional GPCIs are less susceptible to variations in the demand for particular types of employees, such as tech workers in Silicon Valley or lawyers in DC. These earnings proxy for the earnings of physicians, which cannot be directly incorporated into the measure given the magnitude of Medicare as a share of the overall physician market and the use of the GPCI in setting physician payments and hence earnings.

To develop the physician work GPCI by GPCI locality, the index is constructed using two major sets of weights: employment shares by the six professional categories and county shares of RVUs for Medicare services within the GPCI locality. The data inputs for the physician work GPCI, therefore, include the OES data from BLS (described in Section 2 above) and 2008 summary data on RVUs by county and locality provided by CMS.

3.1 Technical Notes on Use of BLS OES

Beyond the differences discussed in Section 2.1, there are two computational changes required for the BLS data compared to the Census data. The first change pertains to the calculation of wages for the various occupation groups. For the previous updates, the special tabulation reported median annual earnings, summarized by Census for the ten occupation groups. Based on the documentation provided by Census to the contractor for the Fourth Update, we believe that these earnings and other data in the Census tabulation represented an aggregation of micro-level data for all workers in the occupational groups in the Census work areas. By aggregating all workers in these occupations, the Census Bureau had sufficient

sample to develop summary results for each reported area. On the other hand, in any given area, this means that the earnings may reflect different mixes of the underlying occupations. Therefore, the geographic variation in wages for the occupation groups may be partially explained by the composition of occupations in each group.

BLS does not publish micro-level OES data. Instead, it publishes key statistics – including median wage – for occupation-area combinations. It does not publish median wages for areas with insufficient numbers of workers in a given occupation. Therefore, the task of aggregating detailed occupations into occupational groups requires combining the data at the occupational level, rather than the individual level. Rather than allow the composition to vary based on area, we used national weights to combine detailed occupations into occupation groups. For instance, the computer, mathematical, life and physical science occupations group includes occupations from the 15-0000 class (computer and mathematical occupations) and specific occupations within the 19-0000 class, such as medical scientists (19-1040). Rather than drop an occupation in an area with insufficient workers for a published median wage, we apply national median hourly wages for those occupations. This only affects individual occupations; all occupational classes have sufficient sample for the areas in the analysis.

The second difference relates to the geographic area definitions for states in New England. Instead of using metropolitan and non-metropolitan areas that adhere to county boundaries, OES wages for the New England states are assigned to NECTAs. The issue with the NECTA definition is that there is not a one-to-one mapping of NECTAs to counties, as the collection of townships in a NECTA may not completely cover a county. This results in counties being represented in multiple NECTAs. To address this issue, we map NECTAs to counties, and calculate median hourly wages for counties covered by multiple NECTAs as a population-weighted mean of wages in each of the NECTAs covering a county.

3.2 Physician Work GPCI Calculations

The first steps in calculating the physician work GPCI produce a county-level median hourly wage index weighted across the seven comparison occupation groups:

(1) Architecture & Engineering
(2) Computer, mathematical, life & physical science
(3) Social science, community & soc service, & legal
(4) Education, training, & library
(5) Registered nurses
(6) Pharmacists
(7) Art, design, entertainment, sports, & media.

Individual occupations comprise each of these groups, although groups (5) and (6), registered nurses and pharmacists, represent only a single occupation each. Although groups (4) and (7) each represent several individual occupations, they are also each represented by a broad occupation classification in the Standard Occupational Classification (SOC) system, and the OES provides wage data for both the individual occupations that comprise each occupation group, it also presents wage data at the broader occupation classification. The individual occupations that comprise groups (1), (2), and (3), though, do not adhere to a single classification in the SOC. Instead they either represent a subset of a broader occupation classification or a mix of occupations across multiple occupation classifications. This distinction is important, because whereas the OES provides median hourly wages for occupation groups (4) through (7), hourly earnings must be calculated for groups (1) through (3) from the individual occupations that comprise each of the three groups (see Appendix A for detail of the individual occupations and broad occupation classifications).

In presenting the formulas used to calculate the physician work GPCI, we use the following notation:

$_C$ – subscript C indicates a county
$_I$ – subscript I indicates an individual occupation in occupation group O
$_O$ – subscript O indicates an occupation group
$_L$ – subscript L indicates a Medicare locality

In the following sections, we detail the eight steps in calculating the physician work GPCI.

Step 1: Calculate hourly earnings by occupation group

Hourly wages serve as the basis for the physician work GPCI. With the Census wage data that had been used in previous updates, this value had to be calculated from total earnings, hours, and workers. The OES wage data, on the other hand, provides median hourly wages for each occupation, as well as for broader occupation classifications. As noted above, four of the seven occupation groups, the OES provides average hourly wages, but for three of the occupation groups, we must calculate an hourly earnings from the individual occupation that comprise the occupation group. This calculation takes the weighted average of the county median hourly wage (M_{IC}) for each individual occupation, weighted using national occupation totals, as defined by the formula below:

$$(1) \qquad M_{OC} = \frac{\sum_{I \in O} (T_I * M_{IC})}{\sum_{I \in O} T_I}$$

where: M_{oc} = the average hourly wages for a occupation group O in county C

T_I = the total number of workers nationally in occupation I in occupation group O
H_{IC} = the median hourly wage for occupation I in county C

As noted in Section 4.1, the national median hourly wage for an individual occupation is substituted for missing wage data at the county level.

Step 2: Calculate an RVU-weighted national average hourly wage by occupation

Because the physician work GPCI is an index, the county hourly wages are all considered relative to the national average. Thus, the next step is to calculate a national average for each occupation. These averages are weighted based on the work RVUs in each county ($\boldsymbol{RVU_{W,C}}$), as reported by CMS. Thus, if the national median hourly wage for occupation group O is N_O, N_O is calculated as:

$$(2) \qquad N_O = \frac{\sum_C \left(RVU_{W,C} * M_{OC}\right)}{\left(\sum_C RVU_{W,C}\right)}$$

where: N_O = the national hourly wage for occupation group O
M_{OC} = the average hourly wages for a occupation group O in county C
$\boldsymbol{RVU_{W,C}}$ = the total work RVUs in county C.

Step 3: Index the wage for each occupation in each county to the national median

With the calculation of the national median wages, the county median wages for each occupation can be converted to a median wage index, P_{OC}. This index is simply the county median hourly wage for the occupation divided by the national wage:

$$(3) \qquad P_{OC} = \frac{M_{OC}}{N_O}$$

where: P_{OC} = the wage index for occupation group O in county C
M_{OC} = the average hourly wages for a occupation group O in county C
N_O = the national hourly wage for occupation group O.

Step 4: Calculate each occupation's share of the total national wage bill

Following the methodology from the previous updates, the median wages by occupation in each county are weighted by a common set of national employment shares (rather than by the employment shares in each work area). Thus, the share for each occupation, $\boldsymbol{S_O}$, is based on the

median hourly wage for that occupation multiplied by the total number of workers with non-zero earnings.[2]

An occupation's share is the wage bill for that occupation – calculated as the national hourly wage for that occupation ($\boldsymbol{N_O}$) multiplied by the number of non-zero wage earners in that occupation nationally ($\boldsymbol{NZ_O}$) then divided by the wage bill summed across all occupations:

$$(4) \qquad S_O = \frac{(N_O * NZ_O)}{\sum_O (N_O * NZ_O)}$$

where: S_O = the share of the wage bill associated with occupation group O
N_O = the national hourly wage for occupation group O
N_{ZO} = the number of non-zero workers in occupation group O.

Table 3.1 lists the wage bill shares between the occupation groups used to calculate the physician work GPCI, along with the shares utilized in the previous update. Replacing the Census wage data with more up-to-date OES data does produce changes in wage-bill shares attributed to each occupation group, but the order remains constant between the groups, with education, training and library showing the largest share, and pharmacists representing the smallest share.

Table 3.1: National Wage Bill Shares

Occupation Group	Fifth Update	Sixth Update
Architecture & Engineering	13.9%	8.5%
Computer, mathematical, life & physical science	19.1%	16.0%
Social science, community & soc service, & legal	15.5%	8.5%
Education, training, & library	30.6%	40.2%
Registered nurses	11.1%	16.6%
Pharmacists	1.6%	2.8%
Art, design, entertainment, sports, media.	8.2%	7.4%

Step 5: Calculate county-specific hourly wage index

Finally, we use the occupational shares from step 4 above to create county-specific wage indexes that weight the individual occupational indices by the occupational shares. This is

[2] This calculation accounts for employment shares and wages, but not for differences in the number of hours worked by occupation. An alternative approach would be to weight the occupations according to the total annual earnings in each occupation (which would be a more traditional average, compared to the median earnings approach). This alternative is feasible in the data, but we did not pursue it to be consistent with the previous updates.

calculated as the sum of the product of the county indices for each occupation times the wage bill share for each occupation, represented by the following equation:

$$(5) \qquad P_C = \sum_O \left(P_{OC} * S_O \right)$$

where: P_C = the wage index for county C
P_{OC} = the wage index for occupation group O in county C
S_O = the share of the wage bill associated with occupation group O.

The resulting county-level index provides values for all counties. This includes counties in Puerto Rico, which are represented in the BLS wage data, but it excludes the Virgin Islands, Guam, American Samoa and the Northern Mariana Islands. For the Pacific island territories, we allow P_C to be missing, since these territories take the Hawaii locality value. However, the Virgin Islands are a separate locality, so the same solution will not work. Given the absence of data, the value for each area within the Virgin Islands locality is set equal to 1.

Step 6: Create Medicare locality measures that are RVU-weighted averages of the county index.

After the GPCI is developed at the county level, we then calculate a Medicare locality-level index. The physician work RVU-weighted average is the sum of the product of county PW RVUs times county wage indices for all counties in a locality divided by the sum of all county PW RVUs in a locality, represented by equation (6):

$$(6) \qquad GPCI_{PW,L} = \frac{\sum_{C \in L} \left(RVU_{PW,C} * P_C \right)}{\left(\sum_{C \in L} RVU_{PW,C} \right)}$$

where: $GPCI_{PW,L}$ = the physician work GPCI for Medicare locality L
$RVU_{PW,C}$ = the total physician work RVUs in county C in locality L
P_C = the wage index for county C in locality L.

Step 7: Reduce the variation of the physician work GPCI to 25% of the original.

By law, the physician work GPCI is adjusted to reduce the variation in the work index by locality to one-quarter (25 percent) of the full variation in X_L. To accomplish this, each value is compared to 1 (as the unit index) and the amount it is different from 1 is reduced, as shown in equation (7):

$$(7) \qquad AdjGPCI_{PW,L} = 1 + (X_L - 1) * \tfrac{1}{4}$$

where: $AdjGPCI_{PW,L}$ = the reduced-variation wage index for Medicare locality L
X_L = the wage index for Medicare locality L.

Step 8: Apply budget neutrality factor

As a final step, each GPCI is rescaled for budget neutrality. The budget neutrality factors are established so that for any given cost factor *CF*, the total payments – summed across all procedures and all localities – would be the same under the updated physician work GPCIs as they were under the previous physician work GPCIs. The current PW RVUs used in the updated physician work GPCIs are applied to establish budget neutrality, with the budget neutrality factor calculated using the following formula:

$$(8) \qquad BN_{PW} = \frac{\sum_{L} AdjGPCI_{PW,P,L} * RVU_{PW,U,L}}{\sum_{L} AdjGPCI_{PW,U,L} * RVU_{PW,U,L}}$$

where: BN_{PW} = the budget neutrality factor for the physician work GPCI
$GPCI_{PW,U,L}$ = the updated physician work GPCI for locality L
$GPCIP_{PW,P,L}$ = the previous physician work GPCI for locality L
$RVU_{PW,U,L}$ = the updated total physician work RVUs for L.

We have RVUs that we can assign to a locality but not to a county (for example, because the RVU data reports locality but the reported ZIP code cannot be mapped to a county). In addition, there are RVUs for Guam and other territories that are not included in the construction of the locality values. The total RVUs used in equation 8 are the locality totals and sum to greater than the sum of the county-level RVUs used in equation 6.

The budget neutrality calculation included in these values is a preliminary calculation. Final budget neutralization is done by the Office of the Actuary (OACT).

3.3 Impact of Physician Work GPCI Update

There are two sources of change for the Sixth Update of the physician work GPCI:

- 2006-2008 OES wage data in place of 2000 Census data
- Updated 2008 county RVUs

To show the impact of updating the physician work GPCI, Table 3.2 reports the localities that have a change exceeding 1 percent when comparing the updated physician work GPCIs to the CY 2010 physician work GPCIs.

Table 3.2: Impact of Sixth Update on Physician Work GPCIs – Values before Final Adjustments Compared to CY 2010 GPCIs

Locality name	5th Update PW GPCI	6th Update PW GPCI	Difference	Percent Difference
Decreased				
Rest of New Jersey	1.042	1.021	-0.021	-2.0%
Indiana	0.986	0.969	-0.017	-1.7%
Metropolitan Boston	1.029	1.014	-0.015	-1.5%
Detroit, MI	1.036	1.022	-0.014	-1.4%
Connecticut	1.038	1.024	-0.014	-1.3%
Beaumont, TX	0.984	0.971	-0.013	-1.3%
Northern NJ	1.057	1.045	-0.012	-1.1%
Arizona	0.988	0.977	-0.011	-1.1%
West Virginia	0.973	0.963	-0.010	-1.0%
Brazoria, TX	1.019	1.009	-0.010	-1.0%
				Increased
Anaheim/Santa Ana, CA	1.034	1.044	0.010	1.0%
Colorado	0.986	0.996	0.010	1.0%
Rest of Florida	0.973	0.983	0.010	1.0%
Virginia	0.982	0.993	0.011	1.1%
Rest of Texas	0.968	0.979	0.011	1.1%
Seattle (King Cnty), WA	1.014	1.026	0.012	1.2%
San Francisco, CA	1.059	1.072	0.013	1.2%
Rest of Oregon	0.968	0.980	0.012	1.2%
Idaho	0.967	0.981	0.014	1.4%
Baltimore/Surr. Cntys, MD	1.012	1.027	0.015	1.5%
Marin/Napa/Solano, CA	1.034	1.051	0.017	1.6%
New Mexico	0.973	0.989	0.016	1.6%
Wyoming	0.956	0.972	0.016	1.7%
Rest of Maryland	0.994	1.011	0.017	1.7%
Rest of California*	1.007	1.025	0.018	1.8%
Galveston, TX	0.991	1.009	0.018	1.8%
North Dakota	0.947	0.966	0.019	2.0%
Queens, NY	1.032	1.063	0.031	3.0%
Anaheim/Santa Ana, CA	1.034	1.044	0.010	1.0%

The Sixth Update values in Table 3.2 do not account for OACT's final budget neutralization. The table shows that even with a different data source, and more recent wage values, there is little impact associated with the Sixth Update of the physician work GPCI. Since Alaska will actually have its floor value of 1.5 continued as in the comparison column, the largest effective change occurs for the Queens, NY locality, which only shows a 3 percent

increase in its physician work GPCI. Of course, much of this stability is due to the fact that the physician work GPCI only allows for one-fourth of the total variation.

4 PRACTICE EXPENSE GPCI UPDATE

The practice expense GPCI is designed to capture the relative cost of operating a physician practice by Medicare locality. The practice expense GPCI is a weighted average of three component elements: the earnings of staff, the cost of equipment and supplies, and the cost of office space. Because equipment and supplies are assumed to be purchased on a national market, this element is always set to 1.0. Therefore, calculating the practice expense GPCI involves calculating the relative earnings of office staff (including earnings by occupation and employment shares by occupation) and the relative cost of office space. These components, along with the unit supply component are then weighted based on their shares within total practice expenses. Table 4.1 lists the cost shares shown in Table 2.3 along with the weights rescaled to total 100% (shares of the practice expense GPCI).

Table 4.1: Cost Share Weights for Practice Expense GPCI

	Cost Share Weight of GAF	Cost Share Weight of PE GPCI
Practice Expense	43.669%	100%
Employee Wage	*18.654%*	*42.717%*
Office Rent	*12.209%*	*27.958%*
Equipment, Supplies, Other	*12.806%*	*29.325%*

In the following sections, we describe the calculation of the employee wage index of the practice expense GPCI and then describe the calculations for the office rent index. Finally, we combine these elements with the Equipment and Supplies index to construct the full practice expense GPCI. We end with an assessment of the aggregate impact of this update on the practice expense GPCI.

The calculation of the employee wage index is almost exactly parallel to the calculation of the physician work GPCI. Instead of comparison occupations, the employee wage index builds from wages for four occupation groups employed in physician practices, weighted by employment shares and county RVUs. We first detail the calculations involved in the employee wage index and then compare the results to the previous update to assess the impact of the change.

4.1 Calculation of the Employee Wage Index

The employee wage index captures geographic differences in the earnings of workers employed in physician practices, based on the following four occupation groups:

(1) Registered nurses

(2) Office, admin support
(3) Licensed practical & licensed vocational nurses
(4) Health care technical & medical assistants & other health care.

The primary data inputs for the employee wage index come from the same sources as those for the physician work GPCI: the 2006-2008 OES wage data and data on 2008 RVUs by county and locality provided by CMS. Office, admin support (group (2)) is a broad SOC occupation classification captured by a single occupation code, and the remaining occupation groups consist of either a single occupation (group (1)), or a collection of individual occupations that do not adhere to a broad SOC occupation classification (groups (3) and (4)). Again, once the full ACS data are available, CMS will reassess the occupational groups used to determine the employee compensation component of the PE GPCI. As with the occupation groups used for the physician work GPCI, we replace missing data with national median values when wages are not identified for an occupation in a county.

We begin with the county-level median hourly wage index weighted across the four physician practice occupations:

Step 1: Calculate hourly earnings by occupation group

We first calculate county-level hourly wages (M_{OC}) by occupation group from each of the individual occupations that comprise the occupation groups. This calculation takes the weighted average of the county median hourly wage (H_{IC}) for each individual occupation, weighted using national occupation totals (T_I), as defined by the formula below (same as equation (1) in previous chapter, but uses occupation groups specific to employee wage index):

$$(1) \qquad M_{OC} = \frac{\sum_{I \in O} (T_I * M_{IC})}{\sum_{I \in O} T_I}$$

where: M_{oc} = the average hourly wages for a occupation group O in county C
T_I = the total number of workers nationally in occupation I in occupation group O
H_{IC} = the median hourly wage for occupation I in county C.

As noted in Section 3.1, the national median hourly wage for an individual occupation is substituted for missing wage data at the county level.

Step 2: Calculate an RVU-weighted national average hourly wage by occupation

Because the physician work GPCI is an index, the county hourly wages are all considered relative to the national average. Thus, the next step is to calculate a national average for each occupation. These averages are weighted based on the Physician Expense RVUs in each county

($RVU_{PE,C}$), as reported by CMS. Thus, if the national median hourly wage for occupation group O is N_O, N_O is calculated as:

$$(2) \qquad N_O = \frac{\sum_C \left(RVU_{PE,C} * M_{OC} \right)}{\left(\sum_C RVU_{PE,C} \right)}$$

where: N_O = the national hourly wage for occupation group O
M_{OC} = the average hourly wages for a occupation group O in county C
$RVU_{PE,C}$ = the total practice expense RVUs in county C.

Step 3: Index the wage for each occupation in each county to the national median

With the calculation of the national median wages, the county median wages for each occupation can be converted to a median wage index, P_{OC}. This index is simply the county median hourly wage for the occupation divided by the national wage:

$$(3) \qquad P_{OC} = \frac{M_{OC}}{N_O}$$

where: P_{OC} = the wage index for occupation group O in county C
M_{OC} = the average hourly wages for a occupation group O in county C
N_O = the national hourly wage for occupation group O.

As with the physician work occupations, the only U.S. territory with occupational data is Puerto Rico.

Step 4: Calculate each occupation's share of the national employee wage expenditures.

Since the employee wage index is designed to capture the employee expenses faced by physician practices, the wages by occupation are weighted by their employment shares in the physician practice setting. The previous two updates used 2004 MEI shares calculated from the 1997 SMS, with shares for office support, and clinical staff broken down by registered nurses, licensed practical and vocational nurses, and technicians. The new 2006 PPIS data now provides cost shares for office staff (60 percent) versus clinical staff (40 percent), compared to an equal split established by the 2004 MEI. Although we use the 2006 PPIC split for office and clinical staff, the previous cost shares establish weights across the clinical staff categories. Table 4.2 compares the weights used in the previous update with those used for the Sixth Update. Although weights do change across the occupation categories, the ordering remains the same,

with the highest weight assigned to office and administrative support, and the least weight associated with LPNs and LVNs.

Table 4.2: Occupational Shares for the Employee Wage Index

Occupational Categories	Fifth Update	Sixth Update
Registered nurses	18.5%	14.8%
Office, admin support	50.3%	60.0%
Licensed practical & licensed vocational nurses	10.5%	8.8%
Health care technicians	20.7%	16.4%

The occupational category shares (CS_O) shown in Table 4.2 are employment shares, rather than expenditure shares. To create expenditure shares, we weight the shares above using the national median hourly wages (Equation (2)). As with the physician work GPCI, these share weights are common across the nation, rather than reflecting differences by county or locality.

$$(4) \qquad S_O = \frac{(N_O * CS_O)}{\sum_O (N_O * CS_O)}$$

where: S_O = the share of the wage bill associated with occupation group O
N_O = the national hourly wage for occupation group O
CS_O = the cost share for occupation group O.

Step 5: Calculate county-specific hourly wage index

Finally, we use the occupational shares from step 4 above to create county-specific wage indexes that weight the individual occupational indices by the occupational shares. This is calculated as the sum of the product of the county indices for each occupation times the wage bill share for each occupation, represented by the following equation:

$$(5) \qquad P_C = \sum_O (P_{OC} * S_O)$$

where: P_C = the wage index for county C
P_{OC} = the wage index for occupation group O in county C
S_O = the share of the wage bill associated with occupation group O.

The resulting county-level index provides values for all counties and territories for which we have BLS wage data. This excludes the Virgin Islands, Guam, and American Samoa. As

with the physician work (and previous updates), Guam and American Samoa are treated as missing and are ultimately assigned the Hawaii locality value. Similarly, given the absence of data, the value for each area within the Virgin Islands locality is set equal to 1.

Step 6: Create Medicare locality measures that are RVU-weighted averages of the county index.

After the employee wage index is developed at the county level, we then calculate a Medicare locality-level index. The practice expense RVU-weighted average is the sum of the product of county practice expense RVUs times county wage indices for all counties in a locality divided by the sum of all county practice expense RVUs in a locality, represented by Equation (6) below:

$$(6) \qquad X_{W,L} = \frac{\sum_{C \in L} \left(RVU_{PE,C} * P_C \right)}{\left(\sum_{C \in L} RVU_{PE,C} \right)}$$

where: $X_{W,L}$ = the wage index for Medicare locality L
$RVU_{PE,C}$ = the total practice expense RVUs in county C in locality L
P_C = the wage index for county C in locality L.

Note that budget neutralization is not applied to the practice expense components – it is only applied in the calculation of the practice expense GPCI itself.

4.2 Impact of the Employee Wage Index Update

There are three sources of change to the wage index:

- 2006-2008 OES wage data in place of 2000 Census data
- Changes in employment shares assigned to each occupation
- Updated 2008 county RVUs

To evaluate the impact of changes to the employee wage component of the practice expense GPCI, we present the wage index component only, comparing it with the wage index component calculated in the previous update. Table 4.3 below lists the localities that show the largest change in the employee wage index. For this table, our threshold is a change of 5 percent change or more. Two localities, Manhattan, NY and Rest of Maryland, have changes of greater than 10 percent.

Unlike the physician work GPCI, the Sixth Update values of the employee wage index allow for the full variation in the employee wages. As described in the proposed rule, the ACA

temporarily imposes a reduction in this variation for 2010 and 2011. The values in Table 4.3 do not account for this reduction.

Table 4.3: Employee Wage Index Impact – Underlying Values without Variation Reduction

Locality name	Fifth Update Wage Index	Sixth Update Wage Index	Difference	Percent Difference
Decreased				
Manhattan, NY	1.375	1.210	-0.165	-12.01%
Metropolitan Boston	1.224	1.114	-0.110	-9.00%
NYC Suburbs/Long I., NY	1.277	1.194	-0.083	-6.48%
Chicago, IL	1.134	1.068	-0.066	-5.79%
Connecticut	1.230	1.167	-0.063	-5.12%
Increased				
Montana	0.825	0.873	0.048	5.78%
Baltimore/Surr. Cntys, MD	1.075	1.138	0.063	5.82%
Rest of Oregon	0.948	1.004	0.056	5.95%
Colorado	0.985	1.044	0.059	5.99%
Vermont	0.949	1.007	0.058	6.06%
Wyoming	0.838	0.891	0.053	6.29%
Santa Clara, CA	1.346	1.437	0.091	6.78%
Brazoria, TX	0.937	1.014	0.077	8.21%
Rest of Maryland	0.947	1.046	0.099	10.40%

4.3 Calculation of the Office Rent Index

Compared to the employee wage index, the office rent index is relatively easy to compute, since there is only one value per county – the 50th percentile rent for a two-bedroom apartment – and the RVU weights. Therefore, the calculation involves three steps:

Step 1: Calculate an RVU-weighted national median rent

The first step is to calculate a national average of the 50th percentile rents for each county (R_C), weighted based on the practice expense RVUs in each county ($RVU_{PE,C}$), as reported by CMS. Thus, the national median rent R_N is calculated as:

$$(7) \qquad R_N = \frac{\sum_C \left(RVU_{PE,C} * R_C \right)}{\left(\sum_C RVU_{PE,C} \right)}$$

where: R_N = the national average of the 50th percentile rents for each county
$RVU_{E,C}$ = the total practice expense RVUs in county C in locality L
R_C = the 50th percentile rent in county C.

Step 2: Index the median rent in each county to the national median.

With the calculation of the national median rent, the county median wages for each occupation can be converted to a median rent index, X_C. This index is simply the county median rent divided by the national average median rent:

$$(8) \qquad X_C = \frac{R_C}{R_N}$$

where: X_C = rent index for each county
R_C = the 50th percentile rent in county C
R_N = the national average of the 50th percentile rents for each county.

Step 3: Create Medicare locality measures that are RVU-weighted averages of the county index.

After the office rent index is developed at the county level, a Medicare locality index is created by weighting the county values for all counties in the locality by the total practice expense RVUs in the county:

$$(9) \qquad X_{R,L} = \frac{\sum_C \left(RVU_{PE,C} * P_C \right)}{\left(\sum_C RVU_{PE,C} \right)}$$

where: $X_{R,L}$ = the office rent index for Medicare locality L
$RVU_{PE,C}$ = the total practice expense RVUs in county C in locality L
P_C = the office rent index for county C in locality L.

Of the three Pacific territories that are included in the Hawaii/Guam locality, HUD rental data are available only for Guam, thus rent indices cannot be calculated for American Somoa or Northern Mariana. In previous updates, a rent index for Guam was calculated and incorporated into the calculation of the Hawaii/Guam office rent index value, but in this update, the Guam value was excluded from this calculation for consistency with other elements of the GPCIs for Hawaii. As a result, the values for the Hawaii/Guam office rent index reflect only Hawaii data.

4.4 Impact of Office Rent Update

For the office rent component of the practice expense GPCI, we utilize the same data source as the previous update (50th percentile county rent from HUD), only updated the data with more recent rent figures from the 2010 HUD file. Along with using more recent rent data, the

Table 4.4: Rent Index Impact – Underlying Values without Variation Reduction

Locality name	Fifth Update Rent Index	Sixth Update Rent Index	Rent Difference	Percent Difference
Decreased				
Metropolitan Boston	1.714	1.483	-0.231	-13.47%
New Orleans, LA	1.230	1.068	-0.162	-13.15%
Puerto Rico	0.604	0.535	-0.069	-11.44%
Rhode Island	1.186	1.054	-0.132	-11.10%
Detroit, MI	1.010	0.907	-0.103	-10.21%
Colorado	1.007	0.909	-0.098	-9.69%
Ventura, CA	1.827	1.664	-0.163	-8.92%
San Francisco, CA	1.993	1.828	-0.165	-8.29%
San Mateo, CA	1.993	1.828	-0.165	-8.29%
Oakland/Berkley, CA	1.583	1.464	-0.119	-7.54%
Rest of Pennsylvania	0.840	0.782	-0.058	-6.95%
Rest of Massachusetts	1.256	1.170	-0.086	-6.82%
New Mexico	0.773	0.724	-0.049	-6.38%
North Dakota	0.677	0.635	-0.042	-6.26%
Northern NJ	1.459	1.369	-0.090	-6.16%
South Dakota	0.749	0.707	-0.042	-5.67%
Brazoria, TX	0.829	0.783	-0.046	-5.57%
Iowa	0.737	0.699	-0.038	-5.14%
Rest of Michigan	0.785	0.745	-0.040	-5.12%
Southern Maine	1.127	1.071	-0.056	-5.00%
Increased				
Virgin Islands	0.932	0.981	0.049	5.22%
Rest of Maryland	1.029	1.083	0.054	5.30%
Mississippi	0.702	0.740	0.038	5.42%
Oklahoma	0.689	0.728	0.039	5.64%
Rest of New York	0.798	0.845	0.047	5.83%
Wyoming	0.694	0.738	0.044	6.40%
Baltimore/Surr. Cntys, MD	1.102	1.183	0.081	7.34%
Rest of Florida	0.925	0.997	0.072	7.76%
Fort Worth, TX	0.873	0.942	0.069	7.96%
Fort Lauderdale, FL	1.124	1.246	0.122	10.90%
Hawaii/Guam	1.454	1.670	0.216	14.86%

other source of change for office rent index comes from updated 2008 county RVUs. Table 4.4 lists the localities that show the largest changes in their office rent index between the Fifth and Sixth Update.

As with the employee wage index, the ACA imposes a reduction in the variation in the office rent index for 2010 and 2011. The values in Table 4.4 are the calculated office rent index measures BEFORE accounting for such reductions. The increase in the Hawaii/Guam value in part reflects the removal of the Guam rent data from the calculation. CMS will also continue to explore the use of commercial rent data for use in the computation of the rent portion of the PE component

4.5 Calculation of the Practice Expense GPCI

There are three components to the practice expense GPCI: (1) the employee wage index, (2) the office rent index, and (3) a 1.0 value for supplies for all localities. The calculations for the wage and rent components create indices that vary by locality. Below we detail the two steps in calculating the practice expense GPCI from the three component parts.

Step 1: Create a single index from three component indices

The practice expense GPCI is the weighted average of the three indices comprising the expense index. The weights are derived from the PPIS survey, which is used to identify the share of costs that each expense type represents. The calculation is represented by the following equation:

(10) $$GPCI_{PE,L} = .42717 * X_{W,L} + .27958 * X_{R,L} + .29325 * X_{S,L}$$

where: $GPCI_{PE,L}$ = the practice expense GPCI for Medicare locality L
$X_{W,L}$ = the wage index for Medicare locality L
$X_{R,L}$ = the office rent index for Medicare locality L
$X_{S,L}$ = factor for equipment/supplies = 1.0 for each Medicare locality L.

Step 2: Apply budget neutrality factor

As a final step, each practice expense GPCI is rescaled for budget neutrality. The budget neutrality factors are established so that for any given cost factor *CF*, the total payments – summed across all procedures and all localities – would be the same under the updated practice expense GPCIs as they were under the previous practice expense GPCIs. The current

malpractice RVUs used in the updated practice expense GPCIs are applied to establish budget neutrality, with the budget neutrality factor calculated using the following formula:

$$(11) \qquad BN_{PE} = \frac{\sum_{L} GPCI_{PE,P,L} * RVU_{PE,U,L}}{\sum_{L} GPCI_{PE,U,L} * RVU_{PE,U,L}}$$

where: BN_{PE} = the budget neutrality factor for the practice expense GPCI
$GPCI_{PE,U,L}$ = the updated practice expense GPCI for locality L
$GPCI_{PE,P,L}$ = the previous practice expense GPCI for locality L
$RVU_{PE,U,L}$ = the updated total practice expense RVUs for L.

As with physician work, we have practice expense RVUs that we can assign to a locality but not to a county (for example, because the RVU data reports locality but the reported ZIP code cannot be mapped to a county). In addition, there are RVUs for Guam and other territories that are not included in the construction of the locality values. The total RVUs used in equation 11 are the locality totals and sum to greater than the sum of the county-level RVUs used in equations 6 and 9. This budget neutrality calculation is a preliminary calculation. Final budget neutralization is done by the CMS Office of the Actuary (OACT).

4.6 Impact of Practice Expense GPCI Update

Three components comprise the practice expense GPCI; (1) employee wage index, (2) office rent index, and (3) a factor for supplies and equipment. With a cost share weight of 42.717 percent (Table 4.1), changes in employee wages produce the greatest impact on the practice expense GPCI. The office rent index exerts the least influence, with a lowest cost share weight of 27.958 percent. Because the office supply index is constant across localities, with a value of 1, the supply component of the physician expense GPCI acts to dampen the effect of changes in the other two components. Table 4.5 lists the Medicare localities showing the greatest change from the previous update to the Sixth Update, identifying those localities experiencing changes of 5 percent or more.

As before, the values shown in Table 4.5 are the calculated values before final adjustments. For both the CY 2010 and the Sixth Update values, the values shown in Table 4.5 do not include the adjustments mandated by the ACA. In other words, neither the reduction in variation in office rent and employee wage indices nor the 1.0 floor for frontier states is applied to these values.

While numerous localities see changes of 5 percent or more in their rent index or wage index, only 6 localities experience a 5 percent change in their PE GPCI. This results from the dampening effect of equipment supplies, whose costs do not vary geographically, and from the rent and wage indices often move independently of each other. Metropolitan Boston experiences the largest change, with a 8.3 percent decline. The Hawaii/Guam and Rest of Maryland localities see the largest increase, with PE GPCIs 6.2 percent higher than their CY 201 GPCIs.

Table 4.5: Impact of Practice Expense GPCI Update – Underlying Values without Variation Reduction or Other Adjustments

Locality name	CY 2010 PE GPCI	Sixth Update PE GPCI	Difference	Percent Difference
Decreased				
Metropolitan Boston	1.291	1.184	-0.107	-8.3%
New Orleans, LA	1.044	0.982	-0.062	-5.9%
Manhattan, NY	1.298	1.226	-0.072	-5.5%
Increased				
Baltimore/Surr. Cntys, MD	1.057	1.11	0.053	5.0%
Hawaii/Guam	1.161	1.233	0.072	6.2%
Rest of Maryland	0.982	1.043	0.061	6.2%

5 MALPRACTICE INSURANCE GPCI UPDATE

The final component is the malpractice insurance GPCI. The malpractice insurance GPCI is designed to adjust for geographic differences in professional liability or malpractice insurance premiums. In calculating this GPCI component, we use the malpractice RVUs by specialty (both by state and by county) along with data on market shares and premiums by specialty, insurer, and territory.

This chapter has four main sections. First, we review the data collection for the Sixth Update and identify changes in the data collection approach from the prior update. Second, we describe the calculation of the malpractice insurance GPCI where all necessary data were available. We then describe the adjustments made to account for missing information. Finally, we examine the impact of this update on the Malpractice GPCI.

5.1 Malpractice Premium Data Collection

The premium data for the Sixth Update of the malpractice insurance GPCIs are drawn from the data collected for the 2010 update of the malpractice RVUs. While Acumen collected data for both the Fifth Update and Sixth Update, the more recent data collection was stronger in two ways.

First, we increased the number of states from which we were able to collect rate filings, as shown in Table 5.1. For the Fifth Update, we were not able to collect rate filings for the District of Columbia, Mississippi, Nevada, New Mexico, Puerto Rico, or Wyoming. We did not attempt to collect premium data from the Pacific territories or the Virgin Islands. For the Sixth Update, we were able to collect filings for the District of Columbia, Nevada, New Mexico, and Wyoming.

For states where we were not able to collect rate filings or which did not provide market share information, we augmented the collected data with publicly available data, as shown in Table 5.2 below. In particular, we filled in market share information with data from the National Association of Insurance Commissioners (NAIC), and we drew on Medical Liability Monitor survey data to address some gaps in filings. Although the NAIC market share data covers all fifty states and the District of Columbia, we were more successful in collecting rate filings on the identified top companies when the market share information was provided by the states. The Medical Liability Monitor also covers all states and DC but it includes only three specialties, including OB/GYN. It also offers less detailed information on the characteristics of the insurance. For this reason, we relied on the main sources of data wherever possible.

Table 5.1: Areas without Rate Filing Data

Fifth Update	Sixth Update
District of Columbia	--
Mississippi	Mississippi
Nevada	--
New Mexico	--
Puerto Rico	Puerto Rico
Wyoming	--

Table 5.2: Data Sources Used in Calculation of Malpractice Insurance GPCIs

	Main Source	Alternative Source
Market Shares	State Departments of Insurance	NAIC Market Share Data
Premiums	State Rate Filings	Medical Liability Monitor survey data 2005-2008

The second improvement in the data collection was the depth of premium data. For the previous update, we collected data on only 20 specialties at only one risk class per specialty. We collected all available specialties for the malpractice RVU data. For the purpose of the malpractice insurance GPCI, however, we narrowed the number of specialties to ensure coverage in as many states as possible. We selected 25 specialties that represented commonly used physician specialties with premium data collected from at least one carrier in at least 47 states. Because rates vary by surgical classification, we selected a specific surgical classification for each specialty. However, since carriers differ in whether or not they specify a surgical classification, we identified a preferred and an alternative surgical classification for each specialty. Generally, specialty premiums either are classified as major surgery (MAJ), major surgery with obstetrics, minor surgery (MIN), or non-surgery (NS). However, the classification may also be unspecified (UN). To select the preferred surgical classification, we identified the most common classification across states. We examined national average premiums in selecting an alternative, choosing the classification that showed rates similar to the preferred. Table 5.3 lists the specialties and surgical classifications used to calculate malpractice GPCIs.

Table 5.3: Malpractice Insurance Specialties and Surgery Classifications (Major, Minor, Non-Surgical or Unspecified)

Spec. Code	Specialty Name	Preferred	Alt
2	General Surgery	MAJ	[1]
3	Allergy Immunology	UN	NS
5	Anesthesiology	UN	MAJ
6	Cardiology	NS	UN
7	Dermatology	NS	UN
8	Family Practice	NS	UN
10	Gastroenterology	MIN	UN
11	Internal Medicine	NS	UN
13	Neurology	NS	UN
14	Neurosurgery	MAJ	[2]
15	Obstetrics Gynecology	MAJ	UN
18	Ophthalmology	MAJ	UN
20	Orthopedic Surgery	MAJ	UN
22	Pathology	NS	UN
24	Plastic and Recon Surgery	MAJ	UN
26	Psychiatry	UN	NS
27	Colorectal Surgery	MAJ	UN
28	Pulmonary Disease	NS	UN
33	Thoracic Surgery	MAJ	[3]
34	Urology	MAJ	UN
37	Pediatric Medicine	NS	UN
39	Nephrology	NS	UN
46	Endocrinology	NS	UN
66	Rheumatology	NS	UN
93	Emergency Medicine	MIN	UN

[1] General surgery, Major available in all states. No alternate selected.
[2] Neurology, Major Surgery is used as the alternate for neurosurgery
[3] Cardiology, Major Surgery is used as the alternate for thoracic surgery.

5.2 Calculation of the Malpractice Insurance GPCI (Base Case)

The calculation of the malpractice insurance GPCI must take into account the premiums for each of the 25 physician specialties, the specific firms with rate filings in each state, and the market shares of these firms. To track all of these elements, we use the following notation in the formulas:

$_C$ – subscript C indicates a county
$_S$ – subscript S indicates a medical specialty

$_T$ – subscript T indicates a state
$_I$ – subscript I indicates an insurance company
$_Y$ – subscript Y indicates the premium year
$_L$ – subscript L indicates a Medicare locality.

In the text description, **bold** is used to indicate data provided in the original data input files, as opposed to calculated values.

Step 1: Calculate specialty weights for each state.

As in previous updates, we develop state-specific specialty weights for the GPCI calculations, rather than rely on national weights. This reflects the fact that state malpractice premiums by specialty in part reflect the norms of care in each state. Using the RVUs for each specialty *S* in each state *T*, the specialty weights are:

(1) $$SW_{S,T} = \frac{RVU_{MP,S,T}}{\sum_{S} RVU_{MP,S,T}}$$

where: $SW_{S,T}$ = the state share of RVUs from specialty *S* in state *T*
$RVU_{MP,S,T}$ = the total malpractice RVUs from specialty *S* in state *T*.

Step 2: Summarize premiums by insurer

The specialty weights are used to develop a summary premium measure for each insurer across all specialties. Since insurers often had different rates for different territories, we develop a specialty-weighted premium for each insurer in each county from the premiums (P_{SICY}) reported by a given insurer *I* for specialty *S* in county *C* in year *Y*:

(2) $$P_{ICY} = \sum_{S} \left(SW_{S,T} * P_{SICY} \right)$$

where: P_{ICY} = the average premium for insurer *I* in county *C*, year *Y*
$SW_{S,T}$ = the state share of RVUs from specialty *S* in state *T*
P_{SICY} = the specialty premium for insurer *I* in county *C*, year *Y*.

For states with patient compensation funds, the premium values P_{SICY} add the compensation fund surcharge to the premium reported in the rate filings.

Step 3: Adjust market share weights

To develop average premiums by county, we need to develop a weighted average of the premiums for each insurer. The market share data was used to identify the companies whose rate filings we requested for premium data. We selected at least two companies in each state, with more selected if necessary to reach 50 percent of the market share in that state. Once the data was collected, these "raw" market shares for insurer I in state T ($rawMS_{I,T}$) needed to be adjusted to re-weight the market shares for the companies whose data we had as a share of the total market whose data we had. In some cases, we had different companies included in different years (as shown in Table 3.4). Therefore, although the initial market share data was all 2006, the adjusted market shares differed each year, as shown below:

$$(3) \qquad MS_{ITY} = \frac{rawMS_{ITY}}{\sum_{I} rawMS_{ITY}}$$

where: MS_{ITY} = the normalized market share for insurer I in state T, year Y
$rawMS_{ITY}$ = the total market share for insurer I in state T, year Y.

The "raw" market shares for insurer I in state T were drawn from the data provided by state departments of insurance, when available. If states did not provide market share data, we used market share data from NAIC.

Step 4: Calculate average county-level malpractice insurance premiums in each year

The market shares ($MS_{I,T}$) allow us to weight the premiums (P_{ICY}) for each insurer to calculate a county average (P_{CY}) for 2006 and 2007. Because rate filings can become effective at any date during the year, we select the premiums in effect on July 1.

$$(4) \qquad P_{CY} = \sum_{I} \left(MS_{I,S} * P_{ICY} \right)$$

where: P_{CY} = the premium price in county C, year Y
MS_{ITY} = the market share for insurer I in state T, year Y
P_{ICY} = the normalized market share for insurer I in state T, year Y.

Step 5: Calculate a two-year average county-level malpractice insurance premium

Following the approach of previous updates, these two years of data are then averaged to create the county-level premium (P_C).

(5) $$P_C = \frac{P_{C,2006} + P_{C,2007}}{2}$$

where: P_C = the average annual premium in county *C*.

Step 6: Calculate a national average malpractice insurance premium

The county-level malpractice RVUs are next used to create a national average malpractice insurance premium (P_N). The national average is the sum of the product of county malpractice RVUs times the county premium divided by the sum of all county malpractice RVUs, identified by the equation below:

(6) $$P_N = \frac{\sum_C \left(RVU_{MP,C} * P_c\right)}{\sum_C RVU_{MP,C}}$$

where: P_N = the national average annual premium
P_C = the average annual premium in county *C*
$RVU_{MP,C}$ = the total malpractice RVUs in county *C*.

Step 7: Index the premium in each county to the national average.

With the calculation of the national average malpractice premium, the county premium can be converted to a premium index, X_C. This index is simply the county three-year average premium divided by the national average premium:

(7) $$X_C = \frac{P_C}{P_N}$$

where: X_C = the premium index for county I
P_C = the average annual premium in county *C*
P_N = the national average annual premium.

Step 8: Create Medicare locality measures that are RVU-weighted averages of the county index.

Finally, the malpractice insurance GPCI is created by taking the malpractice RVU-weighted average the county level index for each Medicare locality, calculated by summing the product of the malpractice RVUs for a county and the county index, then divided b the sum of the malpractice RVUs for a county:

$$(8) \qquad GPCI_{MP,L} = \frac{\sum_{C} \left(RVU_{MP,C} * X_{c} \right)}{\sum_{C} RVU_{MP,C}}$$

where: $GPCI_{MP,L}$ = the malpractice GPCI for Medicare locality L
$RVU_{MP,C}$ = the total malpractice RVUs in county C in locality L
X_C = the malpractice index for county C in locality L

Step 9: Apply budget neutrality factor

As a final step, each malpractice GPCI is rescaled for budget neutrality. The budget neutrality factors are established so that for any given cost factor *CF*, the total payments – summed across all procedures and all localities – would be the same under the updated malpractice GPCIs as they were under the previous GPCIs. The current malpractice RVUs used in the updated malpractice GPCIs are applied to establish budget neutrality, with the budget neutrality factor calculated using the following formula:

$$(9) \qquad BN_{MP} = \frac{\sum_{L} GPCI_{MP,P,L} * RVU_{MP,U,L}}{\sum_{L} GPCI_{MP,U,L} * RVU_{MP,U,L}}$$

where: BN_{MP} = the budget neutrality factor for the malpractice GPCI
$GPCI_{MP,U,L}$ = the updated malpractice GPCI for locality L
$GPCI_{MP,P,L}$ = the previous malpractice GPCI for locality L
$RVU_{MP,U,L}$ = the updated total malpractice RVUs for L.

5.3 Adjustments for Missing Data

The steps outlined above describe the overall strategy for calculating the malpractice insurance GPCI. However, because of missing data problems for entire areas, specific years, or specific specialties, we employed various strategies or imputing missing data or for assigning malpractice GPCI values. To adjust for these issues, we used the following decision process:

Case 1: Premium data missing the base year or become effective mid-year

Rate filings are in effect from the effective date on one filing to the effective date on a replacement filing. For most states, rate filings do not have to be submitted on a regular schedule and are filed only when rates change. Therefore, rate filings can become effective midyear or stay in place for more than one year. The 2006 and 2007 period, for example, could be represented by a filing from January 2005 replaced by one in September 2006. For this

update, we used the rates that were in effect on July 1 2006 and on July 1 2007. In a few cases, our first observed filing was after July 1 2006. In this case, we used existing filings to extrapolate to a July 1 2006. If we did not have two filings (for a linear extrapolation), we used rate changes over time from the Medical Liability Monitor data for the extrapolation. These adjustments are made at the county-insurer-specialty level (P_{SICY}).

Case 2: Missing premium data for a specific specialty

Case 2 is the situation where a rate filing does not show a rate for a specific specialty in a coverage area in any time period. Failing to account for such omissions could produce an insurer price that reflects a specific mix of risk instead of geographic differences in price. Therefore, we sought a method to fill in missing specialties with values that were consistent with a given rate filing (reflecting regional differences) and with the specialty costs (to ensure balance in the weighted averages).

We imputed missing specialties using other premiums on the same rate filing. We took the average of two imputed values, both calculated from risk factors used in the Malpractice RVUs: scaling up from allergy/immunology and scaling down from thoracic surgery. Of our 25 specialty-surgical classes, allergy/immunology has the lowest risk factor, taking the normed value of 1.0. Thoracic surgery has the second highest after neurosurgery, taking the value of 7.489897 when compared to allergy immunology. The example in Table 5.4 shows how these calculations would work, if nephrology were missing in the filing for a company in Kentucky.

Table 5.4: Example of Premium Imputation for Insurers with Missing Rates

Imputing From	PSICY	Relative Risk Factor for Nephrology	Imputed Premium
Allergy/Immunology	$5,783	1.8517	$10,708
Thoracic Surgery	$80,512	0.2472	$1,905
		Average =	$15,307

In this example, the spread between the allergy and thoracic surgery premiums is greater than the national average, creating a fairly large difference between the two estimates. In our example, the actual premium for nephrology is $16,353, so the method works well for this case. There are certainly cases where both imputations would yield estimates that are higher or lower than the actual value, but there does not seem to be any consistent bias up or down.

Before imputing, we ensured that all values were present for allergy/immunology, thoracic surgery and neurosurgery. Neurosurgery is the only specialty of our 25 with a higher risk factor than thoracic surgery (and was the specialty with the most complete coverage). However, at 11.43865, its risk factor was far higher than thoracic surgery as the next closest.

Case 3: No premium data were received for a state

Because Mississippi failed to submit malpractice insurance premium data, we relied on the Monitor data from 2005 through 2007 to calculate the state's malpractice GPCI. However, because the Monitor data covers only internal medicine, surgery and OB/GYN, rather than the 25 specialties we collected in other states, we could not simply plug in the Medical Liability Monitor values in place of the P_{SICY} values for the missing states. Instead, we repeated steps (1) through (7) to get alternative values of the county-level premium index, X_C. These values were calculated for all states, but we only substituted the Monitor data index value for Mississippi. In doing so, we assume that the relative rankings of the states will be the comparable between the two data sources, even if the actual premium rates are not.

Case 4: No premium data were received for a territory, and data are not available in the Medical Liability Monitor.

The U.S. territories are not included in the Medical Liability Monitor and were also not responsive on our survey. For territories such as Guam, the rates from states in their locality apply (Hawaii). However, there is no such overlap for the Virgin Islands and Puerto Rico. For the Virgin Island, we assigned the value of 1.00, as did the previous updates. The malpractice GPCI for Puerto Rico is set to a value of 0.249, equivalent to the previous two updates. Table 5.4 summarizes the strategies for dealing with missing premium data for both Mississippi and the territories.

Table 5.4: Treatment of Areas without Rate Filings

Location	Treatment
Guam, American Samoa & Other Pacific Islands	No values calculated. Assigned Hawaii values.
Puerto Rico	No values calculated. Assigned historic value of 0.249
Virgin Islands	No values calculated. Assigned value of 1.0
Mississippi	Value based on index from MLM

5.4 Impact of Malpractice GPCI Update

There are three potential sources for change in the malpractice GPCI:

- Updated malpractice premium data
- Premium data collected for states missing from the previous collection

- Additional specialties included in premium calculations
- 2008 county RVUs

Table 5.5 lists the localities showing the greatest change, as identified by an absolute change of 20 percent or more. As indicated above, several factors explain the high volatility associated with the malpractice GPCI, from the nature of the data to volatility in malpractice premiums. Of the states for which we could not collect premium data for the previous update, only one state, Wyoming, shows a large change in its index, increasing from 0.88 to 1.209. All Medicare localities in Texas and two in southern California experience large decreases in the malpractice GPCI. The Monitor data validated the findings for Texas, with premiums for OB/GYNs, general surgeons, and internal medicine practitioners all showing similar declines in rates. The Monitor data does not indicate a decline in premiums in southern California for the three specialties for which rates are listed, but it does not indicate an increase in premiums either. The California companies included in this update do differ from those in the previous update (with companies selected by market share in each case). The impact of the volatility of this index, however, is mitigated by the relatively small share in a physician payment assigned to covering malpractice costs.

Table 5.5: Impact of Malpractice GPCI Update - Underlying Values before Final Adjustments

Locality name	CY 2010 MP GPCI	Sixth Update MP GPCI	Difference	Percent Difference
Decreased				
Beaumont, TX	1.346	0.918	-0.428	-31.8%
Houston, TX	1.345	0.918	-0.427	-31.7%
Fort Worth, TX	1.110	0.823	-0.287	-25.9%
Dallas, TX	1.110	0.831	-0.279	-25.1%
Brazoria, TX	1.223	0.918	-0.305	-24.9%
Rest of Texas	1.065	0.809	-0.256	-24.0%
Austin, TX	0.969	0.750	-0.219	-22.6%
Ventura, CA	0.766	0.602	-0.164	-21.4%
Los Angeles, CA	0.804	0.640	-0.164	-20.4%
Galveston, TX	1.223	0.979	-0.244	-20.0%
Increased				
Queens, NY	1.220	1.486	0.266	21.8%
Rest of Washington	0.693	0.848	0.155	22.4%
Arizona	0.822	1.006	0.184	22.4%
Seattle (King Cnty), WA	0.706	0.867	0.161	22.8%
San Francisco, CA	0.414	0.514	0.100	24.2%
Connecticut	0.980	1.227	0.247	25.2%
Manhattan, NY	1.010	1.267	0.257	25.4%
Nebraska	0.245	0.315	0.070	28.6%
Portland, OR	0.472	0.614	0.142	30.1%
Rest of Oregon	0.472	0.614	0.142	30.1%
Poughkpsie/N NYC Suburbs, NY	0.822	1.070	0.248	30.2%
San Mateo, CA	0.394	0.514	0.120	30.5%
Rest of New York	0.425	0.561	0.136	32.0%
Wisconsin	0.409	0.545	0.136	33.3%
North Dakota	0.387	0.520	0.133	34.4%
Colorado	0.641	0.869	0.228	35.6%
Santa Clara, CA	0.377	0.514	0.137	36.3%
Wyoming	0.889	1.217	0.328	36.9%
Rest of Maine	0.492	0.676	0.184	37.4%
Southern Maine	0.492	0.676	0.184	37.4%
Montana	0.673	1.103	0.430	63.9%
Kansas	0.557	0.937	0.380	68.2%
New Hampshire	0.462	0.855	0.393	85.1%

6 GEOGRAPHIC ADJUSTMENT FACTOR UPDATE

The Geographic Adjustment Factor (GAF) is used to summarize differences across localities as well as across updates. The GAF weights each GPCI by the share of total RVUs for each of the payment components, as defined by Equation (1):

(1) $$GAF_{L,P} = \left\{\left[GPCI_{PW,L} * 0.52466\right] + \left[GPCI_{PE,L} * 0.43699\right] + \left[GPCI_{MP,L} * 0.03865\right]\right\}$$

.

where: $GAF_{L,U}$ = the updated GAF for locality L
$GPCI_{PW,L}$ = the physician work GPCI for locality L
$GPCI_{PE,L}$ = the practice expense GPCI for locality L
$GPCI_{MP,L}$ = the malpractice GPCI for locality L

These weights are the same as those used in the Fifth Update.

Table 6.1 lists the GAF for each locality, and compares the GAF calculated from the Sixth Update GPCIs to the GAF calculated for 2010 GPCIs. The Sixth Update GAFs to not account for any ACA adjustments, thus differences across the updates are attributable to updated data sources only. Most localities show only modest change in the GAF, with a majority experiencing less than a 1 percent change. Across the 89 localities, changes range from a 2.4 percent drop for the Metropolitan Boston locality to a 2 percent increase for the Wyoming and Rest of Maryland localities.

Table 6.1: 2010 and Sixth Update GAFs - Underlying Values without Variation Reduction or Other Adjustments

Locality name	2010 GAF	Sixth Update GAF	Difference	Percent Difference
Alabama	0.907	0.906	-0.001	-0.1%
Alaska	1.288	1.288	0.000	0.0%
Arizona	0.968	0.972	0.004	0.4%
Arkansas	0.891	0.892	0.001	0.1%
Anaheim/Santa Ana, CA	1.128	1.129	0.001	0.1%
Los Angeles, CA	1.112	1.106	-0.006	-0.5%
Marin/Napa/Solano, CA	1.112	1.119	0.007	0.6%
Oakland/Berkley, CA	1.130	1.133	0.003	0.3%
San Francisco, CA	1.201	1.198	-0.003	-0.2%
San Mateo, CA	1.203	1.199	-0.004	-0.3%
Santa Clara, CA	1.148	1.156	0.008	0.7%
Ventura, CA	1.121	1.113	-0.008	-0.7%
Rest of California	1.012	1.025	0.013	1.3%
Colorado	0.975	0.983	0.008	0.8%
Connecticut	1.100	1.093	-0.007	-0.6%
DC + MD/VA Suburbs	1.121	1.123	0.002	0.2%
Delaware	1.013	1.012	-0.001	-0.1%
Fort Lauderdale, FL	1.050	1.056	0.006	0.6%
Miami, FL	1.114	1.107	-0.007	-0.6%
Rest of Florida	0.987	0.992	0.005	0.5%
Atlanta, GA	1.004	1.001	-0.003	-0.3%
Rest of Georgia	0.931	0.933	0.002	0.2%
Hawaii/Guam	1.056	1.074	0.018	1.7%
Idaho	0.914	0.920	0.006	0.7%
Chicago, IL	1.084	1.080	-0.004	-0.4%
East St. Louis, IL	0.990	0.993	0.003	0.3%
Suburban Chicago, IL	1.063	1.061	-0.002	-0.2%
Rest of Illinois	0.943	0.946	0.003	0.3%
Indiana	0.941	0.935	-0.006	-0.6%
Iowa	0.903	0.900	-0.003	-0.3%
Kansas	0.915	0.919	0.004	0.4%
Kentucky	0.909	0.913	0.004	0.4%
New Orleans, LA	1.010	0.995	-0.015	-1.5%
Rest of Louisiana	0.927	0.920	-0.007	-0.8%
Southern Maine	0.981	0.987	0.006	0.6%
Rest of Maine	0.914	0.918	0.004	0.4%
Baltimore/Surr. Cntys, MD	1.035	1.052	0.017	1.6%
Rest of Maryland	0.984	1.004	0.020	2.0%
Metropolitan Boston	1.133	1.106	-0.027	-2.4%
Rest of Massachusetts	1.041	1.040	-0.001	-0.1%
Detroit, MI	1.071	1.059	-0.012	-1.1%
Rest of Michigan	0.969	0.965	-0.004	-0.4%
Minnesota	0.959	0.963	0.004	0.4%
Mississippi	0.907	0.909	0.002	0.2%

Locality name	2010 GAF	Sixth Update GAF	Difference	Percent Difference
Metropolitan Kansas City, MO	0.978	0.977	-0.001	-0.1%
Metropolitan St Louis, MO	0.969	0.970	0.001	0.1%
Rest of Missouri	0.895	0.899	0.004	0.4%
Montana	0.894	0.905	0.011	1.2%
Nebraska	0.901	0.903	0.002	0.2%
Nevada	1.016	1.023	0.007	0.7%
New Hampshire	0.987	0.999	0.012	1.2%
Northern NJ	1.134	1.119	-0.015	-1.3%
Rest of New Jersey	1.082	1.074	-0.008	-0.7%
New Mexico	0.942	0.945	0.003	0.3%
Manhattan, NY	1.164	1.153	-0.011	-0.9%
NYC Suburbs/Long I., NY	1.162	1.160	-0.002	-0.2%
Poughkpsie/N NYC Suburbs, NY	1.034	1.037	0.003	0.3%
Queens, NY	1.130	1.140	0.010	0.9%
Rest of New York	0.942	0.945	0.003	0.3%
North Carolina	0.938	0.936	-0.002	-0.2%
North Dakota	0.880	0.889	0.009	1.0%
Ohio	0.973	0.972	-0.001	-0.1%
Oklahoma	0.901	0.903	0.002	0.2%
Portland, OR	0.987	0.991	0.004	0.4%
Rest of Oregon	0.931	0.940	0.009	1.0%
Metropolitan Philadelphia, PA	1.075	1.069	-0.006	-0.6%
Rest of Pennsylvania	0.967	0.962	-0.005	-0.5%
Puerto Rico	0.787	0.787	0.000	0.0%
Rhode Island	1.045	1.042	-0.003	-0.3%
South Carolina	0.924	0.925	0.001	0.1%
South Dakota	0.888	0.887	-0.001	-0.1%
Tennessee	0.925	0.922	-0.003	-0.3%
Austin, TX	0.988	0.983	-0.005	-0.5%
Beaumont, TX	0.950	0.938	-0.012	-1.3%
Brazoria, TX	0.985	0.981	-0.004	-0.4%
Dallas, TX	1.009	1.004	-0.005	-0.5%
Fort Worth, TX	0.983	0.982	-0.001	-0.1%
Galveston, TX	0.986	0.991	0.005	0.5%
Houston, TX	1.016	1.004	-0.012	-1.2%
Rest of Texas	0.933	0.934	0.001	0.1%
Utah	0.948	0.947	-0.001	-0.1%
Vermont	0.956	0.968	0.012	1.3%
Virginia	0.952	0.962	0.010	1.1%
Virgin Islands	0.989	0.993	0.004	0.4%
Seattle (King Cnty), WA	1.033	1.045	0.012	1.2%
Rest of Washington	0.970	0.977	0.007	0.7%
West Virginia	0.924	0.917	-0.007	-0.8%
Wisconsin	0.936	0.943	0.007	0.7%
Wyoming	0.904	0.922	0.018	2.0%

A. OCCUPATION LIST

There are over 800 occupations represented in the OES, with each of these occupations also fitting into a broader occupation classification. Using the SOC system, these broader classifications are identified by SOC codes ending with "0000". For example, SOC code 25-0000 identifies all education, training, and library occupations, and SOC code 25-2010 identifies preschool and kindergarten teachers, which is one of the 14 individual occupations within the broader education, training and library classification. Of the 10 occupation groups used to identify wages, three contain only a single occupation: registered nurses; pharmacists; and licensed practical and licensed vocational nurses. The remaining occupation groups represent a collection of individual occupations. Three of the groups—Education, training, and library; Arts, design, entertainment, sports, and media; and Office and administrative support—are identified with a broad occupation classification identified by a single SOC code. The remaining 4 occupation groups consist of a collection of individual occupations that either cover multiple classifications or are a subset of classifications. Table A.1 below lists the 10 occupation groups used for creating the PW and practice expense GPCIs. The first column lists the group, followed by the SOC code(s) that comprise each group, followed by the title of the occupation(s).

For the purpose of creating the wage indices, we use the SOC codes listed in the table below to identify wages for each county. If there is no wage data available for a code in an area, the national median hourly wage is used to replace the missing data. The missing data only occur for individual occupations within the 10 occupation groups. Wages are identified in all areas for three occupation groups that encompass broad occupation classifications.

Table A1: Occupations Used for Calculating Wage Indices

Occupation Group	Standard Occupational Classification (SOC) Code	Occupation Title
Architecture & Engineering	17-1010	Architects, except naval
	17-1020	Surveyors, cartographers, and photogrammetrists
	17-2011	Aerospace engineers
	17-2021	Agricultural engineers
	17-2031	Biomedical engineers
	17-2041	Chemical engineers
	17-2051	Civil engineers
	17-2061	Computer hardware engineers
	17-2070	Electrical and electronic engineers
	17-2081	Environmental engineers
	17-2110	Industrial engineers, including health and safety

Occupation Group	Standard Occupational Classification (SOC) Code	Occupation Title
	17-2121	Marine engineers and naval architects
	17-2131	Materials engineers
	17-2141	Mechanical engineers
	17-2151	Mining and geological engineers, including mining safety engineers
	17-2171	Petroleum engineers
	17-2161	Nuclear engineers
	17-2199	Engineers, all other
	17-3031	Surveying and mapping technicians
Computer, mathematical, life & physical science	15-0000	Computer and mathematical occupations:
	15-1011	Computer and information scientists, research
	15-1051	Computer systems analysts
	15-1099	Computer specialists, all other
	15-1021	Computer programmers
	15-1030	Computer software engineers
	15-1041	Computer support specialists
	15-1061	Database administrators
	15-1071	Network and computer systems administrators
	15-1081	Network systems and data communications analysts
	15-2011	Actuaries
	15-2031	Operations research analysts
	15-2021	Mathematicians
	15-2041	Statisticians
	15-2090	Miscellaneous mathematical science occupations
	19-1010	Agricultural and food scientists
	19-1020	Biological scientists
	19-1030	Conservation scientists and foresters
	19-1040	Medical scientists
	19-2010	Astronomers and physicists
	19-2021	Atmospheric and space scientists
	19-2030	Chemists and materials scientists
	19-2040	Environmental scientists and geoscientists
	19-2099	Physical scientists, all other
Social science, community & soc service, & legal	19-3011	Economists
	19-3020	Market and survey researchers
	19-3030	Psychologists
	19-3051	Urban and regional planners

Occupation Group	Standard Occupational Classification (SOC) Code	Occupation Title
	19-3041	Sociologists
	19-3090	Miscellaneous social scientists and related workers
	19-4011	Agricultural and food science technicians
	19-4021	Biological technicians
	19-4031	Chemical technicians
	19-4041	Geological and petroleum technicians
	19-4051	Nuclear technicians
	19-4061	Social science research assistants
	19-4090	Miscellaneous life, physical, and social science technicians
	21-1010	Counselors
	21-1020	Social workers
	21-1090	Miscellaneous community and social service specialists
	21-2011	Clergy
	21-2021	Directors, religious activities and education
	21-2099	Religious workers, all other
	23-1011	Lawyers
	23-1020	Judges, magistrates, and other judicial workers
	23-2011	Paralegals and legal assistants
	23-2090	Miscellaneous legal support workers
Education, training, and library	25-0000	Education, Training, and Library Occupations:
Registered nurses	29-1111	Registered nurses
Pharmacists	29-1051	Pharmacists
Art, design, entertainment, sports, & media	27-1000	Arts, Design, Entertainment, Sports, and Media Occupations:
Office, admin support	43-1000	Office and Administrative Support Occupations:
LPNs & LVNs	29-2061	Licensed practical and licensed vocational nurses

Occupation Group	Standard Occupational Classification (SOC) Code	Occupation Title
Health care technical & medical assistants & other health care	29-2010	Clinical laboratory technologists and technicians
	29-2030	Diagnostic related technologists and technicians
	29-2050	Health diagnosing and treating practitioner support technicians
	29-2071	Medical records and health information technicians
	29-2081	Opticians, dispensing
	29-2090	Miscellaneous health technologists and technicians
	29-9000	Other healthcare practitioners and technical occupations