

HOSPITAL LABOR MARKET AREA DEFINITIONS UNDER PPS

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EXECUTIVE SUMMARY

The Medicare Prospective Payment System (PPS) compensates hospitals by adjusting a national standardized amount (i.e., average cost per case) for variations in resource consumption among 494 diagnostic related groups (DRGs). The payment system also recognizes that hospital care is provided in local markets with varying labor costs. To account for this variation the Health Care Financing Administration (HCFA) constructed an index that reflects average hospital wages in each urban and rural area as a percentage of the national average hospital wage. Urban areas are described as metropolitan statistical areas (MSA), and rural areas are described as all non-metropolitan areas within a state. The labor-related portion of the standardized amount, approximately 75 percent of the total amount, is multiplied by the area wage index (AWI) for a hospital's location. The product of this calculation is added to the non-labor portion of the standardized amount. The adjusted standardized amount is then multiplied by the DRG weight to arrive at the payment amount. The standardized amount varies approximately 7.5 percent for every ten-point change in the AWI. In 1994, wage index values ranged from a high of 1.4369 in Oakland, California to a low of 0.6657 in rural Mississippi. As this range illustrates, the wage index profoundly influences PPS payments.

Current labor market definitions inadequately reflect variations in relative labor costs among hospitals. For rural hospitals, inequities of payment under PPS exist both within labor market areas and at their borders. For example, two hospitals just across state borders from each other may truly be in the same labor market, while two hospitals within the same state may not be. To address problems such as these, on March 1, 1993, the Prospective Payment Assessment Commission (ProPAC) recommended a plan to redefine labor market areas. ProPAC recommended defining *hospital-specific labor market areas* based on the geographic proximity of a hospital's "nearest neighbors." Each hospital's "nearest neighbor" wage index would reflect its own wage rate averaged with those of other nearby hospitals. ProPAC described several approaches that might be taken to develop hospital-specific labor markets.

HCFA evaluated ProPAC's proposal and published its results and recommendation on May 27, 1994. HCFA concluded "not to propose changes to labor market areas for FY 1995 because we believe that neither revisions to the current MSA-based system or the nearest neighbor labor market options that we studied constitute a demonstratable improvement over the current system." However, HCFA said that a classification system that combined both MSA and hospital-specific approaches may have "considerable potential for improving the wage index." Therefore, HCFA designed additional alternatives "for comment and future study."

Although both acknowledge serious problems with the current method of defining labor market areas, to date, neither ProPAC nor HCFA have proposed a

specific alternative to replace it. This stalemate can be broken by developing and implementing a policy agenda for improving the area wage index. Our recommendation for such an agenda is as follows:

1. **Pass legislation that allows the Secretary of HHS greater flexibility in refining the hospital wage index.** HCFA believes that it is not authorized to incorporate a hospital-specific wage index scheme into PPS. Until Congress grants HCFA the authority to proceed with the design of such a system, it is unlikely that HCFA will take an active role in improving the index.
2. **Refine and independently replicate the evaluation of the various labor market alternatives proposed by ProPAC and HCFA.** PPS labor market policy evaluation is not coordinated. There is no clear, complete, and reliable source of publicly available information on either ProPAC's or HCFA's proposals. ProPAC and HCFA should cooperate on an assessment of various labor market alternatives augmented by an independent evaluation, if necessary. This evaluation should be completed as soon as possible.
3. **Submit a single, specific proposal for improving the wage index for comment in the proposed PPS rules for FY 1996. The proposal should be implemented as amended (based on comments) in FY 1996.** Based on the evaluation of various methods, HCFA should select and propose a specific method. Selecting a single method will focus the policy debate.
4. **Eliminate the Medicare Geographic Classification Review Board.** Under any of the options currently being discussed, there will be no need to reclassify hospitals to another labor market.
5. **Develop an exceptions process.** Although it would not be necessary to maintain the Medicare Geographic Classification Review Board, it would be prudent to design an exceptions process to allow providers to appeal wage index issues. This function could be delegated to an already existing arm of HCFA such as the Provider Reimbursement Review Board (PRRB).
6. **Estimate corrections to the occupational mix bias and include them in the recalculation of the area wage indices; collect data to support calculation of an occupational mix adjustment; revise estimated corrections to the occupational mix bias as additional information is available.** The problems that already exist with respect to the occupational mix bias are likely to be exacerbated under any plan that increases the number of labor market areas and reduces the number of hospitals per labor market area. Because small and rural hospitals are less occupationally rich than large and urban hospitals, they are particularly disadvantaged by the failure to correct for the occupational mix bias.

7. **Establish a transitional (blended) rate for up to three years to minimize the distributional impact of the change in the labor market definition, if such actions are warranted by the assessments of HCFA and ProPAC.** The proposed methods should more fairly compensate hospitals for their employment costs. However, the redistribution of payments may be too abrupt for some hospitals whose labor-related PPS payments will decline under the new system. Therefore, a transition to the new system might be warranted.

INTRODUCTION

When Ronald Reagan signed the Social Security Amendments of 1983 (Public Law 98-21) he replaced almost 20 years of cost-based reimbursement for inpatient Medicare services with a prospective payment system designed to control Medicare costs and alter provider incentives. Instead of reimbursing hospitals for the reasonable costs of providing care to Medicare beneficiaries, the prospective payment system (PPS) pays providers on the basis of pre-determined amounts per discharge. Because prospective rates are set without regard to a hospital's actual costs, the system rewards hospitals whose actual costs are below prospectively determined rates and penalizes those whose costs are greater than prospectively determined rates. Since a fixed amount is paid for each Medicare case, hospitals are encouraged to provide care as efficiently and inexpensively as possible (Grimaldi, 1984).

Medicare PPS payment rates are determined by adjusting a standardized amount (average cost per case) for variations in the types of cases treated and area wage levels.¹ Each Medicare case is assigned to one of 494 diagnosis-related groups (DRG). A weight is associated with each DRG that indicates the relative amount of resources used to treat a patient whose condition falls within the diagnostic grouping.

¹ National standardized amounts were phased in over a five-year period (FY 1984-1988). During the transition period the standardized amounts were composed of hospital-specific, regional, and national components. PL 98-21 required the establishment of separate urban and rural standardized amounts. In FY 1984 the urban standardized amount was 25.3 percent greater than the rural standardized amount. In FY 1989, Congress began granting rural hospitals annual PPS rate updates that were greater than those for urban hospitals intended to narrow the difference between the urban and rural standardized amounts. The urban-rural differential in the standardized amount should be eliminated by FY 1995.

The following formula is a simplified description of Medicare PPS payments per discharge:

$$\text{Standardized Amount} \times \text{DRG Weight} = \text{Payment Per Discharge}$$

Before the standardized amount is multiplied by the DRG weight, it is adjusted to reflect area wage levels. In implementing PL 98-21, the Health Care Financing Administration (HCFA) constructed an index that reflected average hospital wages in each urban and rural area as a percentage of the national average hospital wage. For PPS, urban areas were described as metropolitan statistical areas (MSA), and rural areas were described as all non-metropolitan areas (non-MSA) within a state. In FY 1994 there were 364 labor market areas; 316 for urban areas and 48 for rural areas.² The labor-related portion of the standardized amount, approximately 75 percent of the total amount³, is multiplied by the area wage index (AWI) for a hospital's location. The product of this calculation is added to the non-labor portion of the standardized amount. The following formula is used to adjust the standardized amount:

$$\left[\begin{array}{l} \text{Labor-related} \\ \text{Portion of} \\ \text{Standardized Amount} \end{array} \times \text{AWI} \right] + \begin{array}{l} \text{Non-labor} \\ \text{Portion of} \\ \text{Standardized Amount} \end{array} = \begin{array}{l} \text{Adjusted} \\ \text{Standardized} \\ \text{Amount} \end{array}$$

² All of the counties of New Jersey and Rhode Island are classified as urban.

³ The labor-related proportion of the standardized rate varies in rural and urban areas. For FY 1994, the labor-related portion of the rural standardized rate is 75.6 percent. The labor-related portion of the standardized amount for both large urban and other urban hospitals is 70.8 percent (Federal Register, September 1, 1993).

The adjusted standardized amount is then multiplied by the DRG weight to arrive at the payment amount.

Since the inception of PPS, controversy has surrounded the wage index and the data used to calculate it. HCFA corrected several technical problems with the index in the early years of PPS implementation. More recently, Congress has attempted to address issues of payment equity by allowing hospitals to seek reclassification from one labor market area to another. These efforts notwithstanding, problems with the definition of labor market areas and the calculation of AWIs still remain. On March 1, 1993 the Prospective Payment Assessment Commission (ProPAC) sought to correct these problems by recommending significant changes in the PPS wage index and hospital labor market definitions (ProPAC, 1993).⁴ On May 27, 1994, HCFA published a detailed analysis of ProPAC's proposal. HCFA also suggested several new approaches for defining labor market areas. The purpose of this paper is 1) to review ProPAC's and HCFA's proposals, 2) to assess their strengths and weaknesses, and 3) propose policy recommendations in regard to labor market area definitions.

The PPS area wage index is a complex subject. An understanding of technical issues surrounding calculation of the index and of previous policy determinations relative to it is necessary to better understand the significance of ProPAC's proposal. Accordingly, a sizeable portion of this paper is dedicated to providing the requisite background. The remainder the paper is divided into five sections. The next two

⁴ ProPAC was created by Congress in the same legislation that enacted PPS (PL 98-21). ProPAC is an independent commission responsible for advising the executive and legislative branches on maintaining and updating PPS. Commission members are appointed by the Office of Technology Assessment (OTA).

sections set the context for the analysis of ProPAC's proposal. The first identifies issues related to hospital labor market area definition and area wage index calculation. The second summarizes proposed and actual modifications to the definition of hospital labor market areas, including ProPAC's 1993 recommendation. The third section contains assessments of ProPAC's labor market area proposal and of HCFA's analysis of various labor market area definitions. The report concludes with policy recommendations based upon these assessments. In an appendix we assess alternative methods for defining labor market areas.

ISSUES RELATED TO LABOR MARKET AREA DEFINITION AND AREA WAGE INDEX CALCULATION

The standardized amount varies approximately 7.5 percent for every tenth of a point change in the AWI. In FY 1994 wage index values ranged from a high of 1.4369 in Oakland, California to a low of 0.6657 in rural Mississippi, a range of 0.7712 points (Federal Register, September 1, 1992). As this range illustrates, the wage index profoundly influences the payments hospitals receive for treating Medicare patients. The equity of PPS, therefore, hinges in large part on the accuracy of the wage index (Pope, 1989). However, changes in the definition of labor market areas or the wage index have been politically difficult to make in the past, because they would have resulted in payment increases to some hospitals and payment decreases to others. Despite consistent calls for changes in the PPS labor adjustment, disagreements arise each time specific changes are considered (ProPAC, 1989). Any

modification to the area wage index that promotes greater payment equity will result in a redistribution of PPS payments.

There are two types of problems associated with the PPS labor adjustment: those having to do with the definition of hospital labor market areas and those having to do with the calculation of the wage index. The labor market area is a device for determining the set of hospitals to include in an AWI calculation, and is, therefore, inextricably linked to the wage index. Although this paper primarily focuses on the hospital labor market area definition, the linkage between the two types of problems requires that issues related to the AWI calculation also be discussed.

Hospital Labor Market Area Definition

Current labor market definitions inadequately reflect labor market conditions and variation in relative labor costs among hospitals. Inequities of payment under PPS exist both within labor market areas and at the boundaries of labor market areas. Two hospitals just across state borders from each other may truly be in the same economic market, while two hospitals within the same state may not be.

Variation in Area Wage Indices Across Labor Market Area Boundaries

Current PPS labor markets rely on political or administrative boundaries (county or state lines) to circumscribe their areas. Unfortunately, these boundaries have little relevance for identifying the extent of a labor market. Under PPS rules, a labor market is assumed to end at the MSA or state border and a completely separate labor market is assumed to begin on the other side of the border (ProPAC, 1993). The arbitrary drawing of labor market area boundaries can have a substantial effect on PPS payment

rates of hospitals on either side of the line, even though they may encounter similar local prices for labor. There are three types of labor market boundaries:

- Rural county - MSA county border
- MSA - MSA border
- State - State border

Each boundary can present problems for hospitals located near the border when wage indices on either side of the border vary significantly. Examples of the effect each type of boundary has on PPS payments will illustrate the problem⁵.

Rural Seward County Nebraska has an AWI of 0.6992, while neighboring Lincoln County, an MSA, has an AWI of 0.8952. The .196 difference in wage indices accounts for a 14.7 percent difference in the standardized amount for hospitals in the two counties (assuming a single standardized amount -- which is not yet the case -- and a labor portion of the standardized amount equal to 75 percent). The Cedar Rapids, Iowa and Iowa City, Iowa MSAs border one another. Cedar Rapids has an AWI of 0.7528 and Iowa City has an AWI of 0.9524. Once again, the effect on the standardized rate of the variation in wage indices is approximately 15 percent. Finally, state-to-state borders can produce similar inequities. Consider Nebraska, which shares a western border with Wyoming. Hospitals in rural Nebraska have an AWI of 0.6992; hospitals in rural Wyoming have an AWI of 0.8453. Rural hospitals on the Wyoming side of the border have a wage index that is 0.1461 greater than rural hospitals on the Nebraska side of the border. As a result of the lower AWI, rural hospitals in western

⁵ Examples use FY 1993 wage indexes and assume no geographic reclassifications.

Nebraska have an adjusted standardized rate that is approximately 10.9 percent lower than their rural neighbors in eastern Wyoming.

Variation in Labor Costs Within Defined Labor Market Areas

Many of the single, statewide rural labor markets are too large. They include a variety of hospitals and communities with varying labor market conditions. Statewide rural labor market definitions do not recognize genuine differences among hospitals in the level of market prices for labor (ProPAC, 1993). For example, the hospitals in Rio Grande City and Perryton, Texas are considered to be in the same labor market despite the fact that they are over 700 miles apart. The economic structures of Vail, Colorado, a prosperous and internationally known resort community, and Walsh, Colorado, an agricultural community, are very different, but, they are in the same PPS labor market. Saint James Community Hospital in Butte, Montana, a town with a long tradition of organized labor, is heavily unionized; it has entered into collective bargaining agreements with six different unions. Saint James Community Hospital is considered to be in the same labor market as Sheridan Memorial Hospital in Plentywood, Montana, even though Sheridan Memorial Hospital has no labor contracts and is over 500 miles from Butte. These examples may be somewhat extreme, but they illustrate the problems inherent in single statewide labor market definitions.

MSA labor markets are much smaller than rural labor market areas, yet substantial differences in labor prices within these markets may also exist. Some

inner-city urban hospitals pay higher wages to attract personnel than hospitals in suburban or urban ring areas.

In the western part of the United States, some MSA counties are so large that they include significant areas that are sparsely populated (Hewitt, 1989). For example, San Bernardino County, California -- the largest county in the United States - - has an area of over 20,000 square miles. The city of San Bernardino sits at the western edge of the county and is considered part of greater Los Angeles. Eighty-seven percent of the population of the county reside in an area smaller than 750 square miles. The remaining 13 percent of the population is scattered over 19,316 square miles with an average population density of 9.5 persons per square mile. All of San Bernardino County is considered an MSA, despite the fact that thousands of square miles are uninhabited desert (California Office of Statewide Health Planning and Development, 1991). Hi-Desert Medical Center in Joshua Tree, California receives the same AWI as St. Bernardine Medical Center in downtown San Bernardino.

Incorrectly assigning a hospital to a labor market area whose AWI is much lower than the hospital's actual labor market may have the consequence of driving down labor costs at the hospital. Unable to spend money it has not received in payment for services rendered, the hospital may pay its staff lower salaries than it would have had the hospital been assigned to its actual labor market. Future adjustments to the wage index based on historical cost data will reflect the lower labor costs of the facility, thereby institutionalizing lower payment rates. Eventually, these hospitals may have

difficulty competing for personnel in local labor markets (Adams, et al., 1991; Size, 1992).

Calculation of the Area Wage Index

In the past, the PPS wage index has not appropriately measured relative area labor costs (Pope, 1989). While some issues raised with respect to the index have been or are presently being resolved, others remain unaddressed. Critics voice four perennial complaints about the index: 1) the wage index is based on out-of-date data; 2) wage data do not include fringe benefits; 3) wage data do not include contract labor costs; and 4) the wage index reflects variations in the price of labor as well as the mix of occupations.

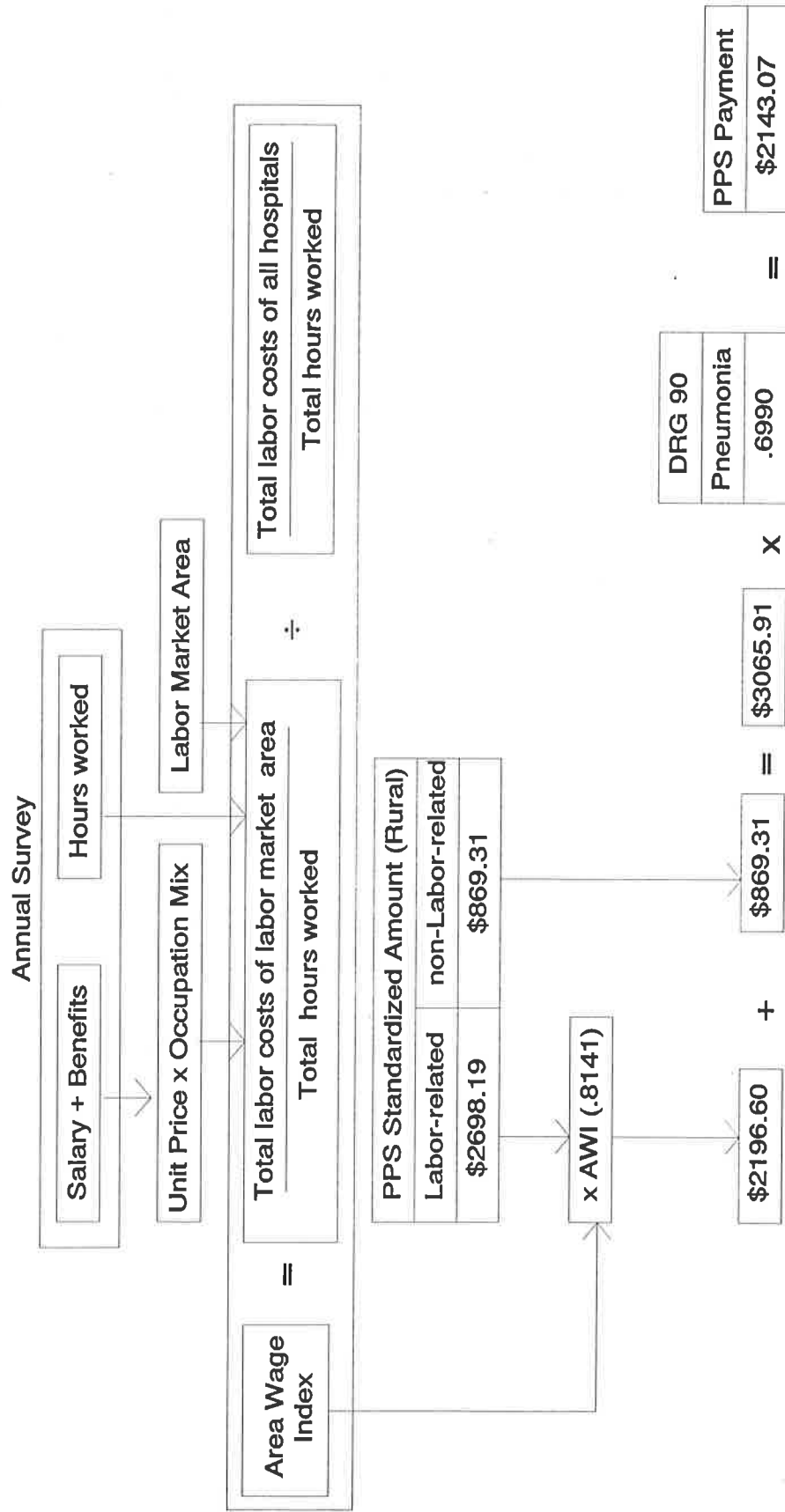
To better understand these issues, it is useful to review the method by which the index is calculated (see Figure 1). The wage index is calculated by summing the total gross wages of all PPS eligible hospitals in a defined labor market and dividing them by the total paid hours for the area. The resulting average hourly rate for the labor market area is divided by the national average wage (calculated by dividing total gross wages for all PPS-eligible hospitals in the country by total paid hours). The result of this calculation is the area wage index for a defined labor market area (Federal Register, September 1, 1987).

Timeliness of Wage Data

Prior to FY 1994, the wage index was last updated in FY 1991 using FY 1988 survey data. The wage index for period FY 1988 to FY 1990 was based on a blend

Figure 1

Example of the Effect of the Prospective Payment System Labor Adjustment on Hospital Payments
(Rural Minnesota Hospital; Diagnosis of Pneumonia, FY 1994)



of 1984 and 1982 survey data (Federal Register, May 8, 1989). This time lag created problems for some hospitals. Hospitals that experience rapid wage rate growth are disadvantaged by out-of-date wage indices, because payments are not comparable to costs. When the index is updated only periodically, the change in index values is especially large for some areas (Sandrick, 1990). The issue of data timeliness was recognized and addressed by Congress, who directed HCFA to update the index annually. Beginning in FY 1994, the hospital wage index will be updated annually (Federal Register, September 1, 1992). However, even though the wage index is updated annually, there is a time lag between the date of the collected data and its use in the index. For example, the wage indices for FY 1995 will be calculated using data collected from hospitals for cost reporting periods beginning in FY 1991 (Federal Register, May 27, 1994).

Fringe Benefits

Until FY 1991, hospital wage data did not include fringe benefits (Federal Register, May 5, 1990). From an employer's perspective, labor costs include not only cash wages but also fringe benefits and training expenses. Hospitals develop their own job reward systems that includes not only cash wages, but also non-cash fringe benefits and promotion opportunities to attract and retain their employees. The proportion of cash and non-cash rewards is not necessarily the same for all hospitals. Some employees are willing to trade cash wages for fringe benefits. To more accurately reflect the costs of employing staff, it is important to include the costs of fringe benefits in the calculation of the hospital wage index. Following the urging of

providers and ProPAC, HCFA incorporated fringe benefits into the wage index calculation. In its proposed PPS rule for FY 1995, HCFA stated its concern over the consistency of fringe benefits cost reporting (now referred to as "wage-related costs") and proposed revisions to the data collection instrument to standardize wage-related cost data gathering (Federal Register, May 27, 1994).

Contract Labor

It is claimed by some that rural hospitals make disproportionate use of professional contract labor, because of worker shortages in some skilled areas (Size, 1992). Prior to FY 1994, the hospital wage data used in the wage index calculation did not include contract labor costs. In its 1988 hospital wage survey, HCFA collected contract labor cost data but did not use it because "the data submitted from hospitals were incomplete and plagued with problems" (Federal Register, September 1, 1992). Primary among the problems was the inability to determine the hours of service associated with contract labor. HCFA also noted that the cost of some contract services, especially those that do not participate in direct patient care such as housekeeping and laundry, include supplies and equipment that are provided by the contractor.

To overcome these problems, HCFA clarified its instructions for reporting contract labor costs and hours for the FY 1990 cost reporting period. It audited and reviewed the reported data and, satisfied that the data were "reasonable," included the cost of those contract services directly related to patient care in the wage index calculations for FY 1994 (Federal Register, May 26, 1993). HCFA specifically

excluded contract services such as management and housekeeping from the calculation.

Rural hospitals expressed concern that many of them currently incur contract labor costs that are not directly related to patient care that, nevertheless, should be included in the data reported by the hospital. Many rural hospitals have management contracts that contain the employment costs of their top managers. HCFA agrees that it is appropriate to include the costs of certain management contracts in the wage index and has proposed collecting contract cost data on the chief executive officer/hospital administrator, chief operating officer, chief financial officer, and nursing administrator (Federal Register, May 27, 1994). HCFA proposes to begin collecting contract management data in FY 1995. A timetable for inclusion of contract management costs in the wage index was not proposed.

Occupational Mix

Finally, the current wage index reflects variations among hospitals in the price and occupational mix of labor. The wage index, however, should measure only the relative opportunity cost of labor (Pope, 1989). That is, the wage index is intended to measure geographic differences in the unit prices of labor inputs hospitals must purchase to provide services. The index should measure geographic differences in the salary scales of hospitals rather than the average salaries paid by hospitals. Because hospitals report total compensation and total hours to HCFA without regard to occupation, the average wage for areas implicitly includes components of both unit price and occupational mix.

Hospitals may have little control over the wages they pay their employees, but they should have control over the quantity and skill mix of the employees they hire (ProPAC, 1993). In addition to the staffing choices a hospital makes and the availability of certain occupations, the mix of occupations in a hospital varies due to differences among hospitals in case mix and intensity of services produced (ProPAC, 1991). Hospitals are compensated for case mix differences under PPS through the DRG relative value scale -- more complex cases that require more specialized health professionals have higher DRG weights. If case mix intensity is also reflected in the wage index by the proxy of occupational mix, occupationally "rich" hospitals may receive a double payment (Pope, 1989). In other words, some hospitals may be rewarded for hiring more costly professionals, even when care could be provided more efficiently with lower priced staff. An example of the effect of occupational mix on PPS payment is shown in Table 1.

Research shows that failure to adjust for occupational mix may overcompensate large urban hospitals that have more complicated cases and hire more professional employees. Based on a study of 1988 California wage and hour data, ProPAC concluded that an adjustment for occupational mix would increase wage index values by approximately 3.0 percent for hospitals in rural areas of California. The effect of removing occupational mix bias from the AWI calculation on hospitals in urban areas of California is mixed. In this study, the effect of the occupational-mix correction on the wage index ranged from a 2.4 percent decrease for hospitals in Oakland to a 7.0 percent increase for those in Yuba City (ProPAC, 1991).

Table 1
Example of the Effect of Occupational Mix
on PPS Payments

	"High" Occupational Mix Wage Area	"Low" Occupational Mix Wage Area
Registered Nurse hourly wage	\$12.00	\$12.00
Nursing Assistant hourly wage	\$ 8.00	\$ 8.00
Registered Nurse percent of workforce	80%	50%
Nursing Assistant percent of workforce	20%	50%
Average Area Wage	\$11.20	\$10.00
Average National Wage	\$11.00	\$11.00
Area Wage Index (AWI) (Avg. Area Wage ÷ Avg. National Wage)	1.0182	0.9091
National Standardized Rate (NSR)	\$3,600	\$3,600
Adjusted Standardized Rate (NSR x .25) + ((NSR x .75) x AWI)	\$3,649.14	\$3,354.57
Payment Differential Due to Occupational Mix		\$ 294.57

Wage index values in some areas of the country are more sensitive to occupational mix than others. In 1990, ProPAC studied the effect of adjusting the wage index using Bureau of the Census wage data on occupations typically employed in hospitals and American Hospital Association employment data. ProPAC found that eliminating occupational-mix bias would increase wage index values in more than 75 percent of rural areas. The average rate of increase in rural areas was 1.8 percent. However, in Montana and some small southern MSAs, the increase in the wage indices was three to six times higher than the average (ProPAC, 1991).

Pope found that the average difference between the 1988 PPS wage index and a fixed-occupation-mix index was approximately two percent. He also found that occupational-mix distortions are substantially larger than the average for a small proportion of labor markets areas. For example, hospitals in some areas are overcompensated by as much as 10 percent because of occupational-mix biases, while hospitals in the rural south and in small southern MSAs are substantially under-compensated (Pope, 1989).

These studies indicate that the wage index as currently constructed tends to overcompensate areas with high wage indices (large urban areas) and under-compensate areas with low wage indices (rural areas). Elimination of the occupational-mix bias would increase payments to rural hospitals, slightly decrease payments to urban hospitals, and reduce variation across labor market area borders.

The issue of occupational mix should not be decoupled from the redefinition of hospital labor market areas. Any plan that would increase the number of labor market

areas will exacerbate the occupational-mix bias (Pope, 1989). Smaller labor market areas will have a smaller number of hospitals over which to average occupational mix. It is likely that the use of a smaller denominator will produce greater variation in occupational mix across labor market areas. Therefore, labor market area redefinition and removal of occupation-mix bias should be considered at the same time.

HCFA acknowledges that the current wage index measures the *cost* of labor rather than the *price* of labor, but it is reluctant to adopt an occupation-mix adjustment in the wage index (Federal Register, June 3, 1991), despite earlier indications of interest. In 1987, HCFA expressed a willingness to take hospital occupational mix into account in calculating the wage index (Federal Register, September 1, 1987), and in 1989, it announced its intention to collect occupation-mix data in its survey of 1988 hospital wages, but later abandoned the idea (Federal Register, September 1, 1989). In 1991, HCFA listed its reasons for not adopting an occupation-mix adjustment to the wage index "at this time" (Federal Register, June 3, 1991):

- The decision to obtain data by occupation category for use in future wage indices must be preceded by a formal evaluation of the value, feasibility, and impact of the collection and use of the data.
- Hospitals should not be burdened with additional data collection when it is still not clear that a substantial improvement in the distribution of payments will result from an occupation-mix adjustment.
- An occupation-mix adjustment should be evaluated in conjunction with other potential wage index changes, such as revised labor market area definitions (i.e., would these two factors tend to moderate each other?)
- The optimum mix or standard of occupations that is needed to provide quality care in an efficient manner is not known.

- It is not clear that a redistribution of payments based upon an occupation-mix adjustment would be desirable, particularly in conjunction with the elimination of separate standardized amounts for rural and urban hospitals.
- Studies that have assessed the distributional impact of eliminating the occupation-mix bias have not examined the effect on hospital Medicare operating margins.
- The double-payment phenomenon caused by the coupling of the occupation-mix bias and case mix may be overstated.
- It is unclear whether the wage index should measure the cost of labor without regard to the mix of employees or the prices paid for labor, holding constant the mix of employees.

In May 1994, HCFA reiterated its belief that an occupational mix adjustment would not improve the accuracy of the wage index (Federal Register, May 27, 1994). HCFA also reported that a group of hospital industry representatives displayed little support for developing a system that, in their opinion, "clearly creates additional reporting burdens with an unproven or minimal impact on the distribution of payments" (p. 27724).

Short of a Congressional mandate to require an occupational mix adjustment, it does not seem likely that HCFA will make such a change. Given the arcane nature of the topic and the inherent bias among providers to reporting, it is also unlikely that a notable grassroots effort will be mounted by providers to persuade Congress to require the adjustment. Despite the current lack of enthusiasm for implementing an occupational mix adjustment, it is very likely that the need for one will be clearly highlighted in the near future by the large increase in the number of labor market areas

that will result from any of a number of the definitions proposed by ProPAC and HCFA.

ACTUAL AND PROPOSED MODIFICATIONS IN THE DEFINITION OF PPS LABOR MARKET AREAS

Two approaches have been taken to correct perceived errors in the definition of labor market areas. One method is to allow hospitals to seek reclassification from one labor market to another. This approach redraws the boundaries of labor markets, but is based on the MSA/non-MSA definition of labor markets currently employed by the Medicare program. The other approach is to develop new labor market areas based on new definitions. To date, HCFA has permitted geographical reclassifications, but has balked at redefining hospital labor markets, despite repeated calls by ProPAC to do so. The following sections trace the evolution of actual and proposed modifications to defining hospital labor markets areas for the purpose of PPS payment.

Geographic Reclassifications

HCFA has implemented several rule changes in recent years to refine the definition of hospital labor market areas. In 1988, HCFA developed rules that allowed hospitals in rural counties adjacent to MSAs to apply for reclassification to the adjacent MSA's labor market (Federal Register, May 27, 1988). This move was in response to claims by some rural hospitals located near urban areas that they had to compete with urban hospitals for employees while their wage index values were lower than urban hospitals. The wage and hour data for the reclassified hospitals were transferred from the rural labor market area to the urban labor market area and the

AWI for each was recalculated. In several cases, the result of the recalculation was a reduction in both the rural index and the urban index. This was due to the fact that the reclassified hospitals' average wages were greater than the rural average, but less than the urban average. While reclassified hospitals may have benefitted from the recalculation of the wage indices, their urban and rural neighbors suffered.

In 1991, HCFA issued new rules for computing wage indices following reclassification (Federal Register, June 3, 1991), based on a "hold harmless" principle.

The new rules held that:

- If including reclassified hospitals reduces an urban area wage index by one percent or less, the original urban area wage index is used.
- If including reclassified hospitals reduces an urban area wage index by more than one percent, the reclassified hospitals are subject to the new wage index, while the rest of the hospitals in the urban area use the original wage index value.
- If removing reclassified hospitals reduces the rural area wage index, the original wage index values are used.

Implementing these "hold harmless" rules in conjunction with a statutory budget neutrality requirement has resulted in reductions in the DRG standardized payment amount in order to fund geographic reclassifications (Federal Register, September 1, 1992).

Congress established the Medicare Geographic Classification Review Board (MGCRB) to evaluate and grant hospital requests for reclassifications of their wage index or standardized amount or both. In 1990, HCFA published rules outlining the reclassification process and the criteria the MGCRB would use in making reclassification decisions (Federal Register, September 6, 1990). According to the

eligibility guidelines, hospitals are allowed to be reclassified from a rural area to an urban area, from a rural area to another rural area, and from an urban area to another urban area. Hospitals may apply individually or as a county group. (The eligibility criteria are slightly different for these two types of reclassifications.) To obtain a wage index reclassification, a hospital must demonstrate geographic proximity as well as wage structure similarity to the area to which it seeks to be reclassified.

An individual hospital may seek reclassification if it meets one of the following geographic proximity conditions:

- The distance from the hospital to the adjacent area is no more than 15 miles for an urban hospital and no more than 35 miles for a rural hospital.
- At least 50 percent of the hospital's employees reside in the adjacent area.

It must also demonstrate that its incurred wage costs are comparable to hospital wage costs in the adjacent urban or rural area by satisfying one of the following two conditions:

- The hospital's average hourly wage is equal to at least 85 percent of the average hospital hourly wage in the adjacent area.
- The hospital's average hourly wage, weighted for occupational categories, is at least 90 percent of the average hospital hourly wage in the adjacent area.

Rural referral centers and sole community hospitals are exempt from the geographic proximity criteria.

In its first year of operation, the MGCRB reclassified 930 hospitals for FY 1992, an approval rate of approximately 90 percent. Over 75 percent of the reclassified

hospitals were located in rural areas, an amount equal to approximately 28 percent of all rural hospitals. These reclassifications were funded by reducing the standardized amounts for large urban and other urban areas by 1.1 percent each under the budget neutrality provision. The average PPS payments for hospitals not reclassified decreased an average of approximately one percent per case. On the other hand, the total PPS payment for reclassified hospitals increased an average of 5.9 percent per case (Federal Register, June 4, 1992).

Reacting to the unexpectedly large number of reclassifications, HCFA took steps to establish more restrictive criteria. Beginning in FY 1994, a hospital will not be reclassified unless its average hourly wage is at least 108 percent of the average hourly wage of its original labor market area and is not less than 84 percent of its new labor market area (Federal Register, September 1, 1992).⁶ This change reduced the number of hospitals eligible for reclassification by approximately 60 percent. HCFA estimates that there will be only 362 reclassified hospitals in FY 1995 (Federal Register, May 27, 1994).

Reclassification from one labor market area to another has benefitted certain hospitals, but it has not addressed fundamental labor market area definition issues. For example, it does not solve the issue of cross-boundary variation; it merely redraws the boundary lines. Adopting new definitions of labor market areas is a more

⁶ The 108 percent threshold is based on the national average hospital wage as a percentage of its area wage (96 percent) plus one standard deviation (12 percent). The same rule is used to establish the lower threshold of 84 percent (96 percent minus one standard deviation) (Federal Register September 1, 1992).

comprehensive approach than geographic reclassification to overcoming the problems identified with the current system.

Proposed Labor Market Area Definitions

From the first days of PPS, ProPAC recognized the need to improve the definition of hospital labor market areas to better account for variations in wages among hospitals in urban and rural areas. In its April 1985 report, the Commission recommended to the Secretary of Health and Human Services that the definition of labor market areas be improved. In its April 1986 report, ProPAC reiterated its previous recommendation and called for the Secretary of HHS to adopt the improvements by FY 1988. In 1986, Congress passed legislation requiring the Secretary of HHS to report on methods for improving hospital labor market areas by May 1987. In its 1987 report, ProPAC recommended a specific improvement to the definition of hospital labor market areas (ProPAC, 1987):

- For urban areas, the Secretary should modify the current Metropolitan Statistical Areas to distinguish between central and outlying areas. The central areas should be defined using urbanized areas as designated by the Census Bureau.
- For rural areas, the Secretary should distinguish between urbanized rural counties and other rural counties within each state. Urbanized rural counties should be defined as counties with a city or a town having a population of 25,000 or greater.

This recommendation was based on two major reports, one prepared for HCFA (Cromwell, Hendricks, and Pope, 1986) and one prepared for ProPAC (Schmitz and Merrell, 1987). These reports studied alternatives to the current labor market area

definitions. Cromwell, et al. studied wage variations among hospitals within MSAs and between hospitals located in rural counties adjacent to MSAs and those that were not adjacent to MSAs. Hospitals in rural counties adjacent to MSAs paid, on average, 2.4 percent higher wages than other rural hospitals. . Approximately 20 percent of the difference was explained by hospital characteristics, such as occupational mix, part-time-full time mix, teaching status, and case mix. Another 20 percent was explained by the gross cost of housing in the counties where the hospitals were located. The remaining 60 percent of the variation was unexplained. They also found that hospitals in the core city paid six to eight percent higher wages than their suburban counterparts. Approximately one-half of the difference could be explained by occupational mix, the mix of full and part-time workers, and teaching status.

This study by Cromwell, Hendricks, and Pope showed that there was systematic variation within PPS-defined labor market areas. Recognizing the difference, Schmitz and Merrell (1987) recommended that urban labor markets be redefined to distinguish between central city (core) and outlying areas (suburban ring). The core would be defined as "urbanized areas" of an MSA designated by the Census Bureau. The suburban ring would be defined as the balance of the designated MSA. For rural areas Medicare would distinguish between urbanized rural counties and other counties within a state. Urbanized counties would be defined as counties with a city or town with a population of 25,000 or greater. In the analysis that accompanied the proposal, Schmitz and Merrell found that core hospitals had average wages almost 16

percent higher than suburban ring hospitals and urbanized rural counties had average hospital wages approximately 8.5 percent higher than non-urbanized counties.

Defining hospital labor markets in this way would have resulted in an increase in the number of labor market areas from 365 to 563. In theory, increasing the number of labor market areas should reduce within-market variation. ProPAC's 1987 recommendation largely follows the lines of that suggested by Schmitz and Merrell. The Secretary of HHS rejected the proposal, stating that additional study and analysis were necessary to evaluate alternative options to redefine labor market areas and to determine their impact (ProPAC, 1988).

In 1990, Wright and Marlor prepared a report for ProPAC on alternative hospital market area definitions. The report considered identification of hospital product markets as well as labor markets. The authors evaluated the applicability and merits of alternative market area definition methodologies for PPS, and concluded that two alternatives to current PPS labor market areas should be considered. The report suggested that labor market areas developed by the Department of Agriculture be tested for their usefulness and applicability to PPS. They also suggested that the use of nationwide data to establish expected wage gradients given region population, distance and other related variables be explored. Statistical estimates obtained in this way would be applied to local areas so that market areas would capture local variation but avoid the problem of undue influence by individual hospitals.

In 1992, ProPAC announced it had launched a new effort to "develop alternative labor market definitions that may alleviate many of the current problems"

and recommended that the current PPS labor market definitions need to be "improved or replaced as soon as possible" (ProPAC, 1992).

In its March 1, 1993 recommendations to Congress, ProPAC proposed yet another plan to redefine hospital labor market areas (ProPAC, 1993). ProPAC recommended defining *hospital-specific labor market areas* based on geographic proximity measured by the air-mile distance between nearby hospitals. Each hospital's "nearest neighbor" wage index would reflect its own wage rate averaged with those of other nearby hospitals. This definition would create over 5,000 hospital labor market areas. A comparison of the number of labor market areas created by alternative labor market definitions is found on Table 2.

ProPAC stopped short of recommending a specific method of defining a hospital's nearest neighbors. The Commission explored a range of hospital-specific labor market area definitions, using two approaches: (1) clustering a predetermined number of hospitals closest to the target hospital without regard to spatial limitations, and (2) establishing a fixed radius measure to demarcate the labor market area. ProPAC also mixed the two approaches, choosing to define labor market areas as, for example, the closest 10 hospitals within a maximum distance of 50 miles, or all of the hospitals within a radius of 20 miles with the distance extended to up to 50 miles to ensure at least three other hospitals in the labor market.

Table 2
Number of Labor Markets Produced
Using Alternative Definitions

Labor Market Definition	Number of Labor Markets
MSA/Non-MSA Labor Markets (current method)	364
Schmitz and Merrell (ProPAC recommendation 1987)	563
Bureau of Economic Analysis Economic Areas	183
USDA Labor Markets	382
Health Service Areas	802
Hospital-Specific Labor Market (ProPAC recommendation 1993)	5,230

When HCFA published its final PPS rules for FY 1994, it made several notable modifications to labor market area definition and wage index calculation (Federal Register, September 1, 1993). They include:

- Redefining MSAs based on 1990 Census Data. The move to redefine MSAs on new census data moved 104 counties from rural designation to urban and 20 from urban designation to rural.
- Using updated wage and hour data (from FY 1990 wage survey) to recalculate the FY 1994 area wage indices.
- Including contract labor costs and hours in the wage index calculation.

In addition to these changes for FY 1994, HCFA implemented the 108 percent geographic reclassification rule it announced on September 1, 1992 for cost reporting periods beginning after September 30, 1993.

When HCFA published its proposed PPS rules for FY 1994, it also provided its initial reaction to ProPAC's most recent area wage definition proposal (Federal Register, May 26, 1993). HCFA acknowledged "the inherent problems with the current wage index," and said that "over the years" the agency had "examined a variety of options for revising wage index market areas." HCFA stated its belief that the hospital-specific (nearest-neighbor) plan proposed by ProPAC would require legislation to implement. Because the plan would conflict with existing legislation, HCFA could not simply implement it administratively. Even if the need for legislation were not a barrier to timely implementation, HCFA said, "We do not believe it would be feasible or advisable to implement ProPAC's recommendation in FY 1994. Although we recognize that ProPAC's recommendation may have promise, we believe

that careful analysis of its impact on hospitals is necessary before proposing to adopt such a significant change."

As part of the process of analysis and evaluation, HCFA asked for comments on ProPAC's proposal. HCFA also solicited specific comments on the following six issue areas:

1. The feasibility of using road miles instead of air miles to define hospital specific labor market areas.
2. The process that should be used to verify hospital location.
3. The policy that should be used to establish a wage index for new hospitals that begin operations subsequent to the year covered by the wage data.
4. The need for special provisions for certain classes of hospitals, such as sole community providers and rural referral centers.
5. Whether there should be an exceptions process to address situations where the hospital is unlike its nearest neighbors and, if so, what types of situations should be addressed on an exceptions basis.
6. Whether other labor market definitions in the context of hospital-specific labor markets may be more appropriate than the nearest neighbors within a 50-mile radius.

In May 1994, HCFA summarized the comments it received concerning ProPAC's proposal and the six issues it identified the preceding year and published its analysis of the impact of various labor market definitions on hospital wage indices (Federal Register, May 27, 1994). HCFA decided not to implement the ProPAC proposal in FY 1995, because it did not consider it to be a significant improvement over the current system. Despite rejecting ProPAC's proposal, HCFA appears to be interested in

improving the current MSA-based labor market system, offering several new alternatives for comment.

HCFA's analysis of the alternative labor market definitions and its new proposals are discussed in detail in the next section of this paper. Readers interested in exploring conceptual and methodological issues related to defining labor market areas before reading this section are directed to the appendix.

EVALUATION OF PROPAC'S HOSPITAL-SPECIFIC LABOR MARKET AREA DEFINITION

ProPAC's Hospital-Specific Labor Market Area Definition Proposal

ProPAC's 1993 report and recommendations to Congress included three specific recommendations concerning the PPS wage index and hospital labor market definitions (ProPAC, 1993):

1. The Secretary should substantially revise the hospital wage index under PPS for fiscal year 1994. The revised wage index should be calculated using hospital-specific labor market areas based on geographic proximity measured by the air-mile distances between nearby hospitals.
2. Congress should repeal the current statutory provisions relating to geographic reclassification for the wage index. The effective date for this action should be the same as the effective date for adopting a wage index based on hospital-specific labor market areas. In addition, reclassification for the standardized payment amount should expire at the beginning of fiscal year 1995.
3. The Secretary should develop and implement improved methods for collecting timely data on employee compensation and paid hours of employment for hospital workers by occupational category. Once these data become available, the Secretary should implement an adjustment to the hospital wage index under PPS. This adjustment would correct for the inappropriate inclusion in the wage index of geographic differences in the mix of occupations employed.

If implemented, these three recommendations (the establishment of hospital-specific labor market areas, the elimination of the Medicare Geographic Classification Review Board, and data gathering as the first step in a process to remove occupational mix bias from the wage index) would significantly change the Medicare payment system for hospitals and would result in a redistribution of payments among hospitals. The changes recommended by ProPAC are consistent with proposals made over a number of years by ProPAC, health services researchers, and providers.

In making its recommendation, ProPAC did not propose a specific labor market area definition, but rather suggested a conceptual framework for a definition that consists of three elements:

- *Hospital-specificity*: each hospital will have its own, uniquely calculated wage index and each hospital will be located at the center of its own labor market area.
- *Geographic proximity to nearby hospitals*: the term "nearby" is not explicitly defined in the report, however ProPAC makes clear its belief that hospitals that are "close to each other...are likely to face similar market conditions."
- *Distance measured in air-miles*: a unit of measurement is specified (i.e., air miles rather than road miles or travel time), but a specific distance is not. Air miles measure the straight-line distance between two locations. The use of a straight line to identify the farthest extent of the market from the target hospital implies that the market will be defined using a radius approach.

ProPAC suggested two methods for defining hospital-specific labor market areas that would fit within this framework. In one method, a set number of nearest neighbors, for example, the closest ten hospitals up to a maximum distance of fifty miles would define the labor market. In the other method, for example, all hospitals

located within a fixed radius of twenty miles would be included in the market, but the radius could be extended up to fifty miles to capture a minimum of three other hospitals. ProPAC performed a series of analyses to test the performance of alternative definitions of labor markets. Alternative definitions were created by varying the number of hospitals, the length of the radius, or both. The size of the market and the ability to reduce within-market variation vary according to the method selected. According to ProPAC's (1993) analysis:

Market areas based on the nearest 10 hospitals tend, by definition, to be much more uniform in terms of the number of hospitals included than those defined by fixed distance (radius). In addition, the Commission found trade-offs related to labor market size. Larger areas tend to reduce the frequency and size of wage index differences among nearby hospitals. On the other hand, wage rates tend to vary more among hospitals included in an area as the size of the area increases. Therefore, larger labor markets are likely to suppress some legitimate geographic differences in market wage rates.

These trade-offs, however, are significant only for large changes in labor market size, such as expanding from the nearest five hospitals to the nearest 10, or from 10, to 15. Within some range around 10 hospitals, the choice of labor market size has little apparent effect on the overall accuracy of the wage index. Adding the next closest hospital, for example, would cause a substantial change in the wage index for only a small fraction of all hospitals.⁷

ProPAC also recommended eliminating the Medicare Geographic Classification Review Board because, after a new definition is implemented, the Review Board will no longer be necessary. The Review Board was established as an administrative remedy that allows hospitals to be reassigned from one labor market area to another.

⁷ ProPAC intended to support its hospital-specific labor market area definition with the publication of a technical report which included estimates of the impact of adopting wage indices based upon alternative market area definitions. ProPAC's technical report has not been released to the public as of the publication date of this paper.

Rather than correcting the fundamental flaws inherent in the current definition of hospital labor markets, the Medicare Geographic Classification Review Board provided an incremental solution to the more egregious problems created by the definition. If the labor market of each hospital were defined in terms of its nearest neighbors, however, the Review Board would become unnecessary. Under the proposed method, hospitals may disagree with the definition of the labor market (i.e., the number of hospitals included or the length of the radius), but they will not be able to make a case for being reassigned to another market.

Finally, ProPAC recommended taking steps to correct the occupational mix bias contained in the wage index calculation. One of the reasons HCFA has given for not accepting previous ProPAC recommendations to eliminate occupational mix bias from the wage index calculation has been the lack of data. Rather than simply proposing that the occupational mix bias be removed as it has in other years, in 1993 ProPAC recommended that data be collected that could be used to eliminate the bias in the future.

HCFA's Analysis of Alternative Labor Market Areas

When HCFA published its proposed PPS rules for FY 1995, it included the comments it received on ProPAC's 1993 proposal. It also published its analysis of various labor market area proposals, including several nearest neighbor approaches (Federal Register, May 27, 1994). HCFA received 266 comments on the nearest neighbor wage index proposal. Thirty-three commenters were in favor of the proposal, 128 were opposed, and 105 were in support if changes were made to satisfy their

concerns. The primary topics addressed by commenters were 1) the distributional effect of changing the AWI, 2) how the boundaries would be drawn, and 3) the nature and extent of an exceptions process. Many commenters suggested that, if adopted, the nearest neighbor wage index should be phased in over several years.

Because ProPAC has not published its analysis of its nearest neighbor proposal, the analysis by HCFA of alternative methodologies for defining labor market areas is the only available quantitative analysis of the impact of ProPAC's proposal that has been made available to the public. In addition to analyzing several hospital-specific (nearest neighbor) approaches, HCFA also revisited several MSA-based approaches suggested earlier by Schmitz and Merrell (1987). Finally, HCFA analyzed a number of combined MSA/hospital-specific approaches that it developed for comment and future study. In all, HCFA analyzed the effect on hospital payment rates of nine hospital-specific alternatives, seven MSA-based alternatives, and four combined MSA/hospital-specific approaches, comparing them to the current MSA-based indices. Table 3 names and describes the various options analyzed by HCFA.

HCFA used three criteria to analyze each of the alternatives:

1. **Wage conformity within labor markets:** The extent to which a wage index conforms to a hospital's own relative wage level.
2. **Wage index conformity across labor markets (boundary problems):** The extent to which hospital wage indices are similar across labor market areas.
3. **Distributional equity improvement:** The extent to which hospitals would gain or lose under various proposals.

Table 3

Alternative Methodologies for Establishing Labor Markets
Assessed by the Health Care Financing Administration

Methodology	Description
<u>Hospital-Specific Alternatives</u>	
10 Nearest Neighbors	Wage index based on each hospital's own wage data and that of its 10 nearest neighbors, or all hospitals within a distance of 50 miles, if there are fewer than 10 hospitals within 50 miles. If there are no hospitals within 50 miles, the hospital is assigned its own wage index by dividing its average wages by the national average.
10 Nearest Neighbors/ Minimum of 2	Wage index is based on each hospital's own wage data and that of its 10 nearest neighbors within 20 miles (with a minimum of at least two nearest neighbors within 20 miles or all hospitals within 35 miles).
15 Nearest Neighbors	Wage index based on each hospital's own wage data and that of its 15 nearest neighbors, or all hospitals within a distance of 50 miles, if there are fewer than 15 hospitals within 50 miles. If there are no hospitals within 50 miles, the hospital is assigned its own wage index by dividing its average wages by the national average.
15 Nearest Neighbors/ Minimum of 2	Wage index is based on each hospital's own wage data and that of its 15 nearest neighbors within 20 miles (with a minimum of at least two nearest neighbors within 20 miles or all hospitals within 35 miles).

Table 3 (Continued)

Methodology	Description
20 Nearest Neighbors	Wage index based on each hospital's own wage data and that of its 20 nearest neighbors, or all hospitals within a distance of 50 miles, if there are fewer than 20 hospitals within 50 miles. If there are no hospitals within 50 miles, the hospital is assigned its own wage index by dividing its average wages by the national average.
20-Mile Radius	Wage index based on each hospital's own wage data and that of all its neighbors within a 20-mile radius. If there are no hospitals within a 20-mile radius, the hospital is assigned its own wage index by dividing its average wages by the national average.
25-Mile Radius	Wage index based on each hospital's own wage data and that of all its neighbors within a 25-mile radius. If there are no hospitals within a 25-mile radius, the hospital is assigned its own wage index by dividing its average wages by the national average.
30-Mile Radius	Wage index based on each hospital's own wage data and that of all its neighbors within a 30-mile radius. If there are no hospitals within a 30-mile radius, the hospital is assigned its own wage index by dividing its average wages by the national average.
35-Mile Radius	Wage index based on each hospital's own wage data and that of all its neighbors within a 35-mile radius. If there are no hospitals within a 35-mile radius, the hospital is assigned its own wage index by dividing its average wages by the national average.

Table 3 (Continued)

Methodology	Description
<u>MSA-Based Alternatives</u>	
Central Outlying	Wage index in which each MSA is divided into two areas based on its central and outlying counties.
Rural-Population	Wage index in which each statewide rural area is divided into 2 distinct labor market areas, one including all counties with populations greater than 25,000 and one composed of counties with populations less than 25,000.
Rural-Density	Wage index in which each statewide rural area is divided into two areas, one including counties with population densities greater than 35 person per square mile and one composed of counties with population densities less than 35 persons per square mile.
Rural-Population/Density	Wage index in which each statewide rural area is divided into as many as four areas depending on whether the populations are greater or less than 25,000 persons and population densities are greater or less than 35 persons per square mile.
Rural-Adjacent	Wage index in which statewide rural area is divided into two areas, one including all counties adjacent to an MSA, and the other composed of counties not adjacent to MSAs.
Rural-Population/Adjacent	Wage index in which each statewide rural area is divided into as many as four areas depending on the adjacent/non-adjacent status of rural counties and whether county populations are greater or less than 25,000 persons.

Table 3 (Continued)

Methodology	Description
Rural-Density/Adjacent	Wage index in which each statewide rural area is divided into as many as four areas depending on the adjacent/non-adjacent status of rural counties and whether county population densities are greater or less than 35 persons per square mile.
<u>Combined MSA/Hospital-Specific Approach</u>	
Minimum 25 (M25)	Wage index places 25 percent weight on each hospital's own average hourly wage and 75 percent weight on the average hourly wage of other hospitals in each hospital MSA or statewide rural area.
Minimum 50 (M50)	Wage index places 50 percent weight on each hospital's own average hourly wage and 50 percent weight on the average hourly wage of other hospitals in each hospital MSA or statewide rural area.
<u>Current MSA-Based Indices</u> (for comparison)	
Geographic	FY 1994 hospital wage index without the effects of geographic reclassification.
Reclassification	Actual FY 1994 hospital wage index after reclassification.
Estimate FY 1995	FY 1994 hospital wage index revised to include the effects of geographic reclassifications in FY 1995.

As a result of its analysis, HCFA concluded that "none of the options we initially reviewed were a significant improvement over the current reclassified wage index in terms of wage conformity within labor markets, wage conformity across labor markets, or distributional equity improvement" (p. 27727). Accordingly, HCFA decided "not to propose changes to labor market areas for FY 1995 because we believe that neither revisions to the current MSA-based system or the nearest neighbors labor market options that we studied constitute a demonstrable improvement over the current system" (p. 27729). While concluding that neither the hospital-specific approach nor the MSA-based approach markedly improved the index, HCFA stated its belief that a classification system that combined both approaches has "considerable potential for improving the wage index." Therefore, HCFA designed additional alternatives "for comment and future study" that are based on the weighted average of each hospital's own average hourly wages and the average hourly wages of a group of other nearby hospitals.

The following assumptions underlie the combined MSA/hospital-specific approach designed by HCFA:

- Empirically defining labor market areas in a highly accurate, definitive manner is extremely difficult, if not impossible.
- Both a hospital's own wage data and that of other hospitals in its vicinity may contain relevant information about the level of wages in the hospital's true labor market .
- No matter how we [HCFA] determine labor market areas, both a hospital's wage data and that of other hospitals assigned to its labor market area may contain any number of spurious sources of variation, including data errors, that should not be captured in the index. The

larger the number of hospitals whose data are averaged, the more the effects of spurious factors are reduced (pp. 27729-27730).

These principles are buttressed by HCFA's belief that "a hospital's own wages, to some degree, reflects its specific labor market conditions" (p. 27730).

The combined MSA/hospital-specific approach designed by HCFA is an attempt to improve the wage index. HCFA devised two alternative wage indices based on the combined MSA/hospital-specific approach. One calculates hospital wage indices by placing a weight of 25 percent on each hospital's own average hourly wage and a weight of 75 percent on the average hourly wage of the other hospitals in each hospital's MSA or statewide rural area. In other words, the wage index calculated under this method would be one-fourth hospital-specific and three-fourths MSA-based. This means that three-fourths of the wage index would be calculated according to the rules that presently apply to labor market area definition (i.e., the MSA-statewide labor market dichotomy). HCFA refers to this approach as "Minimum 25" or "M25." The second approach is similar to the first except that the weighting is divided equally between each hospital and the average of other hospitals in the MSA or statewide rural area. HCFA calls this approach "Minimum 50" or "M50."

Although the wage index of most hospitals would be calculated in the manner just described, HCFA recognizes that, in some cases, the nearest neighbor approach is a more accurate reflection of a hospital's labor market than MSA-based labor market areas, and consequently developed two complex mechanisms that would provide a hospital with an alternative wage index calculated entirely or in part from its nearest neighbor labor market. HCFA calls one method the "simple" reclassification method

and the other the "refined" reclassification method. To be eligible for either of the alternatives the average hourly wage of a hospital must deviate from the average hourly wages of other hospitals in the MSA or statewide rural area. To determine aberrant wage levels, HCFA designed two thresholds similar to those that current apply to geographical reclassification. The M25 "simple" option would lead to 411 hospital reclassifications. Hospitals reclassified under the "simple" option would be assigned to a nearest neighbor labor market area. The M25 "refined" alternative would make it possible for a total of 521 hospitals to use all or part of their nearest neighbors' average wage and average hourly data in calculating their own wage indices.

Tables, 4, 5, and 6 summarize the major findings of HCFA's analysis of alternative hospital-specific, MSA-based, and combined MSA/hospital approaches to labor market definition. (HCFA only displays 13 of the 23 options it analyzed.) Table 4 shows the number of hospitals whose own relative wage index value⁸ is greater or less than .08 of the area wage index value for a given labor market alternative. The 20-mile radius alternative is the most successful of the hospital-specific and MSA-based approaches at reducing losses or gains of more than .08 relative to a hospital's own wage level. However, the M50 Refined approach is superior to all other approaches in improving conformity within labor markets. Rural hospitals under the M50 Refined option have proportionately fewer losses (i.e., rural hospitals comprise 44 percent of all PPS hospitals but only 26 percent of the losing hospitals). The

⁸ Created by dividing the hospital's average hourly wage by the national hourly wage.

Table 4

**Number of Hospitals Losing or Gaining More than .08 Relative to Own Wage Level,
for Selected Wage Indices by Type of Geographic Area**

Wage Index	All Hospitals (n = 5,230)		Large Urban (n = 1,612)		Other Urban (n = 1,307)		Rural (n = 2,311)	
	Lose > .08	Gain > .08	Lose > .08	Gain > .08	Lose > .08	Gain > .08	Lose > .08	Gain > .08
Existing System:								
Geographic FY 94	682	1,708	263	531	137	321	282	856
Estimate FY 95	590	1,672	289	493	141	317	160	862
Hospital-Specific:								
Nearest 10	627	1,674	268	452	178	302	181	920
Nearest 10/Min 2	597	1,204	260	421	140	259	197	524
Nearest 15/Min 2	592	1,224	255	439	140	261	197	524
20 Mile Radius	549	1,014	264	438	141	244	144	332
MSA-Based:								
Central-Outlying	676	1,576	264	474	134	233	278	869
Rural-Adjacent	682	1,690	263	530	137	321	282	839
Rural-Density	706	1,540	262	530	137	321	307	689
Combined:								
M25 Simple	385	1,305	161	412	101	269	123	624
M25 Refined	352	1,284	165	408	104	268	83	610
M50 Simple	195	698	90	235	48	153	57	310
M50 Refined	187	693	91	234	48	151	48	308

Source: Federal Register, May 27, 1994

proportion of rural hospitals that gain under the option to all hospitals that gain under it is approximately the same as the ratio of rural hospitals to total hospitals in the country.

Table 5 presents an analysis of wage conformity across labor markets. HCFA determined that a "boundary problem" existed if:

- Among nearby hospitals⁹, one or more other hospitals' wage index value is at least .04 greater than that of the target hospital, and
- The hospital with the lower wage index value pays higher wages than the hospital with the higher wage index value (Federal Register, May 27, 1994, p. 27728).

The hospital-specific alternatives had a significantly larger number of boundary problems than MSA-based approaches although the problems were smaller in magnitude. The larger number of boundary problems for the hospital-specific options is not surprising, because under these approaches there are many more labor market areas, each with its own wage index. There are approximately 10 times as many labor markets in any of the hospital-specific proposals as in the Rural-Population approach. It is therefore reasonable to expect a larger number of border problems under hospital-specific options than under other alternatives. However, there are fewer actual problems than might be expected, given the large number of markets resulting from hospital-specific approaches.

⁹ "Nearby hospitals" were defined as the 20 nearest hospitals or if a hospital does not have 20 other hospitals within a 35 mile radius, all hospitals within a 35 mile radius (Federal Register, May 27, 1994, p. 27728).

Table 5

Number of Hospitals Subject to "Boundary Problem" and Average Size of "Boundary Problem"
by Type of Geographic Area

Wage Index	All Hospitals (n = 5,230)		Large Urban (n = 1,612)		Other Urban (n = 1,307)		Rural (n = 2,311)	
	Number Hospitals	Average Difference	Number Hospitals	Average Difference	Number Hospitals	Average Difference	Number Hospitals	Average Difference
Existing System:								
Geographic FY 94	760	0.113	49	0.099	240	0.103	471	0.125
Estimate FY 95	662	0.110	51	0.105	215	0.101	396	0.120
Hospital-Specific:								
Nearest 10	1,223	0.077	387	0.074	224	0.074	612	0.086
Nearest 10/Min 2	1,343	0.084	405	0.079	263	0.079	675	0.091
Nearest 15/Min 2	1,240	0.085	305	0.080	260	0.079	676	0.091
20 Mile Radius	1,041	0.083	169	0.079	264	0.080	608	0.089
MSA-Based:								
Central-Outlying	712	0.101	106	0.107	232	0.094	374	0.107
Rural-Adjacent	838	0.106	49	0.098	241	0.102	548	0.113
Rural-Density	884	0.109	49	0.098	241	0.103	594	0.120
Combined:								
M25 Simple	532	0.087	26	0.081	161	0.083	345	0.090
M25 Refined	515	0.085	25	0.081	161	0.082	329	0.089
M50 Simple	273	0.067	8	0.089	86	0.060	179	0.071
M50 Refined	168	0.067	8	0.089	85	0.060	175	0.071

Source: Federal Register, May 27, 1994

The combined MSA/hospital-specific approaches have fewer boundary problems than the other approaches even though there are a greater number of market areas defined under these approaches than under either the MSA-based approaches or the current system. Moreover, the M50 Simple and Refined approaches have smaller magnitude boundary problems than any of the other alternatives.

Table 6 shows the effect that different labor market alternatives would have when compared to the current 1994 pre-reclassified wage index. This table indicates that although the hospital-specific and combined MSA/hospital-specific approaches are better at improving wage conformity with and across labor market areas, they also will have the largest redistributive effect. However, Table 6 does not separate the effect of the labor market definition on the various types of hospitals, large urban, other urban, and rural. Therefore, the distributive effect on rural hospitals is not known.

Based on its analysis, HCFA rejected the ProPAC nearest neighbor approach in favor of the combined MSA/hospital-specific approach. HCFA announced its intention to continue its evaluation of the approach and solicited comments on it until August 31, 1994. HCFA will respond to the comments it receives in the FY 1996 PPS proposed rule (i.e., May 1995). HCFA reiterated its belief that any change to the wage index would require legislative action.

Finally, HCFA sought comment on one final alternative: the state labor markets option (SLMO). Based on the belief that hospitals within a state may have better information regarding market conditions than HCFA, the SLMO would allow hospitals to voluntarily design labor market areas within their own state boundaries.

Table 6

**Labor Market Alternatives: Percent Change from Current MSA Value
(Pre-Reclassification)**

All Hospitals	Greater than 10 Percent	5-10 Percent	0-5 Percent	0	-5 to 0 Percent	-10 to -5 Percent	Less than -10 Percent
Estimate FY 95	210	64	1,114	3,556	235	48	3
Nearest 10	614	665	1,629	0	1,514	490	318
Nearest 10/Min 2	366	480	1,692	0	1,353	590	749
Nearest 15/Min 2	356	452	1,761	0	1,359	553	749
20 Mile Radius	356	333	1,775	0	1,381	491	894
Central-Outlying	10	3	1,380	3,389	150	108	190
Rural-Adjacent	9	5	1,441	2,936	685	126	28
Rural-Density	7	163	775	3,149	506	432	198
M25 Simple	180	201	2,155	0	2,302	379	13
M25 Refined	222	230	1,982	0	2,387	396	13
M50 Simple	318	332	1,662	0	1,528	925	465
M50 Refined	343	301	1,643	0	1,546	927	470

Source: Federal Register, May 27, 1994

Applications to design labor market areas could be submitted by a group of hospitals or by any entity that represents hospitals that would be effected by the SLMO, such as a state hospital association. The application would have to include a statement by each hospital's chief executive or chief financial officer supporting participation in the SLMO. The following criteria would apply to SLMO creation:

- There must be unanimous support among hospitals. HCFA may consider accepting a criterion of "overwhelming support" instead of unanimous support.
- Aggregate payments to hospitals participating in the SLMO must be no higher than they would have otherwise been in the absence of the SLMO, (i.e., payments must be budget neutral).
- All hospitals that participate in the SLMO must sign an application for it to become effective.
- Labor market areas under the SLMO generally would be prohibited from crossing state boundaries.

Perhaps prompted by ProPAC's recommendation to Congress, HCFA has concluded that improvements to the current labor market system are likely warranted. In the past year, HCFA analyzed several labor market area options and designed a number of new alternatives for evaluation and comment. Despite the emerging consensus from Congress, ProPAC, HCFA, and providers on the need to improve the labor market system, the interested parties are no closer today to agreeing on an alternative approach than they were prior to the release of ProPAC's proposal. In the final sections of this paper, ProPAC's nearest neighbor and HCFA's M25/M50 proposals will be assessed.

Issues Related to Hospital-Specific Payment Adjustments

The prospective payment system currently makes hospital-specific payment adjustments to several categories of hospitals. For example, sole community hospitals are paid on the highest of three amounts: the regular PPS amount that applies to other rural hospitals, or a hospital-specific amount based on either 1982 or 1987 costs updated to the current year. Medicare-dependent hospitals are paid on the same basis as sole community hospitals¹⁰. Disproportionate share hospitals¹¹ receive payments based upon their disproportionate patient percentage (DPP). These designations were created specifically to reduce financial risk under PPS for hospitals believed to be especially vulnerable (Congressional Budget Office, 1991).

Several proposals have been made to incorporate hospital-specific costs into the payment formulas for all hospitals. These proposals have included freezing the PPS transition at a blend of hospital-specific and national rates (Sheingold, 1986); using fully hospital-specific rates (Feder, Hadley, and Zuckerman, 1987; Hadley, Zuckerman, and Feder, 1989); mixing (Siegel, et al., 1992) and blending hospital-specific payments¹² (Pope, 1990); and differentiating hospital rates by peer groups (Ellis and

¹⁰ OBRA-89 created a temporary PPS payment classification to assist small rural hospitals that treat relatively high proportions of Medicare patients. The special payments apply for hospital cost reporting periods beginning on or after April 1, 1990 and ending before April 1, 1993.

¹¹ Since 1986, PPS payments have included a disproportionate share adjustment to compensate hospitals for the higher costs associated with treating low-income patients. These hospitals care for a "disproportionate share" of Medicaid patients and Medicare patients receiving Supplemental Security Income benefits.

¹² "A mixed payment is a linear sum of a current patient's costs with one or more aggregate costs such as national average costs during a baseline year. A blended payment is a linear sum of the hospital's historical average costs with other aggregate costs such as national average costs or average costs of a peer grouping of hospitals" (Siegel, et al., 1992, p. 2).

McGuire, 1988; Vertrees and Manton, 1986). All of these proposals are predicated on the assumption that PPS payment rates are "unfair" because they are based on average historical hospital costs that are insensitive to variations in individual facility costs due to unmeasured patient severity and input prices. To date HCFA has not incorporated any hospital-specific elements into the general PPS payment formula.

Revising the PPS payment formula to include hospital-specific elements is not synonymous with a return to cost-based reimbursement. Prospectivity is still the defining characteristic of the payment methodology. Furthermore, fully hospital-specific PPS rates would not be optimal, because hospital-specific costs presumably include costs associated with differences in efficiency, treatment intensity, and other unobserved cost factors that should not be institutionalized in PPS payment rates. The hospital-specific payment adjustment proposed by ProPAC simply recognizes that, within different geographic labor markets, conditions may result in variations in the market prices for labor, and that these variations are largely beyond the control of individual hospital administrators. ProPAC believes that hospitals should be reimbursed for these "legitimate" differences in cost.

Assessment Criteria

The two primary criticisms of the current definitions of PPS hospital labor market areas are that 1) they allow too much variation in wage rates that is not attributable to differences in efficiency to exist within labor market areas, and 2) they allow too great disparities in payment rates across labor market area boundaries. As a consequence, some hospitals within a PPS-defined labor market area and some

hospitals at the margins of PPS-defined labor markets areas are "unfairly" compensated. The inaccurate grouping of hospitals into labor market areas results in underpayments for some and overpayments for others.

A redistribution of PPS payments will result from any change in labor market definition. Some hospitals will receive greater payments and others will receive smaller payments than they currently receive. However, if the revised system more fairly compensates hospitals for the price of their actual labor inputs, the redistribution of payments will merely correct past payment errors and should not be a cause for major concern for policy makers. Nevertheless, to minimize the possible disruption that a change in the labor market system might cause, it would be wise to phase in changes to the system over a period of two to three years.

Any change in the method of identifying PPS hospital labor market areas should be aimed at improving the equity of the payment system. Within the limits imposed by the framework of prospectively-determined payment rates, PPS payments should recognize legitimate differences in the treatment costs of hospitals. To this end, any definition of hospital labor market areas should possess the following characteristics:

- They should minimize wage variation within the market.
- They should reduce wage index variation across contiguous markets.
- They should be easy to administer (i.e., low-cost to implement, simple to maintain, and easy to explain to providers).

How well the ProPAC and HCFA proposals might perform when measured against these criteria is discussed below.

Minimize Wage Variation Within Markets

From economic theory we know that wages within a labor market tend toward uniformity or stability. Practice informs us that, within occupational categories, proximately located hospitals tend to pay similar amounts to their employees based on comparable training and experience. Human resource managers do not administer their wage and salary programs solely on the basis of the comparative value of jobs to the hospital but also on the entry wages, average wages, and wage ranges of competing hospitals. The gathering of such information is made possible through meetings of local human resource managers, wage surveys conducted by regional and state hospital associations, and national studies of wage rates. Because the demand for professional labor (particularly registered nurses, pharmacists, and physical therapists) exceeds the supply in most areas of the country, hospitals, to remain competitive, must either pay prevailing wage rates or differentiate themselves from other hospitals in some other way on a non-wage basis.

In defining labor markets in terms of a hospital's nearest neighbors, ProPAC assumes that proximate hospitals pay their employees similar wages. Because of the tendency toward uniformity of wage rates among nearest neighbors, ProPAC assumes that the area circumscribed by their location represents a hospital's labor market. However, because a static definition of "nearest neighbor" is used, the actual labor market may be somewhat smaller or somewhat greater than the one defined by this approach. Nevertheless, this approach to defining hospital labor markets appears to

produce a reasonable approximation of the market for the purposes of calculating a wage index.

Consider the effect on the wage index of understating and overstating the size of the market. A smaller number of nearest neighbors would seem to produce a more accurate estimate of the average market wage than a larger number. A larger number of hospitals may include hospitals that are not truly in the target hospital's labor market. The inclusion of these hospitals in the calculation of the wage index may improperly increase or lower it. A smaller number of hospitals may not correctly reflect the geographical extent of the market, but it may correctly represent the average wages for the market. If wage stability is a feature of a labor market, then a subset of hospitals within a labor market should reflect the prevailing wage structure of the entire market. Because a smaller number of nearest neighbors is less likely to contain hospitals that are not actually in the target hospital's labor market than a larger number, a smaller number of nearest neighbors is preferred. This line of reasoning would call for smaller rather than larger labor market areas.

An increase in the number of labor market areas will mean a decrease in the number of hospitals per area. As the number of hospitals in a labor market area falls, each individual hospital's wage scale has a greater ability to influence (i.e., inflate) the wage index (Schmitz and Merrell, 1987; Wright and Marlor, 1990). For this reason, labor markets with small numbers of hospitals have been discouraged. While a single hospital may have the ability to effect its wage index under hospital-specific approaches, it is not reasonable to assume that a hospital in a labor market area with

a small number of hospitals would attempt to "game" the payment system. In order to receive larger payments, a hospital would be required to overpay its workers in one year to obtain enhanced reimbursement in a subsequent year. Under the existing system, there is a four-year lag between the wage data used to construct the index and the current payment period. In other words, a hospital would have to pay its workers at the premium rate for five full years in order to receive one full year of enhanced payments.

In proposing its M25 and M50 options, HCFA has apparently overcome its concern about individual hospitals effecting their own wage index. Indeed, the Simple and Refined M25 and M50 options would, in fact, institutionalize the ability of a single hospital to effect its wage index.

Compared to the existing method of defining hospital labor markets, the methods proposed by ProPAC and HCFA substantially reduce wage variation within markets. This is especially true in rural labor markets. Currently, there are only 48 rural labor market areas in the entire country. These rural labor markets vary greatly in geographical size and the number of hospitals that comprise the markets range from fewer than five to more than 200. The proposed definitions will, in most cases, reduce the geographical extent of the market and lower the number of hospitals whose wages are factored into the wage index equation. These changes will reduce within-market hospital wage variation in rural areas.

According to HCFA's analysis of the various labor market alternatives, the hospital-specific approaches (specifically the 20-mile radius option) meaningfully

reduces within market wage variation. The hospital-specific approaches, however, are not as successful in reducing within market wage variation as any of the combined MSA/hospital-specific approaches.

Reduce Wage Index Variation Across Contiguous Markets

There are two ways of visualizing hospital labor market areas in space. They may be thought of as existing side-by-side and composed of mutually exclusive sets of hospitals, or they may be thought of as overlapping and composed of intersecting sets of hospitals. The current method of defining labor market areas conceives of them as existing side-by-side. Under this conception, nearby hospitals may be in different labor markets while distant hospitals may be in the same labor market. ProPAC's proposal visualizes labor markets as overlapping in space. Gradient measures of variations in hospital prices introduce the concept that markets are an essentially continuous process without boundaries (Wright and Marlor, 1990). The attempt to create labor market boundaries produces false groupings. Under ProPAC's proposal, each hospital would have a different set of nearest neighbors, and all nearby hospitals would be in the same labor market as the target hospital. The adoption of this view of markets increases the number of borders, but reduces the magnitude of average wage index variations among proximate hospitals.

The M25/50 alternative maintains the current MSA-based labor markets for most hospitals, but allows other hospitals to be reclassified into hospital-specific markets for the calculation of a portion of their wage index. Because this approach is a combination of MSA-based and hospital-specific approaches, it is impossible to

represent the hospital labor market in geographical space. Nevertheless, under the reclassified M25/50 options a hospital would have a unique wage index and wage index variation across borders would be measured in terms of the variation between the target hospital's index and those of nearby hospitals.

Both the hospital-specific approaches and the combined MSA/hospital-specific approaches are successful at reducing the magnitude of wage index variation across markets. The combined MSA/hospital-specific approaches produce fewer hospitals that are subject to "boundary problems" than the hospital-specific approaches, but that is primarily a function of the number of "boundaries" produced by the method. The hospital-specific approach yields 5,230 labor markets (one for each hospital) and the combined MSA/hospital-specific approaches, at a maximum, produce 895 labor market areas (374 MSA-based market areas and 521 reclassifications to hospital-specific market areas). The hospital-specific approaches produce proportionally fewer "boundary problems" (approximately 1,200 out of 5,230) than the combined MSA/hospital-specific approaches (approximately 270 out of 895), and there is not a large difference in the average difference caused by the two approaches.

Ease of Administration

Ease of administration is judged by three criteria: cost of implementation, simplicity of maintenance, and provider acceptance.

Cost of implementation. The ProPAC proposal for defining labor markets seems relatively inexpensive to implement. Once a market radius and other definitional characteristics have been decided upon, hospital-specific market areas can be defined

using existing data sources. However, one variable may require validation before the hospitals can be grouped. The location of hospitals in existing data bases is not uniformly or accurately determined. Computer programs allow the calculation of straight line distances between two street addresses for most places in the United States. However, some rural hospitals do not use street addresses as their primary mailing address or they are physically located outside of an organized community. When a street address is not available, these computer programs use zip code centroids to locate the hospital. The use of zip code centroids to locate hospitals can result in substantial errors of placement, especially in the rural west where zip code areas tend to be somewhat larger. Hospitals with multiple campuses also present a locational problem.

We are unaware of an accurate data base of hospital locations. However, it would be neither especially time consuming nor costly to develop one. Furthermore, the existence of an accurate data base of hospital locations would be beneficial to a wide variety of health services research applications. The other data elements necessary to calculate the wage indices are already collected by HCFA. Wage and hour data would merely be grouped differently than they are currently.

Adoption of this method of defining hospital labor markets would allow the Medicare Geographic Classification Review Board to be disbanded. If implemented, it should be replaced, however, with an appeals process that would be administered by the Provider Reimbursement Review Board. Although it is unlikely that many

appeals would be lodged, the Medicare program should provide hospitals with an administrative process through which legitimate problems can be redressed.

Because the M25/50 options are more computationally complex, they likely will be slightly more expensive to implement and maintain. However, like the hospital-specific approaches, all of the data elements necessary to construct wage indices are already collected by HCFA. Therefore, there should not be a significant difference in the cost of implementing either of the two approaches.

Simplicity of maintenance. HCFA is required by Congress to annually update the wage and hour survey data used to calculate the wage indices. Once hospitals are grouped and algorithms are developed to compute hospital-specific wage indices, the annual maintenance of the system should be straightforward. Newly calculated wage indices would have to be published annually in the Federal Register and communicated to each hospital, a task that will likely devolve to local fiscal intermediaries. Even if an appeals process is established, neither the hospital-specific nor the combined MSA/hospital-specific approaches seem difficult to maintain.

Provider acceptance. Hospital providers are likely to accept the concept upon which the ProPAC proposal rests, because it is understandable and fair: every hospital is located at the center of its own labor market area and the labor costs of the market are defined by the average labor costs of the target hospital and its nearest neighbors. Hospitals that pay more than the market average typically will have difficulty justifying a higher wage index. Agreement in concept, however, does not assure agreement in fact. Hospitals that stand to suffer a reduction in payment because of a change in

method are likely to withdraw support for it. The impact of the change on these hospitals may be blunted somewhat by phasing in the system over a number of years. Combined with the apparent fairness of the approach, a phase-in may improve provider acceptance.

Because the M25/50 proposals are more difficult to understand, providers may be less willing to accept these methods. They may view the complexity with skepticism and oppose the approach based on insufficient information. Like the other methods, the M25/50 approaches will result in a redistribution of payments and those providers whose payments are reduced are not likely to support the method. Unlike the hospital-specific approaches which are easy to understand, the essential fairness of the M25/50 approaches may be difficult to communicate to providers. As a result, it may be difficult to mitigate against provider dissatisfaction with assertions that the new system produces greater payment equity.

RECOMMENDATIONS AND CONCLUSIONS

Redefining hospital labor market areas for the purpose of paying hospitals under PPS is an idea whose time apparently has come. Consensus seems to be forming among Congress, the administration, and providers on the need to replace the current system. The House Ways and Means Committee and Senate Finance Committee asked ProPAC to study alternative methods for defining hospital-specific labor market areas based on hospital geographic proximity. HCFA has acknowledged the need to redefine labor market areas. The American Hospital Association (AHA) has said, "While the nearest-neighbor proposal has conceptual appeal, our definitive judgement

as to its feasibility depends ultimately on where HCFA would draw the lines around hospitals" (AHA News, July 26, 1993). Indeed, the one remaining issue to resolve is "where to draw the lines." Neither ProPAC nor HCFA have specifically proposed where the lines should be drawn and AHA will not commit to a proposal until it can weigh the distributional effects on its members. This stalemate can be broken by developing a policy agenda for improving the area wage index. Our recommendation to the interested parties for such an agenda is as follows:

1. **Pass legislation that allows the Secretary of HHS greater flexibility in refining the hospital wage index.** HCFA believes that the Social Security Act does not authorize it to incorporate a hospital-specific wage index scheme into PPS. Until Congress grants HCFA the authority to proceed with the design of such a system, it is unlikely that HCFA will take an active role in improving the index. Having the authority to implement a wage index based in part or in total on hospital-specificity is not the same as requiring it. HCFA may decide not to proceed with developing a hospital-specific approach, but granting HCFA the authority to make such a change, would deprive it of a justification it has used in the past for not making changes. It is preferable for Congress to give HCFA broad authority to design a better labor market system than for Congress to be overly prescriptive in its legislation. Overly prescriptive legislation might tie HCFA's hands unnecessarily, resulting in a change that is not a notable improvement over the current system.
2. **Refine and independently replicate the evaluation of the various labor market alternatives proposed by ProPAC and HCFA.** Both ProPAC and HCFA have evaluated the proposal made by ProPAC. Summary tables of HCFA's evaluation have been made public, but ProPAC's evaluation of its plan has not. Based on ProPAC's unpublished assessment of its plan, ProPAC recommended proceeding with its implementation. Based on HCFA's assessment of ProPAC's plan, HCFA recommended not proceeding with the proposal. HCFA assessed the impact of its M25/50 proposals on hospitals and published summary tables of its assessment. ProPAC has not performed an analysis of the HCFA alternatives. Policy evaluation in regard to the PPS labor market system is not coordinated. There is no clear, reliable source of publicly available information. ProPAC and HCFA should cooperate on an assessment of various labor market alternatives augmented by an independent evaluation, if necessary. This evaluation should be completed as soon as possible, so that HCFA can propose

a specific change in the labor market system when it publishes its proposed PPS rules for FY 1996.

3. **Submit a single, specific proposal for improving the wage index for comment in the proposed PPS rules for FY 1996.** The proposal should be implemented as amended (based on comments) in FY 1996. Based on the evaluation of various methods, HCFA should select and propose a specific method. Selecting a single method will focus the policy debate. Providers and organizations like the AHA will be able to submit their comments on a concrete proposal rather than on a concept. At this juncture, it appears as though the hospital-specific approaches, especially those based on a fixed radius, and the combined MSA/hospital-specific approaches hold the most promise. However, because of the policy evaluation confusion, it is difficult at this time to say, with any certainty, which of the proposed methods is superior.
4. **Eliminate the Medicare Geographic Classification Review Board.** Under nearest neighbor options, each hospital will be at the center of its own labor market area. As such, there will be no need to reclassify hospitals to another labor market. Under the combined MSA/hospital-specific options, reclassifications will be made automatically. Consequently, under either of the leading proposals, there will be no need for a Board dedicated solely to reclassifications. On the other hand, there may be a need for an appeals process (see number 5 below) to consider issues such as the homogeneity of nearest neighbors. The elimination of the Medicare Geographic Classification Review Board will require Congressional action. The bill granting the Secretary of HHS the authority to implement hospital-specific wage should also include a provision to eliminate the Review Board effective upon the implementation of the improved labor market system.
5. **Develop an exceptions process.** Although it would not be necessary to maintain the Medicare Geographic Classification Review Board, it would be prudent to design an exceptions process that would allow providers to appeal wage index issues to HCFA. This function could be delegated to an already existing arm of HCFA such as the Provider Reimbursement Review Board (PRRB). It is unlikely that many appeals will be lodged, but the Medicare program should provide hospitals with an administrative process through which legitimate problems can be redressed.
6. **Estimate corrections to the occupational mix bias and include them in the recalculation of the area wage indices; collect data to support calculation of an occupational mix adjustment; revise estimated corrections to the occupational mix bias as additional information is available.** The problems that already exist with respect to the occupational mix bias are likely to be exacerbated under any plan that increases the number of labor market areas and reduces the number

of hospitals per labor market area. Because small and rural hospitals are less occupationally rich than large and urban hospitals, they are particularly disadvantaged by the failure to correct for the occupational mix bias. As the urban/rural differential in standardized rate is eliminated, the occupational mix bias is the primary remaining obstacle to equitable payment of rural providers under PPS. Failure to correct the occupational mix bias will erase some of the gain rural hospitals have achieved through the elimination of the urban/rural differential. If HCFA were to begin collecting data in FY 1995 to correct the occupational mix bias, the correction likely would not be ready for implementation before FY 1998 at the earliest. In the interim between the change to the improved labor market system and the correction of the occupational mix bias, small and rural hospitals will suffer an unnecessary setback in reimbursement. Therefore, it is recommended that HCFA estimate corrections to the occupational mix bias based on available data and implement the corrections at the same time it implements the change to the labor market system. It is also recommended that HCFA begin collecting wage, wage-related cost, and hour data by occupational category and revise the occupational mix estimates as data becomes available.

7. **Establish a transitional (blended) rate for up to three years to minimize the distributional impact of the change in the labor market definition, if such actions are warranted by the assessments of HCFA and ProPAC.** The proposed methods should more fairly compensate hospitals for their employment costs. However, the redistribution of payments may be too abrupt for some hospitals whose labor-related PPS payments will decline under the new system. Therefore, a transition to the new system might be warranted. If, in the judgement of HCFA and ProPAC, the redistribution of payments will not create a hardship on hospitals, the change should be made as quickly as possible.

Conclusion

Since its creation, policy makers have attempted to refine the Prospective Payment System to more accurately reflect variations in cost among hospitals that are beyond the control of hospitals and that are not related to efficiency. Aside from the urban-rural differential in the standardized amount contained in the original legislation, perhaps no other PPS payment issue has drawn the attention of policy makers and providers as much as the area wage index. The area wage index is intended to modify

the labor portion of the standardized payment amount relative to the price of labor inputs. Because approximately three-quarters of the standardized rate is attributable to labor expense, the wage index plays a considerable role in compensating hospitals for legitimate variations in cost. However, throughout the PPS era, providers, trade associations, and researchers have claimed that the wage index is not properly calculated and that hospital labor markets are improperly defined. As a result, some hospitals are underpaid relative to their labor costs and other hospitals are overpaid by Medicare.

In recent years, Congress and HCFA have both attempted to improve the ability of the wage index to accurately reflect cost variations in PPS payments. These new policies have concentrated on incremental modifications to the existing methods of calculating the index and of reassigning hospitals to labor market areas, rather than on a complete redefinition of the wage index and labor markets. The March 1993 recommendation of ProPAC to Congress that the labor market areas be redrawn and wage indices recalculated is a far-reaching, credible, and politically acceptable proposal for refining the payment system relative to the price of hospital labor. Based on its own evaluation, HCFA's M25/50 options also appear to have some merit. For the first time, policy makers have a menu of feasible labor market definitions from which to choose. Our recommendations offer a strategy to facilitate future policy development in this area.

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APPENDIX

ALTERNATIVE METHODS OF DEFINING LABOR MARKET AREAS

ALTERNATIVE METHODS OF DEFINING LABOR MARKET AREAS

Wright and Marlor (1990) identified 21 different approaches for defining hospital market areas that were grouped under five quantitative techniques. Most of the methodologies apply primarily to hospital product markets, but some may also apply to hospital labor market areas. The five quantitative techniques are:

1. Administrative standards
2. Radius measures
3. Clustering measures
4. Gravity model approach
5. Gradient measures

Using Wright and Marlor's typology, we reassessed and updated their 1990 literature review. Table A.1 compares alternative methods for defining hospital labor markets outlined in this section. The shape of the market, determinants of market size, characteristics of borders, and the advantages and disadvantages of each method are compared.

Administrative Standards

Metropolitan statistical areas (MSA) are often used to define labor markets.¹ Most hospital labor market research has focused on MSAs as the unit of analysis,

¹ MSAs are designated, reviewed, and revised by the Office of Management and Budget, Statistical Policy Office, Office of Information and Regulatory Affairs with advice from the interagency Federal Executive Committee on Metropolitan Statistical Areas, using population data supplied by the Bureau of the Census.

Table A.1

Alternative Approaches for Defining Hospital Labor Market Areas

Method	Shape of Market	Determinants of Market Size	Characteristic of Borders	Advantages	Disadvantages
Administrative Standards					
MSAs ¹	Follows existing geopolitical borders	Population density of area surrounding central city	Discrete	Ease of administration; periodically updated	Boundaries are arbitrary and vary in size & composition across the country; weakly related to behavior in labor market
Counties	Follows existing geopolitical borders	Geography/politics/history	Discrete	Ease of administration; may reduce within market variation	Boundaries are arbitrary and vary in size & composition across the country; weakly related to behavior in labor market
BEA Economic Areas ¹	Follows existing geopolitical borders	Commuting patterns	Discrete	Follows actual commuting patterns by county	Boundaries are arbitrary and vary in size & composition across the country; not updated since 1977; weakly related to behavior in labor market

Table A.1 (continued)

Method	Shape of Market	Determinants of Market Size	Characteristic of Borders	Advantages	Disadvantages
USDA Labor Markets ¹	Follows existing geopolitical borders	Commuting patterns	Discrete	Follows actual commuting patterns by county	Boundaries are arbitrary and vary in size & composition across the country; commuting patterns may not indicate uniform wage rates
Health Service Areas ¹	Follows existing geopolitical borders	Travel patterns of Medicare beneficiaries for routine medical care	Discrete	Each area has at least one hospital; areas are self-contained relative to routine hospital services delivery	Travel patterns of Medicare beneficiaries for routine medical care may not duplicate hospital worker commuting patterns
Radius Measures					
Fixed	Circular	Length of radius (usually air miles)	Continuous	Ease of administration; hospital-specific labor market area; reduce across-market wage variation	Individual hospitals may have undue influence on their own wage index
Variable	Circular	Length of radius (air miles, road miles, travel time)	Continuous	Hospital-specific labor market area; reduce across-market wage variation; may account for variations in population density, and distribution of hospitals	Individual hospitals may have undue influence on their own wage index; lack of empirical justification for the length of variable radii

Table A.1 (continued)

Method	Shape of Market	Determinants of Market Size	Characteristic of Borders	Advantages	Disadvantages
Clustering Measures					
Spatial (e.g., MSA)	Irregularly shaped; may follow geopolitical borders	Population, geography, commuting patterns, etc.	Discrete or continuous	Hospitals within a given space are linked by one or more common characteristics; may reduce within market wage variation	Area may be too large and, depending on clustering variables selected, may result in within market variation; may exacerbate across-market wage variations
Non-Spatial Characteristics					
Seed Clustering	Irregularly shaped	Characteristics of hospitals	Discrete or continuous	Technique would follow economic definition of market if wages were selected as key variable of market	Administrative complexity; technique may not group hospitals by geographic region
	Irregularly shaped	Clustering variables, e.g., bed size, occupancy rate, length of stay, case mix	Discrete or continuous	Labor markets defined by this method would be hospital-specific; border problems would be eliminated	Depending on variables selected for grouping, cluster may not describe actual market

Table A.1 (continued)

Method	Shape of Market	Determinants of Market Size	Characteristic of Borders	Advantages	Disadvantages
Gravity Model Approach	Irregularly shaped, tending toward circular with hospital in or near the center	Characteristics of hospitals and characteristics of competitors	Discrete	Determines area from which a hospital draws employees in competition with other hospitals	Difficult to administer; complex to calculate; only one hospital per market area
Gradient Measures	"Isobars" connecting providers with similar characteristics; or concentric circles from central urban area measured in miles	Characteristics of hospitals; air miles	Continuous	Relates suburban and closely located rural area wage rates to urban wage rates	Technique is untested; feasibility would need to be proven; may be more suitable in some areas of the country than others (problems of urban area over-lap and sparsely populated areas)

¹ Technique involves clustering of counties.

because geographic wage data is commonly available for MSAs and counties. An MSA is defined by the Bureau of the Census as a large population center and adjacent communities that have a high degree of economic and social integration with that center (Bureau of the Census, 1987). MSAs contain both supply and demand components within their borders. They also exhibit a high degree of labor mobility within their borders (Hirsh, 1978).

While MSAs may provide a reasonable definition of labor markets for urban analyses, they are decidedly less acceptable for non-metropolitan uses. By definition, MSA labor market areas exclude non-metropolitan areas. Every place that is not designated an MSA is considered a rural area. Using the simple metropolitan/non-metropolitan area schema, it is not possible to discriminate further among rural areas, either by market characteristics or geography. Rural labor market areas defined as the entire non-metropolitan area of a state may not have sufficient market structure homogeneity to serve as the geographical proxy for the actual labor market. Furthermore, the large size of some entire state labor market areas may limit the ability of laborers to commute freely to all areas of the market, restricting the range of possible market exchanges between buyers and sellers of labor.

MSAs are composed of single counties or clusters of counties.² Generally speaking, the size of the large population nucleus will determine the force of its attractiveness to nearby communities. Large cities tend to cluster counties together;

² In six New England states (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut), MSAs are composed of cities and towns rather than whole counties (Hewitt, 1989).

smaller cities tend to be designated as single-county MSAs. Because counties are the basic building blocks of MSAs, it is possible to disaggregate them from MSAs.

Single counties have also been suggested as a possible market area specification (Parcell and Mueller 1983; Bloomquist and Summers, 1982). Both MSA and non-MSA areas may be disaggregated into individual counties that may be more reflective of actual labor markets than larger clusters of counties. Complex studies of county-wide labor markets are possible, due to an abundance of available data on counties and county equivalents. However, counties, like other areas bordered by preexisting geopolitical boundaries, suffer from the fact that they are arbitrarily established without regard to actual market conditions. County labor market definitions might also be inappropriate if applied nationally, because of the size difference of counties in the eastern and western parts of the country. Counties are generally much larger in the west than the east. A rural labor market area may span more than one county in the east, but in the west a single county may function in multiple labor markets.

In an effort to further discriminate among non-MSA counties, the concept of an urbanized rural county has been proposed (ProPAC, 1987a; ProPAC, 1987b; Schmitz and Merrell, 1987). An urbanized county is defined as a county with a city or town having a population of 25,000 or greater. All non-MSA counties would be designated as either rural or urbanized rural.

Another method of clustering counties was proposed in 1991 by the National Center for Health Statistics. The Center identified "health service areas" to be used

as units of analysis in future health services research. Health service areas may be defined as one or more counties that are relatively self-sufficient with respect to the provision of routine (i.e., non-specialized) hospital care (Makuc, 1991). That is, the vast majority of the routine hospital services consumed by the residents of the health service area are provided by the hospitals within the health service area. Health service areas that include more than one county were grouped according to the travel patterns of Medicare beneficiaries between counties for routine hospital services. Four alternative definitions of health service areas were proposed that differed in regard to the number of service areas considered (either approximately 800 or approximately 1400) and whether or not counties within MSAs were in the same health service area (linked or unlinked). The four alternatives were compared and the "800-unlinked solution" appeared to be the preferred approach for most health services research applications. The "800-unlinked solution" yielded 802 health service areas that were relatively uniform in size (Makuc, 1991).

Health service areas appear to have several advantages over other county or county-clustering methods for approximating hospital labor market areas. Although they are composed of counties, health service areas are not confined within state boundaries. Almost 16 percent (or 126) of them cross state borders. Every health service area contains at least one hospital. The median number of hospitals in a health service area is five (one hospital at the fifth percentile and twenty hospitals at the ninety-fifth percentile), and they are reasonably proximate to one another. Over eighty percent of health service areas are composed of five or fewer counties. Finally,

health service areas are self-contained with respect to the provision of health care based upon the travel patterns of Medicare beneficiaries. Relatively few patients who live within the area are hospitalized outside of the area and relatively few patients who live outside of the area are hospitalized within the area. To the extent that traveling for hospital services mirror the commuting patterns of hospital workers, health service areas may provide a reasonable approximation of hospital labor markets.³

Because health service areas are clusters of counties, they are subject to the weaknesses of other administrative standards. Hospitals at the periphery of health service areas may share payment and employment patterns that are more similar to nearby hospitals in adjacent areas than to those within its own area.

Counties have been used by various researchers as a proxy unit of analysis for product market areas. Although researchers seem to agree on little else, they are universally critical of using counties as product markets. For example, one study suggested that county boundaries are arbitrarily drawn and are generally smaller than actual markets (Zwanziger and Melnick, 1988). Another observed that the use of counties for reimbursement policy can result in distortions and biases (Welch, 1989). Noting problems with the current county-based location adjustment to the Medicare payment formula for HMO's, Welch observed that some counties are quite heterogeneous, having both urban and rural parts. Thus, it is likely that the adjusted average per capita cost for a county -- although an accurate reflection of the county

³ Markets defined in product space may not be the same as markets defined in terms of labor relationships, and their area specifications may not be the same. However, it should be noted that, although independent, there are important relationships between product and labor markets (Wright and Marlor, 1990).

as a whole -- may mask variations in cost within the county. The two examples cited by Welch were San Bernardino County, California and St. Louis County, Minnesota, both MSAs with large rural areas.

Using a methodology developed by Elzinga and Hogarty (1973; 1978),⁴ Morrissey, Sloan, and Valvona, (1989) defined product markets by analyzing patient migration patterns and clustering counties where appropriate. According to their analysis, Morrissey and his colleagues concluded that product markets are larger than previously thought in both rural and urban areas. A typical rural hospital product market in Nebraska encompasses six counties. Their analysis of the Birmingham, Phoenix, and Omaha MSAs showed that a hospital product market is at least as large, and typically larger than, the designated MSA. In contrast, Goody (1993) found that rural hospital product markets are generally much smaller than counties and frequently cross county boundaries. By comparing hospital-specific market areas to county-based market areas using a series of geographic and socioeconomic-demographic dimensions, she found that the county is an imperfect measure of a hospital's market because it includes areas from which the hospital does not draw patients and excludes areas from which the hospital does draw patients.

Whether these findings are germane to labor market area definition is uncertain. The decision to travel for episodic medical treatment is likely made on different

⁴ Elzinga and Hogarty developed a definition of markets based upon identification of geographic areas in which very little of a product, such as coal, is shipped in from the outside and little of that produced within the area is transported outside of it. The dual concepts of "little in from outside, " or LIFO, and "little out from inside," or LOFI, define the market. This definition of markets is used by the Department of Justice in antitrust cases.

grounds than the decision to accept a job in a hospital that would require a significant daily commute. However, a hypothesis that workers would be willing to travel less far on a daily basis than patients seeking care episodically has not been tested. To the best of our knowledge, no studies have attempted to superimpose labor markets on product markets to test for congruity.

Bureau of Economic Analysis (BEA) economic areas are yet another option for the specification of labor market areas. BEA economic areas were created because of a concern that MSAs did not capture the breadth of diversity of the surrounding region. The BEA economic areas group counties together based on central place theory. Each BEA economic area has an urban center (central place) surrounded by nearby counties assumed to be economically dependent on the urban center. Fringe counties are added to the group according to commuting-to-work patterns. There are 183 BEA economic areas (Tolbert, 1989).

BEA used the following process for establishing economic areas (Schmitz and Merrell, 1987):

1. MSAs containing the largest percentage of employment in an area identified as a potential economic area were chosen as the urban center. In some cases smaller MSAs were grouped with larger MSAs, and in cases where an MSA was an integral part of a larger metropolitan complex, a multi-MSA center was designated.
2. In sections of the country without MSAs, counties containing a city of 25,000 or more residents and functioning as economic nodes were identified as area centers.
3. Each of the approximately 2,600 counties that did not fall within the centers was studied to determine the center to which it most closely

related. County relationships were determined by commuting patterns. Economic areas were permitted to cross state boundaries.⁵

BEA economic areas have been used successfully in several non-hospital labor market analyses (Horan and Tolbert, 1984). Schmitz and Merrell (1987) used BEA economic areas to define hospital labor market areas and found little improvement over the current system. BEA economic areas have been criticized because of the weakness of the link between rural and urban centers. The economic areas were defined in 1969 and refined in 1977 using 1970 census records, however, they have not been updated since using 1980 or 1990 census data.

Using data obtained from the 1980 census, the Economic Research Service of the Department of Agriculture (USDA) grouped counties into 382 labor market areas (and 875 "subareas") on the principle that labor market areas are regions that encompass both places of residence and the place of work of a local population (Tolbert and Killian, 1987). Based on travel-to-work data, a hierarchical cluster analysis of county-to-county commuter flows was used to specify areas of at least 100,000 residents. This definition of labor markets is superior to other administrative standards. It defines a limited set of buyers and sellers of labor. It is not restricted to state boundaries. It does not exclude rural areas or require an urban center. Because the USDA labor markets areas are groups of counties, it is possible to aggregate county-level data. While USDA labor markets areas may approximate actual

⁵ In many cases, the association between a county and a central place was not based on direct commuting ties, but rather on commuting ties to a non-central county which, in turn, was tied to the central place. Because of the insufficiency of commuting data in rural areas, BEA used supplemental data, such as metropolitan newspaper circulation statistics for rural areas and advice from local experts such as state planning agencies.

labor market areas better than other administrative standards, they suffer from a degree of distortion at the margins due to the rigidity of county boundaries. We are not aware of any studies that have attempted to test USDA labor markets with real hospital wages.

Radius Measures

Radius measures are among the most simple means of determining spatial labor markets. Radius measures merely circumscribe the area around a central place by a set radius. The notion of placing spatial determinants of labor utilization rates into a conceptual framework was introduced by Beck and Goode (1981). They hypothesized that communities surrounded by areas with excess labor will tend to have more elastic labor supply schedules than isolated areas where commuting costs are high. This hypothesis is supported by the work of Nakagome (1991). Nakagome observed that in a real economy there are centralized competitive markets operating side-by-side with dispersed local markets under imperfect competition. In developed countries, where travel costs are low, Nakagome concluded that large well-developed "central business district" labor markets will dominate small local markets. Spatial labor markets are more centralized and more highly developed as the time required to travel to work diminishes.

In this country, Henry (1989) pointed out that rural labor markets interact with other rural areas as well as with urban areas. It is important, therefore, to recognize these spatial relationships when modelling rural labor market areas. Distinguishing

between urban and rural labor markets simply on the basis of population or administrative criteria may not properly reflect actual labor market areas.

Radius measures of labor market areas are concerned with two primary issues: identification of a central place and determination of the length of the radius. If every census designated place⁶ occupies the center of a circle, labor markets will overlap each other to a significant degree. The amount of labor market overlap can be controlled by establishing more restrictive criteria for the central place. For example, the centers of the circles could be limited to "places" with hospitals. If the central places are too far apart, a nationally standardized radius will likely cause some populated areas to fall outside of the definition of the labor market area. This would not be a problem for a hospital-specific PPS labor market area definition based on a fixed radius. By definition every hospital would be in a labor market area, and every labor market area would contain at least one hospital. Therefore, an index could be calculated for every hospital.

Like other market specifications discussed here, radius measures were first developed to delimit product markets. Although admittedly arbitrary, several studies have suggested that 15 miles is the distance physicians are willing to travel, and is, therefore, a good standard radius measure for product markets (Luft, et al., 1989). Luft and Maerki (1985) estimated market-area competition (i.e., whether there was another hospital in the market) using 15-mile and 5-mile radii. Using a 15-mile radius

⁶ Census designated places are either: 1) incorporated places such as cities, villages, boroughs, towns, and villages; or 2) closely settled population centers that are outside of urbanized areas, do not have corporate limits, and have a population of at least 1,000. The minimum population standard of unincorporated areas is lower in Alaska and Hawaii (Hewit, 1989).

they found that 26 percent of all hospitals would be in single hospital markets. Using a 5-mile radius, they found that 47 percent of hospitals were in single-hospital markets.

Hospital-specific radius measures and variable radius measures take hospital and local area characteristics into consideration in determining the length of the radius. Phibbs and Robinson (1993) determined the radius necessary for California hospitals to capture 90 percent of each hospital's admissions. The radius was used as the dependent variable in a regression where the independent variables controlled for hospital, local market, and area demographic characteristics. The resulting California model was used to predict a hospital-specific radius for each non-federal, short-term, general hospital in the continental United States. The mean predicted radius was 19.4 miles, with a standard deviation of 7.37 miles. The minimum predicted radius was 4.74 miles and the maximum predicted radius was 42.4 miles.⁷

One might expect the size of labor markets to similarly vary with hospital, market, and demographic characteristics. However, no studies have attempted to predict the size of labor markets using this approach. It is not known whether the same set of hospital, market and demographic variables that predict product market size might also be used to predict labor market size. Are the characteristics that attract patients to hospitals the same characteristics that attract employees?

⁷ There were significant differences between the comparison of calculated minimum and maximum radii in California (the only state for which comparisons were performed) and actual radii. The minimum calculated radius was 4.74 miles; the minimum actual radius was 0.60 miles. The maximum calculated radius was 42.55 miles; the maximum actual radius was 124.44 miles. The mean predicted radius for California hospitals of 17.82 miles was very close to the mean actual radius of 17.83 miles.

Clustering Measures

Clustering is a technique for grouping together objects with similar characteristics. Hospitals may be clustered by one or multiple characteristics. Clustering hospitals according to a single characteristic is the most simple method of clustering. MSA/non-MSA distinction is a type of single-characteristic clustering. Some researchers propose grouping or clustering hospitals on the basis of several easily measured characteristics, such as bed size or geographical location, which serve as proxies for the determinants of cost (Cromwell, Hendricks, and Pope, 1986). The fundamental premise upon which clustering rests is that similar hospitals should have similar costs. If this is true, within-group differences may be due to variations in efficiency.

Clustering is not exclusively a spatial technique. Hospitals that are grouped by characteristics related to their costs may or may not be in geographical proximity. If they are not, it is difficult to conceive of them as being in the same labor market area, although their labor input costs may be similar.

Hospital product markets have been defined by clustering counties or zip code areas on the basis of patient origin data. Similar approaches have been used to identify labor market areas using commuting data instead of patient origin data. Some of the approaches discussed above in the section on administrative standards for defining labor market areas use clustering techniques. Many MSAs, especially the highly populated ones, are composed of multiple counties. To be included in an MSA, an outlying county must meet specific criteria concerning its level of commuting to the

central county, population density, and degree of urbanization. BEA economic areas were composed of counties that were grouped together on the basis of commuting patterns to a highly populated central place. The USDA labor markets were formed by clustering counties according to commuting patterns until a minimum population of 100,000 was achieved.

Clustering methods that rely on counties as the unit of aggregation are liable to the same criticism leveled against other labor market area definitions that rely on existing geopolitical borders. Wright and Marlor (1990) also suggest that commuting patterns may not be the most appropriate measure upon which to base clustering routines. They argue that information flow may be more germane than commuting patterns. Information on prevailing wages, they argue, allows highly-skilled workers to bargain for improved compensation without actually having to relocate to obtain a better wage. Information flow, and not the free flow of workers within a market, creates the tendency toward occupational price uniformity.

Wright and Marlor also suggest the possibility of constructing labor markets by clustering hospitals that pay their employees similar wages. Because wages in a labor market tend toward uniformity, clustering together hospitals in an area by similar wage rates should define the market area. They suggest two techniques to measure whether wages are the same or the degree to which they are converging (Horowitz, 1981; Stigler and Sherwin, 1985). The computational complexity required to establish labor market areas using either of these techniques and the cost of maintaining a payment system based on it, makes the approach undesirable.

Seed clustering is a clustering technique in which each hospital is at the center of its own group. Seed clustering creates a continuous series of clusters, one for each hospital. A hospital's costs are averaged with the costs of other hospitals within the cluster. Hospitals may be in more than one group, but only one average cost applies to a hospital. Seed clustering reduces boundary problems, because hospitals may belong to multiple groups, and because the technique, by definition, is hospital specific (Cromwell, Hendricks, and Pope, 1986).

Seed clustering can be based on statistical groupings of cost related variables⁸ or simple spatial criteria. ProPAC's proposal to define labor market areas according to a hospital's nearest neighbors is a seed clustering approach. Each hospital has its own wage index calculated by comparing the average wages of the hospitals closest to it to the national average.

Gravity Model Approach

Gravity models in behavioral sciences are used to explain and predict the interaction of persons and objects in a spatial context, such as population migration, commodity shopping, flow of information, intra-urban traffic, and tourist travel. Gravity models are also known as spatial interaction models. The fundamental idea behind gravity models is analogous to, and was originally derived from, Newtonian laws of force and energy -- that potentially attractive force between two objects

⁸ In the mid-1980s, New York State used seed clustering in its rate setting program. Clusters of at least four, but no more than 14 hospitals were created using approximately 15 variables, such as bed size, occupancy rate, length-of-stay, a hospital service index, and a large number of case-mix indicators (Cromwell, et al., 1986).

increases with the product of their masses and decreases with the distances between them (Neidercorn and Bechdolt, 1969; Meade 1974). In social applications, the two objects may be two hospitals, two business districts, or two large towns. The masses of the "objects" may be measured by the degrees of concentration of hospital beds, shops, or population that attract people to travel to or move toward them. The distances between two "objects" may be measured by road miles, travel costs, or travel time (Hua and Porell, 1979.)

Gravity models might be used to delineate labor market areas. The labor market for a hospital or cluster of hospitals could be defined by its ability to attract employees based on hospital and community characteristics and the intensity of competition for employees from other facilities. Despite the intuitive plausibility of the gravity model approach to hospital labor market definition, there are no empirical studies that support its feasibility or argue for its acceptance.

Gravity models have been used to define health service or catchment areas (Meade, 1974; Smith, 1979). In those studies, Reilly's gravity model⁹ was applied

⁹ Reilly's gravity model is based on the premise that a place will attract trade from an individual in its adjacent area in direct proportion to the size of the service center and in inverse proportion to the square of the distance away from the service (Isard, 1960). The model locates the boundary (breaking point) of two markets. In a health care application, it may be calculated by the following formula:

$$DSH = \frac{DIST}{1 + \sqrt{\frac{\sum ATTRIB_a}{\sum ATTRIB_b}}}$$

Where:

DSH = Distance of market breaking point from smaller hospital

DIST = Distance between hospitals A and B

ATTRIB_a = Attributes of larger hospital A (e.g., beds, services, physicians)

ATTRIB_b = Attributes of smaller hospital B

to draw the boundaries between hospital service areas. Meade compared hospital services areas in Idaho calculated using Reilly's gravity model to service areas defined using patient origin data and found that the two methods agreed 96.5 percent of the time. While highlighting the high degree of correlation between calculated service areas and those reflected in actual use patterns, Meade cautioned that Reilly's gravity model may be more suitable for rural areas, that do not have towns that vary greatly in size, than for urban or "mixed" areas. He also suggested that attention must be paid to lakes, rivers, and seasonal traveling conditions when determining routes and alternative routes between pairs (Meade, 1974).

To date, gravity models have not been used to define hospital labor market areas. Exploratory studies are needed to ascertain the feasibility of using gravity models for this purpose. Market definition by gravity formulas require that multiple sets of hospital pairs be defined to trace the boundaries of an individual hospital's market. The costs of identifying hospital pairs and collecting data on primary and alternate travel routes and hospital characteristics may be too great and too time consuming.

The use of a gravity model to define labor market areas also presents a conceptual problem. Gravity models measure the attractiveness of a firm to customers (or in this case, workers). They are aimed at defining the extent of an individual firm's markets. If hospital labor markets were calculated using typical gravity model techniques, each hospital would have a labor market defined for it. The size of the market defines the relative attractiveness of the hospital in comparison to

its competitors. By definition, every labor market would consist of only one hospital. One way to avoid one-hospital labor market areas would be to measure the relative attractiveness of only communities of a certain critical mass (population or population density). This would reduce the number of labor market areas and create labor market areas which contain multiple hospitals. Smaller hospitals which are in the gravitational pull of larger communities would be included in the same labor market area. However, empirical evidence concerning the variation in labor costs among urban core/suburban ring and rural/urbanized rural areas would seem to argue against using such an approach.

Gradient Measures

Gradient measures have been used to define the structure of urban labor markets. Cromwell and his colleagues (1986) and Schmitz and Merrell (1987) found that wage rates are lower at the outer limits of a city (MSA) than at its core, and suggested that a labor market area distinction between urban core and suburban ring be made. The core/ring method of labor market definition is a wage gradient approach. A wage gradient is the continuous spatial variation in wages within an urban labor market (Wright and Marlor, 1990). The idea of a wage gradient begins to move labor market area definitions away from discrete boundaries (with their attendant problems) toward a method of continuous adjustment. Under this approach, wage gradients can be measured continuously in miles or as a series of concentric circles that extend from urban areas into rural areas.

Hendricks (1989) was able to show wage gradients in large, medium, and small MSAs across the United States, using location in urbanized and non-urbanized suburbs of central cities as proxies for distance from the central hospital district. She concluded that there is merit to the contention of many central city hospitals that a single PPS wage index for an entire MSA penalizes them.

The application of this technique in rural areas is somewhat problematic. It assumes that wages decline as distance from the central core increases. However, some rural facilities, for example, rural referral centers, may have labor costs that are more similar to urbanized suburbs or even central city areas than other hospitals a set number of miles from an urban core.

Gradient measures may have conceptual validity, but a method to operationalize the concept has yet to be proposed. The gradient approach 's greatest contribution to the discussion of labor market definition to date is the notion that labor market areas are continuous spatial models that minimize variation across porous boundaries.

The alternative approaches outlined in this appendix form a basis for defining labor market areas. In the past, HCFA has defined labor market areas using administrative standards. ProPAC has recommended moving from that approach to a radius measure/seed clustering approach in which every hospital has a uniquely calculated wage index. In reviewing ProPAC's proposal, HCFA proposed yet another method, combining administrative standards and radius measures/seed clustering, that may hold promise.

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