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*Variations in Medicare
AAPCC Rates During the
1990s for Metropolitan and
Non-Metropolitan Counties*

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PREFACE

The Health Care Financing Administration (HCFA) contracted with RAND to perform an analysis of Medicare special payments to rural providers and implications for access and costs of care for rural Medicare beneficiaries, with a focus on underserved areas. The payment provisions examined include (1) bonus payments to physicians in rural HPSAs; (2) reimbursements to rural health clinics and federally qualified health centers; (3) special payments for sole community hospitals, Medicare-dependent hospitals, rural referral centers, EACH/RPCH hospital networks, and Medical Assistance Facilities; and (4) capitation payments in rural counties.

This report presents the findings of our analysis of trends in the Medicare adjusted average per capita costs (AAPCCs) and determinants of those trends. Section 1 presents background on rural issues and Medicare payment methods, and Section 2 describes our analytic methods. In Section 3, we describe the distribution of metropolitan and non-metropolitan counties by groupings of counties, and we examine trends in provider supplies by county categories. In Section 4, trends in AAPCC rates for urban and rural counties are described, and results of a model that estimates determinants of these rates are presented. Section 5 contains a discussion of these findings and implications for further analysis of rural payment issues.

This draft report is one of four reports being prepared from our analyses of Medicare special payment policies for rural providers. The other reports address trends during the 1990s in rural hospitals with special Medicare payment designations, bonus payments for rural physicians, and payments for rural health clinics and Federally Qualified Health Centers.

The work presented in this report was performed under Task 11 of Health Care Financing Administration Contract Number HCFA-500-96-0056, Project Officer William Buczko.

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SUMMARY

The Health Care Financing Administration (HCFA) contracted with RAND to analyze Medicare special payments to rural providers and their implications for access and costs of care for rural Medicare beneficiaries. The purpose of the research is to provide a comprehensive overview of Medicare special payments to rural providers over the last decade, to (1) estimate the relative contribution of these special payments to the Medicare capitation rates in rural counties and (2) help identify and assess alternative approaches to assuring access. The focus of the study is on services in geographic areas designated by the Health Resources and Services Administration (HRSA) as either Health Professional Shortage Areas (HPSAs) or Medically Underserved Areas (MUA/Ps).

In the first phase of the project, historical trends in payments under several special payment policies are being analyzed. The special payment provisions being examined include:

- Capitation payments in rural counties, especially in underserved areas;
- Reimbursements to Rural Health Clinics and Federally Qualified Health Centers;
- Special payments for sole community hospitals, Medicare-dependent hospitals, rural referral centers, EACH/RPCH hospital networks, and Medical Assistance Facilities; and
- Bonus payments to physicians in rural HPSAs;

This preliminary report presents the results of the analysis of trends in AAPCC capitation rates from 1990 through 1997.

BACKGROUND

The ability of the rural elderly to access health care services has been a continuing source of concern for policy makers. Elderly people live in rural areas in disproportionate numbers, and a larger proportion of rural elderly suffer from activity limiting chronic diseases (Rogers et al., 1993; Schlenker and Shaughnessy, 1996). Elderly people in rural areas also travel longer and wait longer for outpatient care and use fewer preventive services compared to their non-rural counterparts (Taylor et al., 1993; Van Nostrand et al., 1993). Rural communities face difficulties protecting provider supplies, including recruitment and retention of physicians and the viability

of rural hospitals. Rural hospitals tend to be small and offer a limited range of services compared to their counterparts in more densely populated regions, and their numbers continue to decline. Rural hospitals with less than 100 beds are less likely to offer a range of acute care services. Instead, outpatient and long-term care services have become more important shares of total rural hospital services during the 1990s (Moscovice et al., 1999).

Medicare spending for rural fee-for-service beneficiaries is the basis for the county-level adjusted average per capita costs (AAPCC) that serve as the basis for capitation payments to Medicare health maintenance organizations. The published AAPCC rates consist of separate rates for Medicare Part A and Part B services, and the total base county AAPCC rate for health plan payments is the sum of the county's Part A and Part B rates. In general, the AAPCC rates for counties outside of Metropolitan Statistical Areas (MSAs) are lower than those for more urbanized counties, reflecting lower rural utilization and payment rates. Furthermore, each county's rates tend to fluctuate more widely from year to year because they are based on spending for smaller populations. Given these payment issues and rural provider supply problems, few HMOs have contracted to serve Medicare beneficiaries in rural areas (PPRC, 1995). The BBA introduced a new capitation payment formula, effective January 1998, which stabilized and increased rural capitation rates. The 1997 AAPCC rates were the baseline rates for this new payment formula.

Eligibility for many of the rural programs and payments being addressed by this project requires service providers to operate in underserved areas, which are designated based on Congressional provisions for Medically Underserved Areas/Populations (MUA/P) and Health Professional Shortage Areas (HPSAs). These areas are designated by the Health Resources and Services Administration (HRSA) through its regulatory process. HRSA reviews HPSA designations every three years, adding or deleting area designations as appropriate. In 1997, roughly 64 percent of counties outside of MSAs contained at least one region officially designated as a HPSA and roughly 10 percent of non-MSA counties had no active primary care physician (NC-RHRPAC, 1998). In response to the Health Centers Consolidation Act of 1996, HRSA is revising the criteria and procedures for designating MUA/Ps and HPSAs, with plans to publish the new provisions during 2001.

METHODS AND DATA

The analytic results presented in this report encompass two broad topic areas:

(1) descriptive profiles of the U.S. counties based on categories of urban, rural, and frontier counties, which provide baseline information on county characteristics that are used for all four components of the trend analyses performed for this project, and (2) an analysis of the historical variation in AAPCC capitation rates across counties and over time from 1990 through 1997, which is one of those four analyses. We describe payment trends for alternative designations for urban and rural counties, including urban/rural categories established by the Urban Influence Codes (UICs), HPSA and MUA designations, and the most remote frontier counties. Three basic measures were examined in our analyses of the AAPCCs:

- Levels of the AAPCCs, looking at how the levels varied across categories of counties and the extent to which that variation changed from 1990 through 1995;
- The percentage of the total AAPCCs that was for Medicare Part A services, which encompass hospital inpatient care and several types of post-hospital services, to assess changes in service mix across inpatient and outpatient services;
- The volatility of the AAPCCs over time within each county, defined as the fluctuation in AAPCC rates from one year to the next due to variations in health care costs for the county's Medicare population.

To establish our analytic files for this work, we merged Medicare data on county-level counts of beneficiaries, AAPCC rates, and Medicare health plan enrollments with Area Resource File (ARF) data, as well as with separate data from HRSA on county designations of MUAs. The ARF was the source of many of the key data elements used for these analyses, including data on urban/rural characteristics, population demographics, provider supply, and designation as Health Professional Shortage Areas.

The analytic methods used for the trend analyses were descriptive summaries of county categories, provider supplies, and AAPCC rates, as well as regression models to examine determinants of the county AAPCC rates. To estimate of the determinants of the AAPCC rates, we used the 1997 AAPCC rates as the dependent variable in weighted least-squares regression models with predictor variables that included arrays of demographic variables (per capita

income, percentage Medicare population), provider supply variables, HPSA and MUA designations, urban/rural categories, and frontier county status. The weights for the models were the county Medicare beneficiary populations for 1997.

Although enrollment in Medicare health plans by rural beneficiaries has been low historically, some urban health plans have included rural areas in their service areas and a small number of health plans have defined themselves as rural plans. We estimated the penetration of Medicare plans in rural counties during 1997, which is the year in which participation in Medicare managed care peaked for both health plans and enrollments. These rates were compared to 1993 rates to examine changes in Medicare managed care over the 4-year period.

SUMMARY OF FINDINGS

The AAPCC comparisons presented in this report document the well-known differences between metropolitan and non-metropolitan counties in their profiles of provider supply and mix as well as Medicare spending levels for its fee-for-service beneficiaries. Key findings regarding county characteristics and provider supplies are:

- Although the non-metropolitan counties far outnumber the metropolitan counties, they contain only one quarter of the Medicare population.
- Medicare beneficiaries in non-metropolitan counties represent larger shares of the total population, with the most remote counties having the largest shares (20 percent of the population in 1997 compared to 16.3 percent for counties adjacent to an MSA and with a city of 10,000 or more).
- Large percentages of non-metropolitan counties have been designated as either whole-county or partial-county underserved areas (HPSAs or MUAs); although many counties have both HPSA and MUA designations, others have only one or the other designation.
- The ratios of physicians to populations were substantially higher for metropolitan counties, but per capita ratios of hospital services, skilled nursing services, nursing home services, home health services, and rural health clinics were higher for non-metropolitan counties, especially the more remote county categories.

- Within the non-metropolitan counties, different patterns of provider supply were found for physicians and hospital beds. The ratios of physicians to population were highest in counties adjacent to an MSA and lowest for the most remote counties; ratios of hospital beds were higher for the more remote counties.

We also observed variations in how non-metropolitan counties are grouped depending on different types of classification, for example, by categories of non-metropolitan counties, designations as HPSAs and MUAs, and frontier counties. One might expect non-metropolitan counties to converge into a reasonably consistent set of groups based on a combination of factors such as proximity to urban health care or status as underserved areas. We did not find such clustering in these analyses. For example, both provider supplies and average AAPCC rates varied among non-metropolitan counties based on both proximity to and MSA and the size of the largest city or town in a county.

Differences between metropolitan and non-metropolitan counties in AAPCC levels and volatility persisted over the past decade. Highlights of findings regarding the AAPCCs are:

- AAPCC levels were substantially higher for metropolitan counties, and volatility was somewhat lower.
- Higher annual increases in the AAPCC rates for non-metropolitan counties between 1990 and 1997 resulted in some reduction in the gap between rates for metropolitan and non-metropolitan counties.
- At the same time, AAPCC volatility declined for all categories of counties except the most remote counties with no town. This decline was smaller for more remote counties than for metropolitan counties or counties adjacent to an MSA.
- The Part A AAPCC increased from an estimated 61 percent of the total AAPCC in 1990 to 66 percent in 1997. This trend reflects the net effect of reduced spending on hospital inpatient services and increased spending on home health and skilled nursing services.
- In 1990, the Part A AAPCC for metropolitan counties was lower than for non-metropolitan counties (60 percent versus 63 percent), but this difference all but disappeared by 1997.

The results of our regression models highlight the contrasts in AAPCCs between metropolitan and non-metropolitan counties. The models for all counties and for non-

metropolitan counties explained a large percentage of the variation in AAPCC rates across counties, but the model for non-metropolitan counties explained much less. In addition, many factors for the models for all counties and for metropolitan counties had significant effects on AAPCC rates, but fewer factors were significant in the model for non-metropolitan counties. These results could be interpreted in two ways. Other factors may exist that we did not measure but are predictors of AAPCC rates in non-metropolitan areas. On the other hand, the county-level AAPCC rates in non-metropolitan areas may be the net result of such a diversity of local service use patterns within each county that it be impossible to explain much more of the variation in county rates than our models capture. For example, some remote non-metropolitan counties may have many small urbanized locations (communities or cities) within them, each of which has enough providers to support the demand for primary health care, but others may have only one or two urbanized locations that make access more difficult for beneficiaries living outside of those locations. These two counties could have similar county-level averages of provider supply but different rates of utilization (and resulting AAPCC rates).

The models also showed positive associations between physician and hospital supply and AAPCC rates but negative associations for SNFs, nursing homes and home health agencies. Although these effects on AAPCCs were small in size, they do suggest that the mix of acute care and post-acute care services in non-metropolitan counties may be an important factor in access to care for Medicare beneficiaries and resulting service utilization and costs. The local mix in these services also would be likely to affect beneficiaries' choices to obtain acute care services locally or from more distant providers.

HPSAs and MUAs are, by definition, underserved areas. Therefore, there should be lower utilization rates by Medicare beneficiaries in these areas, which would be observable in lower AAPCC rates. The absence of strong relationships between AAPCC rates and either MUAs or HPSAs may reflect flaws in the criteria for these designation, such that the designated areas are not truly the most underserved areas, or there are enough other underserved areas that were not designated to dilute observed differences in AAPCC rates between the two groups. Alternatively, we could hypothesize that these designations indeed had accomplished what was intended—increasing access to care for residents of the designated areas.

Another surprising finding was the weak evidence for frontier counties of either under-supply of providers or low utilization and costs for residents. We pursued examination of frontier counties far enough to confirm that the Medicare populations in these counties are indeed quite small. Yet most of the provider supply measures were similar to those other non-metropolitan counties. Frontier county AAPCCs in 1990 were, on average, similar to AAPCCs for other non-metropolitan counties, but they increased at a slower rate from 1990 to 1997, indicating some differences in trends of access or utilization for their Medicare beneficiaries.

ISSUES AND IMPLICATIONS

Continuing challenges will be faced to identify and measure the factors that have contributed to lower service utilization in non-metropolitan areas compared with urban areas. We used county boundaries for the analysis of historical trends in AAPCC rates because these rates were set at the county level. Yet it is well understood that county boundaries are a poor choice for defining groups of homogeneous rural areas, especially given the large land areas included in rural counties in many of the states. With each of those land areas there are diverse local communities surrounded by remote areas, each with their unique supply of health care providers and service networks. As we work with utilization data for beneficiaries to analyze the effects of Medicare special payment policies, one of our goals will be to continue to search for systematic patterns of health care based on characteristics of the local rural areas, in particular those that are designated as underserved.

The provider supply data in the ARF is too crude for use in more detailed exploration of the issue of supply and access. The counts are aggregated at too high a level to provide information on what is happening specifically for Medicare beneficiaries. These issues will be pursued in other analyses that use Medicare claims, to attempt to improve our understanding of access, utilization, and costs for beneficiaries residing in HPSAs, MUAs, and frontier counties.

Section 1.

INTRODUCTION

The Health Care Financing Administration (HCFA) has contracted with RAND to perform an analysis of Medicare special payments to rural providers and their implications for access and costs of care for rural Medicare beneficiaries. The purpose of the research is to provide a comprehensive overview of Medicare special payments to rural providers over the last decade, through which we will (1) estimate the relative contribution of these special payments to the Medicare capitation rates in rural counties and (2) help identify and assess alternative approaches to assuring access. The focus of the study is on services in geographic areas designated by the Health Resources and Services Administration (HRSA) as either Health Professional Shortage Areas (HPSAs) or Medically Underserved Areas (MUA/Ps).

In the first phase of the project, historical trends in payments under several special payment policies are being analyzed. The special payment provisions being examined include:

- Capitation payments in rural counties, especially in underserved areas;
- Reimbursements to Rural Health Clinics and Federally Qualified Health Centers;
- Special payments for sole community hospitals, Medicare-dependent hospitals, rural referral centers, EACH/RPCH hospital networks, and Medical Assistance Facilities; and
- Bonus payments to physicians in rural HPSAs;

This preliminary report presents the results of the first analysis – examination of trends in AAPCC capitation rates from 1990 through 1997. The AAPCCs were used for the last time in 1997, after which the new capitation rate formula established by the Balanced Budget Act of 1997 went into effect. This draft will serve as a basis for discussion and further analysis as work continues on the remaining three special payment provisions.

BACKGROUND

The ability of the rural elderly to access health care services has been a continuing source of concern for policy makers. This concern is driven by a number of factors that combine to

make elderly population more vulnerable and service delivery organizations less stable compared to their non-rural counterparts. First, elderly people live in rural areas in disproportionate numbers (Rogers et al., 1993). Second, although the incidence of acute conditions does not appear to be any greater, a larger proportion of rural elderly (41 percent versus 36 percent) suffer from activity limiting chronic diseases, such as diabetes, hypertension, and arthritis (Schlenker and Shaughnessy, 1996). Third, elderly people travel longer and wait longer for outpatient care and use fewer preventive services compared to their non-rural counterparts (Taylor et al., 1993; Van Nostrand et al., 1993).

The supply and financial viability of rural providers has been a chronic problem. Rural communities face difficulties recruiting and retaining physicians, due to a number of factors that make physicians reluctant to locate in rural areas (PPRC Report to Congress, 1991). Low patient volumes in sparsely populated areas with relatively large numbers of uninsured make it difficult for service delivery organizations to be financially stable (ProPAC, 1991). Between 1990 and 1996, the number of rural hospitals decreased by 8.6 percent, from 2,383 to 2,177 hospitals. Rural hospitals tend to be small and offer a limited range of services compared to their counterparts in more densely populated regions. In 1996, 72 percent of hospitals outside of Metropolitan Statistical Areas (MSAs) had 100 or fewer beds and 47 percent had fewer than 50 beds. Rural hospitals with less than 100 beds are less likely to offer a range of services considered standard in more densely populated regions. Instead, they provide proportionately more outpatient and long-term care services, compared to urban hospitals, and these services have been growing components of their total services during the 1990s (Moscovice et al., 1999).

Provisions contained in the Omnibus Reconciliation Acts of 1987 and 1989, and subsequent revisions to hospital and physician payment rules, influenced Medicare payments to rural providers throughout the 1990s. More recently, the 1997 Balanced Budget Act (BBA) contained a number of provisions with important implications for the financing and delivery of Medicare-funded services in rural areas. Some provisions addressed fee-for-service payments for rural hospitals, skilled nursing facilities (SNFs), and home health agencies, which can be anticipated to have complex effects for rural providers. Others addressed capitation payments for the new Medicare+Choice organizations, including provisions to encourage plans to serve rural areas.

Medicare Capitation Payment Rates

Since 1983, Medicare has contracted with health maintenance organizations (HMO) to provide Medicare-covered services on a capitated basis. The base capitation rates were county-level rates established at 95 percent of the adjusted average per capita cost (AAPCC) for fee-for-service beneficiaries living in each county. HMOs received a monthly payment for each enrollee that was the product of the base capitation rate for the enrollee's county of residence and a demographic (risk) adjustment factor. The published AAPCC rates consist of separate 95 percent rates for Medicare Part A and Part B services. The total base county AAPCC rate for health plan payments is the sum of the county's Part A and Part B rates.

There have been substantial problems with the AAPCC rates for rural counties. Rural AAPCCs have been low on average, and they have been more volatile than rates for urban counties, because service levels for small rural beneficiary populations fluctuate more from year to year than those for larger urban populations. Given these payment issues and rural provider supply problems, few HMOs have contracted to serve Medicare beneficiaries in rural areas (PPRC, 1995). The BBA introduced a new capitation payment formula, effective January 1998, which stabilized and increase rural capitation rates. The 1997 AAPCC rates were the baseline rates for this new payment formula.

Effects of Medicare Rural Payment Policies on AAPCC Rates

Medicare payment policies to enhance access for rural beneficiaries may be classified into three broad categories: (1) payments to health care professionals practicing in designated areas, (2) payments to special categories of service delivery organizations in designated areas; and (3) special payment provisions to lessen the negative impact on rural hospitals of national payment policies. All of the fee-for-service payments made to providers for services to beneficiaries residing in any given county are rolled into the AAPCC rates for that county. Thus, in the counties where beneficiaries are using providers that receive the special payments, the AAPCC rates will be larger than they would be without the special payment amounts. However, the size of this effect on the AAPCC rates is not known. One of the goals of this research project is to estimate the contribution of to the Medicare average per capita cost of each special payment policy alone as well as the aggregate effects of the combination of policies.

DESIGNATIONS FOR UNDERSERVED AREAS

Eligibility for many of the rural programs and payments being addressed by this project requires service providers to operate in underserved areas, which are designated based on Congressional provisions for Medically Underserved Areas/Populations (MUA/P) and Health Professional Shortage Areas (HPSAs). These areas are designated by the Health Resources and Services Administration (HRSA) through its regulatory process. HRSA first designated MUAs in 1973 and has added new MUA/P designations periodically through the 1990s. HPSAs were first designated in 1978 (HRSA, 1998; Goldsmith and Ricketts, 1999). HRSA reviews HPSA designations every three years, adding or deleting area designations as appropriate. In 1997, roughly 64 percent of counties outside of MSAs contained at least one region officially designated as a HPSA and roughly 10 percent of non-MSA counties had no active primary care physician (NC-RHRPAC, 1998). HRSA also has added new MUA/P designations periodically through the 1990s, but no existing MUA designations have been deleted.

In response to requirements of the Health Centers Consolidation Act of 1996, HRSA is revising the criteria and procedures for designating MUA/Ps and HPSAs. Earlier proposed changes provided for the HPSAs to be a subset of the MUA/Ps and use of a consistent set of criteria to determine the two designations (HRSA, 1998). In response to extensive comments received on these proposed rules, HRSA is making substantial changes to the methodology, with plans to publish a revised proposed rule in 2001.

PURPOSE OF THE AAPCC ANALYSIS

The research reported here is designed to document trends in Medicare base capitation rates from 1990 through 1997 for rural and urban counties and to examine factors that may have contributed to observed payment trends. Relationships between AAPCCs and managed care participation also are examined. The analysis includes consideration of AAPCCs for urban areas to provide a reference point for assessing the levels and volatility of the rural AAPCC rates.

These analyses address the following specific research questions:

Rural/urban differences in AAPCC rates:

How do the levels and volatility of Medicare AAPCC rates differ among rural underserved areas, other rural counties, and urban counties?

How do these differences change over time?

AAPCC rates and health plan enrollments:

What are the relationships between capitation rates and Medicare health plan enrollments in rural areas, with comparisons to urban area relationships?

ORGANIZATION OF THIS REPORT

The remainder of this report is organized in four sections. In Section 2, we describe the methods and data we used for the analysis of trends in AAPCC capitation rates. The profiles of urban and rural counties are presented in Section 3 and results of the AAPCC analysis are in Section 3. The AAPCC analysis examines levels and variations in AAPCC rates as well as enrollment rates in Medicare managed care plans for beneficiaries residing in urban and rural counties. Section 4 summarizes our findings and discusses implications for Medicare policy and for the remaining work on this project.

Section 2.

METHODS AND DATA

GENERAL ANALYSIS PLAN

The analytic results presented in this report encompass two broad topic areas. The first set of results are descriptive profiles of the U.S. counties based on categories of urban, rural, and frontier counties. These analyses generate baseline information on county characteristics that will be used for the full scope of research for this project, including analyses of AAPCC rates, payments for rural health clinics, special payments for designated rural hospitals, and physician bonus payments. The second set of results address the first of these four topic areas—an analysis of the historical variation in AAPCC capitation rates across counties and over time from 1990 through 1997.

The Area Resource File (ARF) is the source of the key data elements used for these analyses, including data on urban/rural characteristics, population demographics, provider supply, and designation as Health Professional Shortage Areas. To establish our analytic files for this work, we merged the ARF data with Medicare data on county-level counts of beneficiaries, AAPCC rates, and Medicare health plan enrollments, as well as with separate data from HRSA on county designations of MUAs.

In performing the descriptive profiles of counties, we tested relationships among the various designations for urban and rural counties, including urban/rural categories established by the Urban Influence Codes (UICs), HPSA and MUA designations, and the most remote frontier counties. In general, we found substantial differences in groupings of counties according to each of these individual classification schemes, highlighting the importance of reporting analytic results according to several different groupings. We have used this strategy in presenting our results for the AAPCC analyses.

Three basic measures were examined in our analyses of the AAPCCs:

- Levels of the AAPCCs, looking at how the levels varied across categories of counties and the extent to which that variation changed from 1990 through 1997.

- The percentage of the total AAPCCs that was attributed to Medicare Part A services, which encompass hospital inpatient care and several types of post-hospital services.
- The volatility of the AAPCCs over time within each county, measured as the fluctuation in AAPCC rates from one year to the next due to variations in health care costs for the county's Medicare population.

The AAPCC volatility measure is distinct from measures of differences across counties in time trends of AAPCC increases or decreases. A time trend is the mean (expected value) of the slope for a series of AAPCC levels, while volatility may be viewed as the variance in a county's AAPCCs at a given point in time. Greater volatility represented more financial risk for Medicare health plans because they could not predict subsequent years' AAPCC rates with confidence.

Although enrollment in Medicare health plans by rural beneficiaries has been low historically, some urban health plans have included rural areas in their service areas and a small number of health plans have defined themselves as rural plans. We estimated the penetration of Medicare plans in rural counties during 1997, which is the year in which participation in Medicare managed care peaked for both health plans and enrollments. These rates were compared to 1993 rates to examine changes in Medicare managed care over the 4-year period.

The method we used to define rural locations was based on whether or not a beneficiary resided in a county that is part of a Metropolitan Statistical Area (MSA), as defined by the Bureau of the Census. All counties outside of an MSA were considered to be rural for purposes of this analysis. This definition is consistent with the geographic boundaries used in Medicare payment schedules for many provider services. However, county boundaries obscure a wide range of local characteristics because each county contains a mix of urbanized and more truly rural locations. Counties that are not in MSAs have fewer and smaller urbanized locations than MSA counties, but they are not uniformly rural in nature. Therefore, we refer to these counties as "non-metropolitan" counties, rather than "rural." We address this further below in our definition of non-metropolitan county categories, as well as in our analysis plan for the full study of which the current analysis is a component (Farley et al., 1999).

KEY VARIABLES

To perform the analysis of county profiles and AAPCC rates, it was necessary to define several key variables that were used throughout the analyses. We describe these variable definitions here, including discussion of relevant measurement or interpretation issues. Four sets of variables are discussed—definition of categories for rural and urban counties, definitions of Health Professional Shortage Areas and Medically Underserved Areas, measures for supplies of health care providers, and measures to characterize the levels and volatility of county-level Medicare AAPCC rates.

Establishing Categories for Rural and Urban Counties

We defined categories of rural and urban counties to help characterize the rural or urban nature of each county. Urban and rural categories were established based on values of the Urban Influence Codes (UICs) developed by the U.S. Department of Agriculture, which classify counties using values from 1 through 9 (Ghelfi and Parker, 1995). Refer to Appendix A for additional discussion of coding systems. Codes 1 and 2 define large and small counties in the Metropolitan Statistical Areas (MSAs) established by the Census Bureau, and codes 3 through 9 define categories of counties outside of the MSAs (non-metropolitan counties). The UICs classify non-metropolitan counties on two dimensions: (1) the size of the largest town in the county and (2) adjacency to a metropolitan county. Thus, the UICs do not yield a monotonic scale of rurality, but must be considered as a matrix with each dimension serving as one of the axes. Urban Influence Codes have not been updated since their publication in 1993. Consequently the stratification of counties using these codes may not reflect the actual rural designation that applied to a county in later years of the study period.

For our categories of rural counties, we used the 2 UICs for metropolitan counties and collapsed the UICs for non-metropolitan counties from the original 7 categories to 5 categories, as follows:

Metropolitan categories:

- Central and fringe counties in metropolitan areas of 1 million population or more (UIC 1)
- Counties in metropolitan areas of fewer than 1 million population (UIC 2)

Non-metropolitan categories:

- Counties adjacent to an MSA with a city of at least 10,000 population (UIC 3 and 5);
- Counties adjacent to an MSA without a city of at least 10,000 population (UIC 4 and 6);
- Counties not adjacent to an MSA with a city of at least 10,000 population (UIC 7),
- Counties not adjacent to an MSA with a town of 2,500 to 9,999 population (UIC 8),
- Remote counties not adjacent to an MSA without a town of at least 2,500 population (UIC 9).

There is some consensus among rural health experts that the UICs are imperfect in capturing variations in characteristics among rural counties because they are based on county boundaries. Many rural counties have large land areas, and within a given rural county, there may be large local variations in population density, demographics, and health care provider supply that become lost in the larger county aggregates. Health service areas are not necessarily contiguous with county lines, and multiple health service areas within a geographically area county can vary widely in the degree of rurality. Also, the large metropolitan counties, mostly in the West, contain large rural areas, which is a political problem as well as an analytic one.

Despite these limitations, the UICs are the preferred measure of rurality when compared to alternative measures, the most well known of which are the urban continuum codes. The Rural-Urban Continuum Codes (RUCCs) are based on the total urbanized population in a county, rather than the size of the largest city. Given the need for a "critical mass" of urban population to establish a local health care infrastructure, most analysts prefer the UICs as better representing this capability because they are based on the presence of a city of at least 10,000 population (Ricketts, et al., 1998). (See Appendix A.)

We defined frontier counties as another measure of sparsely populated rural areas. Counties were classified as frontier if they had a population density of 6 persons per square mile or less based on 1990 census data on population and county land area and were located in a western state. Only a small number of counties in the eastern portion of the country had such low population densities, and they were omitted from the frontier county definition because residents in these counties had much closer access to urbanized areas than those in the western frontier counties. We also tested the extent to which frontier county classifications would change if they were based on more recent (1997) population estimates. Only 18 counties had

different classifications based on the 1997 population data, with 12 counties losing the frontier classification and 6 counties becoming frontier counties.

Measures of Under-Served Areas

Designations of counties as underserved areas form an important basis for the analyses performed in this project because many of the Medicare payment policies were established specifically for providers serving these designated areas. The federal government has established MUAs and HPSAs as two distinct designations, although the rules for their designation processes differ. For both MUAs and HPSAs, designations may be made for either whole-county or partial-county areas. The ARF contains variables for HPSA designations, including coding for the whole or partial county status. We worked with variables for primary care HPSA designations for the years 1991, 1993, 1995, 1996, and 1997, all of which were available on the ARF. A data file with the MUA designations was obtained from HRSA, and we merged these data into our county-level analytic file. The MUA designations were as of the current date, so we did not have data on historical trends in MUAs.

Variables for Provider Supply

All of the data for defining variables for provider supplies were obtained from the ARF. We defined supply measures for the following providers:

- Patient care physicians, including primary care and specialty physicians
- General short-term hospital facilities, as defined by the American Hospital Association
- General short-term hospital beds
- Skilled nursing facilities (SNF)
- Skilled nursing facility beds
- Nursing home facilities, other than skilled nursing
- Nursing home beds
- Home health agencies
- Rural health clinics

ARF data for physicians and hospitals were available for several years during the 1990s, but data for skilled nursing facilities, nursing homes, home health agencies, and rural health clinics were available only for 1994. Guided by data availability, physician supply measures

were established for the years 1990, 1993, and 1997, and hospital supply measures were established for 1990, 1993, and 1996.

For each provider supply measure (and year), we established two variables: (1) the number of providers in a county and (2) the ratios of providers per 100,000 population based on the total county population for the year for which the variable was calculated. The ratios are better measures than simple counts of the availability of providers to a county population. They are vulnerable, however, to being over-stated in counties with small populations that are the denominators for calculating the ratios. As a result, a rural county with few SNFs may have a much larger ratio of SNFs to population than an urban county with a much larger number of SNFs. We find this effect in our provider supply profiles reported below.

The number of hospital beds reported in the ARF are licensed beds, rather than staffed beds. Therefore, these measures overstate facilities' operational capacities, given the large number of hospitals that do not staff or use the full complement of beds they officially have, as shown by AHA survey data and MedPAC studies. Similar issues may exist for SNF and nursing home beds, although to a lesser extent. The comparisons of bed capacities across county categories control somewhat for differences in staffed bed capacities because these capacities are related to their reported licensed capacities. However, these comparisons assume that all hospitals or other type of provider have the same ratio of staffed to licensed beds, which is not likely to be true. A frequently used methodological response to this issue is to use utilization measures such as inpatient census rather than the structural measures of supply. We do not take this approach because we intend these measures to represent the availability of providers as determinants of service utilization and costs.

Base Capitation Rates

We described and compared trends in capitation rates for urban and rural counties, and among categories of rural counties. To develop a comprehensive picture of how AAPCC capitation rates varied over time, and the extent to which trends differed for rural and urban counties, we examined the three measures described here.

Average levels of the AAPCCs. Total AAPCC rates were calculated as the sum of the Part A and Part B AAPCC rates published by HCFA each year. These published rates were

established by the HCFA actuary at 95 percent of the adjusted average per capita cost for Medicare fee-for-service beneficiaries for previous years of utilization. When calculating average AAPCC for groups of counties, we weighted the averages by the number of Medicare beneficiaries residing in each county, because these beneficiaries were candidates for health plan enrollment (if a plan is offered). For the enrollment analysis, we also weight some of the average AAPCC rates by the number of Medicare health plan enrollees in a county to compare the average rates for total beneficiaries and plan enrollees.

Part A share of AAPCC rates. The Part A AAPCC rate was measured as a percentage of total AAPCC. This measure was used to explore the extent to which the AAPCCs reflected shifts of service mix from inpatient to outpatient care that occurred during this past decade.

Volatility in total AAPCC rates. The measures of AAPCC volatility were five-year average measures established for each of the years 1990 through 1995 using formula (1):

Absolute volatility: 4-year average of absolute differences between the reference year and 2 years before and after it (for 1990 through 1995)

Relative volatility: 5-year average difference as percent of average AAPCCs for the 5 years

$$\text{Relative volatility}_0 = \frac{\sum_i |A_i - A_0| / 4}{\sum_i A_i / 5} \quad \text{for } i = -2, -1, 0, +1, +2 \quad (1)$$

where: A_i = AAPCC rate for year i
 A_0 = AAPCC rate for reference year

For example, AAPCCs for the years 1988 through 1992 were used to calculate the volatility measure for 1990. The numerator for the measure is the sum of the absolute deviations of the 1988, 1989, 1991, and 1992 AAPCCs from the 5-year average AAPCC for 1988 through 1992. The denominator was the 5-year average AAPCC. These standardized measures of relative volatility can be compared across years because they control for increases in the AAPCC levels over time. Averages of the AAPCC volatility measures are weighted by the number of Medicare beneficiaries residing in each county.

These AAPCC analyses applied and extended many of the techniques used by the Physician Payment Review Commission (PPRC) in its analyses of the Medicare AAPCCs, including calculation of indices of the 5-year average volatility in the AAPCC rates for each year

(PPRC, 1995). Our approach was to look independently at each year to assess the extent of financial risk for health plans related to uncertainty in the next year's AAPCC rates.

This measure of volatility differs from that used by McBride and associates (1997). They defined local volatility for the 1990 to 1997 time period as the nominal growth in AAPCC less the Consumer Price Index, that is, an inflation adjusted measure of growth in per capita Medicare costs. They report the average absolute deviation in local volatility over the time period rather than fluctuations at specified points in time.

ANALYSIS

Most of the analytic methods used for the analyses presented in this report were descriptive summaries of county categories, provider supplies, and AAPCC rates. We began by characterizing the counties to become familiar with the distribution of counties by the various categories or designations being examined in the study. Then, for these categories of counties, we used bivariate analyses to generate comparisons of provider supplies across different types of counties. Finally, we performed similar comparative analyses for the three measures defined for the AAPCC rates.

Based on results of these descriptive analyses, we used weighted linear regression methods to estimate models of the determinants of the county AAPCC rates. The 1997 AAPCC rates were the dependent variable in the models and the predictor variables included arrays of demographic variables (per capita income, percentage Medicare population), provider supply variables, HPSA and MUA designations, urban/rural categories, and frontier county status. The weights for the models were the county Medicare beneficiary populations for 1997.

County-level data availability issues influenced the sets of counties that we were able to include in each analysis. Medicare AAPCCs have been established for a larger set of counties (or other similar geographic jurisdictions) than those included in the ARF. The ARF contains only one record for the entire state of Alaska, whereas AAPCC rates exist for a number of Alaskan boroughs. We added new records for these boroughs to our analysis file, for which we obtained data on the 1990 population, UICs, metropolitan area designations, AAPCC rates, and Medicare beneficiary counts. A similar discrepancy existed for a set of independent cities in the state of Virginia, which the state separates legally from historical county boundaries to form their

own jurisdictions. Again, AAPCC rates have been established for these areas, for which we also added records to our analytic file.

With these new records added to our file, we were able to retain a good level of detail for the Alaska and Virginia areas in most of our AAPCC analyses. However, we could not obtain data for the new Alaska or Virginia "counties" on provider supplies, HPSAs, MUAs, or other county characteristics that were on the ARF. For any analyses that used these variables, we worked with the smaller set of counties for which we had the full set of data. Alaska counties were dropped from the file, and the Virginia independent cities were re-combined with the counties from which they were extracted. Weighted average AAPCC rates were calculated for the combined counties using beneficiary counts as the weights.

The last component of the work reported here was a comparative analysis of enrollments in Medicare health plans by urban and rural county categories. For this analysis, we merged the data in our analysis file with HCFA health plan enrollment data for 1993 and 1997. We examined the percentages of counties with health plans, average enrollments by county category, and average AAPCCs for counties with and without enrollees. Finally, we focused on the subset of health plans with enrollees who resided in rural counties to assess the urban/rural mix of enrollees in those plans.

Section 3.
**CHARACTERISTICS OF U.S. METROPOLITAN
AND NON-METROPOLITAN COUNTIES**

PROFILES OF RURAL AND METROPOLITAN COUNTIES

Medicare AAPCCs are calculated for more than 3,100 counties and similar geographic areas within the continental United States.¹ We obtained data on AAPCC rates, Medicare beneficiary counts, total population, Urban Influence Codes, and Metropolitan Statistical Areas for a total of 3,126 U.S. counties. However, not all of these counties are represented in the Area Resource File, which was our source for data on some of the demographics measures and provider supply variables. The missing counties consist of counties in Alaska and independent cities in Virginia. The ARF contains only one record for the entire state of Alaska, and it does not provide separate data for some of the Virginia independent cities. Therefore, we use the full set of counties whenever possible, but for some analyses that work with ARF data, we use the smaller set of 3,078 counties.

County Distributions by Metropolitan and Rural Locations

As shown in Table 3.1, 73.3 percent of the U.S. counties are categorized as non-metropolitan based on the Urban Influence Codes. Non-metropolitan counties that do not contain a city of at least 10,000 population represent 57.8 percent of all counties (24.0 percent are adjacent to MSAs and 33.8 percent are remote counties). Large metropolitan counties are 9.9 percent of the total, and small metropolitan counties are another 16.8 percent of the total. However, the metropolitan counties have much larger total populations and Medicare populations than the non-metropolitan counties.

¹ AAPCC rates also are calculated for geographic areas outside the United States, including Guam, Puerto Rico, Virgin Islands, and several other areas. These areas are not included in our analyses.

Table 3.1
Distribution of U.S. Counties by Metropolitan and Non-Metropolitan Categories
Based on 1993 Urban Influence Codes

Category	Number of Counties	Percentage of Totals	
		All Counties	Metropolitan/ Non- metropolitan
Metropolitan—all counties	834	26.7	100.0
Large counties	309	9.9	37.1
Small counties	525	16.8	62.9
Non-metropolitan—all counties	2,292	73.3	100.0
Adjacent, city 10,000+	251	8.0	11.0
Adjacent, no city 10,000+	749	24.0	32.7
Remote, city 10,000+	233	7.5	10.2
Remote, town 2,500-10,000	549	17.6	24.0
Remote, no town	510	16.2	22.3

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

Counties that qualified as frontier counties due to low population densities represent 12.1 percent of the counties, as shown in Table 3.2. Most of these counties (7.1 percent of total counties and 58.9 percent of frontier counties) are classified as remote counties with no town, and the remainder are other categories of non-metropolitan counties. The sole exception is Nye County, Nevada, which is an metropolitan county that qualified as a frontier county. This status was obtained for both the 1990 census population and the 1997 population estimates.

The distributions of the counties by metropolitan, non-metropolitan, and frontier status vary by HHS region, as shown in Table 3.3. In general, the eastern regions (1 through 5) have higher percentages of metropolitan counties, whereas the reverse is found for the western regions (6 through 10). One eastern and two western regions stand out as having unique distributions of counties. Region 2 is predominantly an urban region, with 71.1 percent of its counties being classified as metropolitan. No other region comes close to this percentage of metropolitan counties. By contrast, frontier counties represent 61.0 percent of the counties in Region 8, and only 8.6 of the region's counties are metropolitan. Region 9 has a balanced mix of metropolitan, non-metropolitan, and frontier counties, with 45.2 percent metropolitan, 32.3 percent non-frontier non-metropolitan, and 22.6 percent frontier counties. This distribution reflects the presence of Los Angeles and other large cities in California and other states, along with large

areas of sparsely populated land outside of these cities. Additional detail on the percentages of counties by metropolitan and non-metropolitan subcategories is provided in Table 3.4.

Table 3.2
Distribution of Frontier Counties by Metropolitan and Non-Metropolitan Locations
Based on 1993 Urban Influence Codes and 1990 Population Census

	Number of Counties	Percentage of Counties	
		All Counties	Frontier Counties
Metropolitan—all counties	1	<0.1	0.3
Large counties			
Small counties	1	<0.1	0.3
Non-metropolitan—all counties	376	12.1	99.7
Adjacent, city 10,000+	3	0.1	0.8
Adjacent, no city 10,000+	58	1.9	15.4
Remote, city 10,000+	5	0.2	1.3
Remote, town 2,500-10,000	88	2.8	23.3
Remote, no town	222	7.1	58.9
All Frontier counties	377	12.1	100.0

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* The sole frontier county in a metropolitan area is Nye County, Nevada.

Table 3.3
Distribution of Metropolitan, Non-Metropolitan, and Frontier Counties by HHS Region

HHS Region	Number of Counties	Percentage Metropolitan	Percentage Non- Metropolitan (Not Frontier)	Percentage Frontier
All Regions	3,126	26.6	61.3	12.1
1. Boston	67	44.8	55.2	0
2. New York	83	71.1	29.9	0
3. Philadelphia	284	43.3	56.7	0
4. Atlanta	736	27.6	72.4	0
5. Chicago	524	31.9	68.1	0
6. Dallas	502	22.5	61.2	16.3
7. Kansas City	412	11.4	73.5	15.1
8. Denver	290	8.6	30.3	61.0
9. San Francisco	93	45.2	32.3	22.6
10. Seattle	135	17.8	56.3	25.9

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

Table 3.4
Distribution of Metropolitan and Non-Metropolitan Counties by HHS Region

HHS Region	Percentage Distribution of Counties by Location						
	Metropolitan		Non-Metropolitan				
	Large	Small	Adjacent, City	Adjacent, No City	Remote, City	Remote, Town	Remote, No Town
All Regions	9.9	16.8	8.1	24.0	7.5	17.6	16.3
1. Boston	14.9	29.9	13.4	16.4	7.5	11.9	6.0
2. New York	42.2	28.9	8.4	13.3	4.8	2.4	0
3. Philadelphia	19.4	23.9	6.0	27.1	3.2	11.6	8.8
4. Atlanta	6.5	21.1	7.5	29.9	6.5	15.2	13.3
5. Chicago	13.4	18.5	11.8	24.4	7.3	14.9	9.7
6. Dallas	6.6	15.9	10.6	28.5	7.6	19.9	11.0
7. Kansas City	4.4	7.0	4.9	19.4	9.5	24.5	30.3
8. Denver	3.1	5.5	1.7	15.9	9.7	22.1	42.1
9. San Francisco	23.7	22.6	10.8	17.2	5.4	16.1	4.3
10. Seattle	6.7	11.1	9.6	12.6	14.1	26.7	19.3

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

Populations and Demographics

The differences in average populations for metropolitan, non-metropolitan, and frontier counties and changes in levels over time reported in Table 3.5 are well known. The overall average metropolitan county population is 10 times that of the overall average non-metropolitan counties, and large metropolitan counties have much larger populations than small metropolitan counties. Similar contrasts are seen between non-metropolitan counties with and without cities of 10,000 or more. In addition, both larger and smaller counties adjacent to MSAs have larger populations than their remote counterparts. The sparse populations in frontier counties also are seen clearly in these numbers. Annual compounded growth rates from 1990 to 1997 were slightly higher for metropolitan counties than non-metropolitan counties. Two exceptions were adjacent non-metropolitan counties with no city of 10,000 or more and frontier counties, for both of which populations increased an average of 1.2 percent annually (similar to increases for metropolitan counties).

Table 3.5
Average Total Population by Metropolitan, Non-Metropolitan, and Frontier Counties

	Average County Total Population			Annual Percent Change 90-97
	1990	1993	1997	
Metropolitan—all counties	242,100	251,400	261,200	1.1%
Large counties	407,500	421,900	437,700	1.0
Small counties	144,500	150,700	156,900	1.2
Non-metropolitan—all counties	22,300	23,000	23,800	0.9
Adjacent, city 10,000+	54,300	55,900	57,800	0.9
Adjacent, no city 10,000+	19,800	20,500	21,500	1.2
Remote, city 10,000+	42,400	43,700	44,800	0.8
Remote, town 2,500-10,000	17,500	17,900	18,400	0.7
Remote, no town	6,600	6,700	6,900	0.6
Frontier counties				
Non-metro, not frontier	25,600	26,300	27,300	0.9
Frontier	6,000	6,200	6,500	1.2

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Change in average county population is measured as average compounded annual percentage change from 1990 to 1997.

Contrasts in average per capita incomes for metropolitan and non-metropolitan counties are documented in Table 3.6. Residents of large metropolitan counties had the highest per capita incomes, with those for small metropolitan counties being somewhat smaller. Non-metropolitan residents had lower incomes than residents of either large or small metropolitan areas. Yet per capita incomes for larger non-metropolitan counties grew slightly more than 4 percent annually from 1990 to 1997, which were similar to growth rates for metropolitan per capita incomes. Income increased more slowly for non-metropolitan counties without a city of 10,000 or more, with growth rates of 3.8 for counties adjacent to metropolitan areas, 3.9 percent for remote counties with a town, and 2.2 percent for counties with no town. Per capita incomes for frontier counties were reasonably high in 1990 but increased only 1.1 percent annually.

Table 3.6
Average County per Capita Income by Metropolitan, Non-Metropolitan,
and Frontier Counties

	Average County Total Population			Annual Percent Change 90-96
	1990	1993	1996	
Metropolitan				
Large counties	\$19,290	\$21,110	\$25,020	4.4%
Small counties	16,090	18,100	21,160	4.7
Non-metropolitan				
Adjacent, city 10,000+	14,950	16,630	19,180	4.2
Adjacent, no city 10,000+	13,980	15,370	17,480	3.8
Remote, city 10,000+	14,710	16,490	19,130	4.5
Remote, town 2,500-10,000	14,250	15,780	17,930	3.9
Remote, no town	15,020	16,270	17,140	2.2
Frontier counties				
Non-metro, not frontier	14,040	15,520	17,910	4.1
Frontier	16,550	17,940	17,660	1.1

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Change in county per capita income is measured as average compounded annual percentage change from 1990 to 1996.

In the next two tables, we describe the sizes of the Medicare populations for metropolitan, non-metropolitan, and frontier counties. The average size of the Medicare populations by county categories, as shown in Table 3.7, mirror those of the total populations. Yet the numbers of Medicare beneficiaries have grown at faster rates than total populations, and growth rates for non-metropolitan areas are similar to those for metropolitan areas. The fastest increase in Medicare populations of 2.0 percent annually occurred in small metropolitan counties. As shown in Table 3.8, Medicare beneficiaries are a larger share of non-metropolitan populations, compared to metropolitan populations, and the largest percentages are in the most remote counties with no towns.

Table 3.7
Number of Medicare Beneficiaries by Metropolitan and Non-Metropolitan Counties

	Average Number of Medicare Beneficiaries			Annual Percent Change 90-97
	1990	1993	1997	
Metropolitan				
Large counties	52,300	54,520	57,270	1.3
Small counties	20,280	21,600	23,230	2.0
Non-metropolitan				
Adjacent, city 10,000+	8,530	8,940	9,420	1.4
Adjacent, no city 10,000+	3,360	3,540	3,760	1.6
Remote, city 10,000+	6,520	6,830	7,210	1.4
Remote, town 2,500-10,000	3,140	3,300	3,400	1.1
Remote, no town	1,270	1,300	1,400	1.4
Frontier counties				
Non-metro, not frontier	4,280	4,480	4,720	1.4
Frontier	950	990	1,050	1.4

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Change in average number of Medicare beneficiaries is measured as average compounded annual percentage change from 1990 to 1997.

Table 3.8
Medicare Beneficiaries as a Percentage of Total Population, by Metropolitan, Non-Metropolitan, and Frontier Counties

	Percentage of Medicare Beneficiaries			Annual Pct. Change 90-97
	1990	1993	1997	
Metropolitan				
Large counties	12.8	12.9	13.1	0.3
Small counties	14.0	14.3	14.8	0.8
Non-metropolitan				
Adjacent, city 10,000+	15.7	16.0	16.3	0.5
Adjacent, no city 10,000+	17.0	17.3	17.5	0.4
Remote, city 10,000+	15.4	15.6	16.1	0.6
Remote, town 2,500-10,000	17.9	18.2	18.5	0.4
Remote, no town	19.3	19.7	20.0	0.5
Frontier counties				
Non-metro, not frontier	16.7	17.0	17.3	0.5
Frontier	15.7	16.1	16.2	0.4

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Change in percentage Medicare population is measured as average compounded annual percentage change from 1990 to 1997.

DISTRIBUTION OF UNDERSERVED AREAS

We begin by examining the distribution of MUAs and HPSAs, which are designated based on demographic and provider supply factors. Table 3.9 shows that 46.3 percent of U.S. counties are designated as whole-county MUAs and 33.3 percent are designated as partial-county MUAs. Smaller percentages are designated as HPSAs. As of 1997, 24.5 percent of counties were whole-county HPSAs, and 38.9 percent were partial-county HPSAs. We see slight increases from 1991 to 1995 in the percentages of counties designated as HPSAs, followed by a decline in designations in 1997.

Table 3.9
Distribution of Medically Under-Served Areas and Primary Care Health Professional Shortage Areas by Metropolitan and Non-Metropolitan Locations

	MUA Counties	Health Professional Shortage Area Counties			
		1991	1993	1995	1997
<i>Number of counties</i>	2,451	1,720	1,857	1,966	1,952
<i>Percentage of all counties*</i>					
Whole counties	46.3	22.7	25.2	25.4	24.5
Partial counties	33.3	33.1	35.2	39.4	38.9
<i>Percentage of Counties:**</i>					
Metropolitan—all counties	77.6	52.5	55.3	59.4	60.8
Large counties	69.0	45.9	49.8	54.8	56.4
Small counties	82.7	56.3	58.5	62.2	63.4
Non-metropolitan—all counties	65.5	57.1	62.2	65.5	64.4
Adjacent, city 10,000+	73.6	41.5	46.3	48.8	49.6
Adjacent, no city 10,000+	84.1	64.5	69.8	74.2	72.5
Remote, city 10,000+	71.3	41.3	48.3	51.7	51.3
Remote, town 2,500-10,000	78.2	52.2	55.7	60.6	61.1
Remote, no town	85.8	66.3	71.9	72.3	69.1
Frontier counties	72.8	69.3	75.2	72.8	72.3

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Total of 3,078 counties excludes independent cities in Virginia and Alaska counties, for which this information was not available on the Area Resource File or other source files.

** The percentages of counties designated as MUAs or HPSAs is the sum of the percentages for whole-county and partial-county areas.

The percentages of MUA and HPSA designations vary by metropolitan, non-metropolitan, and frontier counties. For the sum of whole and partial county designations, metropolitan counties have larger percentages of MUA designations and smaller percentages of

HPSA designations, compared to non-metropolitan counties. In addition, HPSA designations for metropolitan counties increased steadily from 1991 to 1997, while designations in non-metropolitan areas increased markedly from 1991 to 1993 followed by only slight increases in subsequent years. Frontier counties have the largest percentages of both MUA and HPSA designations, with 72.8 percent of frontier counties designated as MUAs and 72.3 percent designated as HPSAs in 1997.

Not shown in the table, non-metropolitan HPSAs generally are evenly distributed between whole county and partial county designations, whereas metropolitan HPSAs are predominantly partial county areas. For example, in 1997, 47.5 percent of non-metropolitan HPSAs were whole-county HPSAs, while only 12.9 percent of the 1997 metropolitan HPSAs were whole-county areas. For MUAs, 69.1 percent of non-metropolitan MUAs were whole-county areas, and 26.7 percent of metropolitan MUAs were whole-county areas. Substantial numbers of counties have been designated as both HPSAs and MUAs. For metropolitan and non-metropolitan counties in 1997, 84.9 percent of counties designated as whole- or partial-county HPSAs also were MUAs, and 67.6 percent of counties designated as whole- or partial-county MUAs also were HPSAs. Smaller overlaps were found for the subset of whole-county areas (78.4 percent of HPSAs also MUAs and 41.5 percent of MUAs also HPSAs).

Within the non-metropolitan counties, MUA and HPSA designations varied with both adjacency to MSAs and the presence or absence of a city of 10,000 or more. The highest percentage of designations as MUAs or HPSAs were found for counties adjacent to an MSA without a city and for the most remote counties without a town. Non-metropolitan counties with a city had smaller percentages of designations than other non-metropolitan counties. Within the non-metropolitan counties with a city of 10,000 or more, the remote counties had relatively more HPSA designations than those adjacent to MSAs, and the differences grew over time. These differences have existed since the 1991 designations.

SUPPLY OF PROVIDERS

An important factor in determining access to care and utilization rates by non-metropolitan beneficiaries is the local supply of providers. In this section, we use ARF data and HRSA data on MUA designations to describe provider supplies in metropolitan, non-metropolitan, and frontier areas. We summarize the numbers of patient care physicians,

hospitals, skilled nursing facilities, nursing homes, home health agencies, and rural health clinics, as reported in the Area Resource File. This information provides a foundation for our analyses of factors influencing the levels of county-level AAPCC rates.

The well-known contrasts between metropolitan and non-metropolitan counties in the supplies of physicians and hospitals are documented in Table 3.10, with comparisons across the metropolitan, non-metropolitan, and frontier county categories. Using 1997 data for physicians and 1996 data for hospitals, of provider supply is measured both as counts of providers and the number of providers per 100,000 total county population. Hospital supply is measured as number of hospitals as well as number of hospital beds. The expected metropolitan/non-metropolitan differences in counts of providers were found, with metropolitan counties having much larger numbers of physicians, hospitals, and hospital beds than non-metropolitan counties. Frontier counties had the smallest numbers of providers.

Table 3.10
Supply of Physicians and Hospitals, by Metropolitan, Non-Metropolitan,
and Frontier Counties, 1996 or 1997

	<u>Patient Care Physicians</u>		<u>Short-Stay Hospital Services</u>			
			<u>Facilities</u>		<u>Beds</u>	
	Number	Ratio*	Number	Ratio*	Number	Ratio*
Metropolitan						
Large counties	1,185	270	5.1	1.2	1,360	313
Small counties	347	221	2.5	1.6	558	359
Non-metropolitan						
Adjacent, city 10,000+	70	122	1.6	2.7	189	328
Adjacent, no city 10,000+	16	75	0.9	4.0	59	279
Remote, city 10,000+	76	170	1.5	3.3	193	432
Remote, town 2,500-10,000	17	91	1.1	6.1	73	396
Remote, no town	4	54	0.6	8.8	29	418
Frontier counties						
Non-metro, not frontier	29	91	1.1	4.4	94	393
Frontier	5	54	0.7	12.3	32	546

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: 1997 data for physicians and 1996 data for hospitals in the Area Resource File. Under the frontier county groupings, the "non-metropolitan not-frontier" counties are all non-metropolitan counties that do not qualify as frontier.

* Ratio = number of providers, hospitals, beds per 100,000 total county population.

We found quite different patterns for physician and hospital supplies when measured based on the size of the populations served. For physicians, metropolitan counties had well over 200 physicians per 100,000 population, which were two to four times the ratios for non-metropolitan counties. Within non-metropolitan counties, the average physician supply ratio for counties with a city of at least 10,000 was twice those for the counties with smaller towns or no towns. The frontier county ratio was a low 54 physicians per 100,000 population, mirroring that of the most remote counties with no town.

By contrast, the ratios of hospitals per 100,000 population for non-metropolitan counties were consistently larger than those for metropolitan counties, and the ratios of hospital beds in non-metropolitan counties were equal to or larger than those for metropolitan counties. As discussed in Section 2, these ratios reflect the small populations in the denominators for these counties. Even though the numbers of institutional providers in non-metropolitan counties were small, they still represented substantial supply relative to the small resident population. The ratios of staffed hospital beds per 100,000 population would be smaller than the ratios reported here for licensed beds, and they would more accurately reflect operating capacity. We expect, however, that comparisons across county categories would not change substantially.

The supply patterns for skilled nursing facilities (SNFs), SNF beds, and home health agencies were similar to those observed for hospitals and hospital beds, although there were larger numbers of SNFs and home health agencies than hospitals.² As shown in Table 3.11, the numbers of SNF facilities and beds, as well as the numbers of home health agencies, were larger in metropolitan than non-metropolitan counties, and they were largest in the large metropolitan counties. The ratios per 100,000 population for SNFs and home health agencies were higher in non-metropolitan counties than the ratios for metropolitan counties, similar to the pattern found for hospitals. However, we see quite different supply patterns in non-metropolitan counties for SNF beds and hospital beds.

Comparing counties adjacent to MSAs to the remote non-metropolitan counties, the adjacent counties had smaller ratios of hospital beds than remote counties, but the ratios of SNF

² Skilled nursing services and other nursing home services differ in their goals and nature of care. Patients are given skilled nursing care to improve their health and functional status after an illness or health care event (e.g.

beds were quite similar for the two county groups. In addition, within the non-metropolitan counties adjacent to MSAs, the counties without a city of at least 10,000 had smaller ratios of hospital beds but larger ratios of SNF beds than the other counties. The remote counties with a town of 2,500 were found to have the lowest ratio of hospital beds but the highest ratio of SNF beds. Both of these findings point to relatively greater supplies of SNF beds in non-metropolitan counties in 1994, especially in the counties without a city of 10,000. Of interest, frontier counties had the highest supply ratios for SNFs and home health agencies, but they have relatively fewer SNF beds than the non-metro non-frontier counties (596 beds per 100,000 population compared to 661 beds for other non-metropolitan counties).

Table 3.11
Supply of Skilled Nursing and Home Health Providers, by Metropolitan, Non-Metropolitan, and Frontier Counties, 1994

	Skilled Nursing Services				Home Health Agencies	
	Facilities		Beds			
	Number	Ratio*	Number	Ratio*	Number	Ratio*
Metropolitan						
Large counties	16.6	3.9	2,153	506	9.5	2.2
Small counties	7.3	4.8	847	555	4.7	3.1
Non-metropolitan						
Adjacent, city 10,000+	3.6	6.3	365	648	2.2	3.9
Adjacent, no city 10,000+	1.5	7.4	139	672	0.9	4.6
Remote, city 10,000+	2.9	6.6	283	641	2.2	5.0
Remote, town 2,500-10,000	1.4	8.0	283	678	1.4	7.5
Remote, no town	0.6	9.2	123	640	0.6	8.3
Frontier counties						
Non-metro, not frontier	1.9	7.1	176	661	1.3	5.1
Frontier	0.6	9.6	37	596	0.6	9.5

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Ratio = number of providers per 100,000 county population

The remaining provider supplies we examined were nursing homes and rural health clinics, which are reported in Table 3.12. As expected, metropolitan counties had larger numbers of nursing homes and nursing home beds. However, the differences in the numbers were not as large as they were for hospitals or SNFs. Therefore, when expressed as ratios per 100,000

after a stroke), whereas other nursing home services provide maintenance support for patients whose health status is not likely to improve.

population, we find the non-metropolitan counties had substantially larger supplies of nursing homes and nursing home beds than metropolitan counties, relative to the sizes of their populations. Within the non-metropolitan counties, the counties adjacent to an MSA had lower ratios of both nursing homes and nursing home beds than the remote non-metropolitan counties, and frontier counties had ratios similar to those for the smaller remote non-metropolitan counties.

By definition, rural health clinics (RHC) are providers in underserved non-urbanized locations. Therefore, we expect to see the lower numbers and ratios of RHCs in metropolitan counties presented in Table 12. The fact that some RHCs are found in metropolitan counties reminds us that the geographic criterion for designation of these clinics is "located outside of urbanized areas" rather than "in a non-metropolitan county." Non-metropolitan counties in all five categories had similar numbers of RHCs, averaging 0.8 RHCs per county. When expressed as ratios, the non-metropolitan counties without a city of 10,000 had higher ratios, with the highest ratio being 9.8 RHCs per 100,000 population for the most remote counties without a town. The frontier counties also had a high ratio of 9.2, which is consistent with the role of the RHCs to improve access to care for Medicare beneficiaries in remote areas.

Table 3.12
Supply of Nursing Homes and Rural Health Clinics, by Metropolitan,
Non-Metropolitan, and Frontier Counties, 1994

	Nursing Home Services				Rural Health Clinics	
	Facilities		Beds		Number	Ratio*
	Number	Ratio*	Number	Ratio*		
Metropolitan						
Large counties	3.1	0.7	308	72	0.2	0.1
Small counties	2.0	1.3	200	131	0.5	0.3
Non-metropolitan						
Adjacent, city 10,000+	1.5	2.7	133	235	0.7	1.3
Adjacent, no city 10,000+	0.9	4.4	70	336	0.8	3.7
Remote, city 10,000+	1.4	3.2	124	281	0.8	1.7
Remote, town 2,500-10,000	1.0	5.4	73	406	0.8	4.6
Remote, no town	0.6	8.9	36	531	0.7	9.8
Frontier counties						
Non-metro, not frontier	1.1	4.1	86	323	0.8	3.0
Frontier	0.4	6.7	21	343	0.6	9.2

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Ratio = number of providers per 100,000 county population

Section 4.

1990-1997 TRENDS IN AAPCC CAPITATION RATES

The AAPCC rates that HCFA published each year through 1997 were set at 95 percent of the adjusted average per capita costs for Medicare fee-for-service beneficiaries. These rates were the basis for capitation payments to Medicare health plans, which were risk adjusted using demographic factors. The AAPCC rates were replaced in 1998 by the new capitation rates established by the BBA of 1997. The 1997 AAPCCs were the baseline capitation rates for calculation of these new capitation rates. The BBA also mandated an improved risk adjustment methodology, which began being used in 2000.

Our analyses of the AAPCC rates provides a historical summary of trends in the rates that were in use before the current capitation policy was put in place. Furthermore, by anchoring the analyses on the 1997 AAPCC rates, we will be able to contribute to a more detailed understanding of the factors that influenced the baseline rates that will drive Medicare capitation rates for some time to come.

DISTRIBUTIONS OF AAPCC RATES

Trends in AAPCC rates were compared across the defined county categories for each of our three AAPCC measures: average AAPCC rates, the Part A share of the AAPCCs, and the volatility of the AAPCCs over time. Relationships between AAPCC rates and several measures of county demographics and provider supply were examined, estimating multivariate models of determinants of AAPCCs. We also examined 1997 enrollment rates for Medicare health plans, with comparisons to 1993 enrollments, to assess the extent to which Medicare managed care had a presence in non-metropolitan locations. We present the results of this research below.

Levels of AAPCCs Over Time

In the first step of our analysis of trends in AAPCC capitation rates, we compare levels of AAPCCs over time for several groupings of counties. First, we compare average AAPCCs for metropolitan, non-metropolitan, and frontier counties. Then we perform similar comparisons by

region. Finally, we compare AAPCCs for HPSA and MUA counties, also categorized by metropolitan, non-metropolitan, and frontier categories.

The well-known differences in AAPCC rates for metropolitan and non-metropolitan counties are documented in Table 4.1, which presents average AAPCC rates for 1990, 1994, and 1997. These averages are weighted by the number of Medicare beneficiaries residing in each county. For each year, the overall average AAPCC rates for metropolitan counties were \$100 higher than those for non-metropolitan counties. The large metropolitan counties had the highest AAPCC rates, averaging \$349 in 1990 and increasing to \$535 in 1997. Within the non-metropolitan counties, differences in AAPCC rates for counties adjacent to MSAs and remote counties became larger over time. In 1990, rates were similar for all five categories of non-metropolitan counties, ranging from \$243 to \$232 (a difference of 4.7 percent).

Table 4.1
Average AAPCC Capitation Rates, by Metropolitan, Non-Metropolitan,
and Frontier Counties, 1990, 1994 and 1997

	Average AAPCC Rates (weighted by Medicare population)			Annual Percentage Change
	1990	1994	1997	1990-1997
Metropolitan	320	407	493	6.4
Large counties	349	446	535	6.3
Small counties	275	351	432	6.7
Non-metropolitan	238	306	386	7.2
Adjacent, city 10,000+	243	317	399	7.3
Adjacent, no city 10,000+	239	308	391	7.3
Remote, city 10,000+	235	299	374	6.9
Remote, town 2,500-10,000	233	297	376	7.0
Remote, no town	232	295	374	7.0
Frontier counties				
Non-metro, not frontier	237	306	387	7.3
Frontier	244	296	356	5.5

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Change in average AAPCC rates is measured as average compounded annual percentage change from 1990 to 1997.

By 1997, AAPCC rates ranged from \$399 for adjacent counties with a city of at least 10,000 to \$374 for the more remote counties (a difference of 6.7 percent). The average AAPCC rate of \$244 for frontier counties in 1990 was as high as the average AAPCC for non-

metropolitan counties adjacent to an MSA with a city, but by 1997, the \$356 average AAPCC rate for frontier counties was the lowest of all county groups.

The differences in the 1990 and 1997 AAPCC rates are the result of differing rates of increase in AAPCCs for metropolitan and non-metropolitan counties during this time period. Overall, AAPCCs for non-metropolitan counties increased at a compounded rate of 7.2 percent annually, compared with an average 6.4 percent increase for metropolitan counties. The AAPCCs for non-metropolitan counties adjacent to MSAs grew fastest at 7.3 percent annually. The lowest rate of growth was an average 5.5 percent annually for the frontier counties.

One measure of the variation in AAPCC rates for metropolitan and non-metropolitan counties is the range of AAPCCs across counties within each category. In 1997, the AAPCCs for metropolitan counties ranged from \$256 to \$767, and the AAPCCs for the large metropolitan counties tended to be higher within that range, but varying substantially from \$283 to \$767. For non-metropolitan counties, the AAPCCs ranged from \$221 to \$693, with similarly wide ranges within each of the five categories of counties.

In Table 4.2, we find variation among regions in the average levels of AAPCC rates and the rates at which they increased over time. The San Francisco region had the highest rates in 1990 for both metropolitan and non-metropolitan counties. The New York and Philadelphia regions also had high metropolitan AAPCC rates, and non-metropolitan rates were high in the Philadelphia region. Annual increases in the metropolitan AAPCC rates ranged from a high of 7.5 percent for the Dallas region to a low of 4.3 percent for the Seattle region. Increases for non-metropolitan counties ranged from 8.7 percent for the Atlanta region to 4.7 percent for the Seattle region. These variations in AAPCC rate increases yielded a different regional distribution of rates by 1997. The New York region had the highest average AAPCC rate for metropolitan counties in 1997, followed closely by the San Francisco and Philadelphia regions. At the same time, regional average AAPCC rates for non-metropolitan counties changed noticeably between 1990 and 1997, resulting in the Philadelphia region having the highest average rate in 1997, followed by the Atlanta region.

Table 4.2
Average AAPCCs for Metropolitan, Non-Metropolitan, and Frontier Counties
by HHS Region, 1990 and 1997

Region	Average AAPCCs								
	Metropolitan Counties			Non-Metropolitan Counties (not Frontier)			Frontier Counties		
	1990	1997	Change	1990	1997	Change	1990	1997	Change
1. Boston	\$305	\$495	7.2%	\$237	\$372	6.7%	0	0	--
2. New York	332	543	7.3	231	367	6.8	0	0	--
3. Philadelphia	333	510	6.3	262	423	7.1	0	0	--
4. Atlanta	297	487	7.3	232	416	8.7	0	0	--
5. Chicago	318	472	5.8	233	361	6.5	0	0	--
6. Dallas	291	483	7.5	240	401	7.6	243	360	5.8
7. Kansas City	301	436	5.4	220	343	6.5	228	353	6.4
8. Denver	276	409	5.8	232	343	5.7	248	352	5.1
9. San Francisco	365	522	5.2	266	403	6.1	257	386	6.0
10. Seattle	288	387	4.3	258	355	4.7	236	337	5.6

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Averages are weighted by the Medicare population in each county. There are no frontier counties in the eastern regions. Change in average AAPCC rates is measured as average compounded annual percentage change from 1990 to 1997.

Some regional differences in AAPCC rates were found for frontier counties. The San Francisco region had the highest average rate in both 1990 and 1997. The frontier counties in the Denver region also had high AAPCC rates during the 1990s, but with the lowest rate of increase over time (of 5.1 percent annualized), frontier counties in this region had the lowest AAPCC rates by 1997. This finding is notable given the large percentage (61.0 percent) of counties in the region that qualify as frontier counties (see Table 3.3).

Average AAPCC rates for counties designated as HPSAs or MUAs are presented in Table 4.3 for the years 1990, 1994, and 1997. These rates are grouped by metropolitan, non-metropolitan, and frontier categories, and comparisons are provided for counties within each category that were not designated as a HPSA (or MUA) or were whole-county or partial-county designations. We observe some similar patterns in AAPCC rates for the HPSA and MUA counties. Among the metropolitan counties, the counties designated as partial-county HPSAs or MUAs had the highest average AAPCC rates for all three years reported. The whole-county HPSAs or MUAs had the lowest rates (with the exception of the metropolitan MUA counties in 1997 which had the same rates as non-MUA counties).

Table 4.3
Average AAPCC Capitation Rates, by Metropolitan and Non-Metropolitan Shortage Areas, 1990, 1994, and 1997

	Average AAPCC Rates (weighted by Medicare population)			Annual Percentage Change 1990-1997
	1990	1994	1997	
<i>Health Professional Shortage Areas</i>				
	(1991 HPSA)	(1993 HPSA)	(1997 HPSA)	
Metropolitan				
Whole County	\$283	\$365	\$437	6.4%
Partial County	330	417	505	6.3
Not HPSA	296	384	457	6.4
Non-metropolitan				
Whole County	235	310	396	7.7
Partial County	241	305	385	6.9
Not HPSA	236	305	381	7.1
Frontier				
Whole County	250	294	349	4.9
Partial County	241	294	354	5.6
Not HPSA	246	302	368	5.9
<i>Medically Under-Served Areas</i>				
Metropolitan				
Whole County	278	365	458	7.4
Partial County	327	415	502	6.3
Not MUA	294	377	458	6.5
Non-metropolitan				
Whole County	237	310	400	7.8
Partial County	238	303	376	6.8
Not MUA	238	301	373	6.6
Frontier				
Whole County	242	287	346	5.2
Partial County	247	297	362	5.6
Not MUA	246	309	367	5.9

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

* Change in average AAPCC rates is measured as average compounded annual percentage change from 1990 to 1997.

Among the non-metropolitan counties, the average 1990 AAPCC rates were similar for whole-county, partial-county, and non-designated counties, but the rates diverged between 1990 and 1997. For HPSA designations in non-metropolitan counties, the 1997 average AAPCC rate was highest for counties designated as partial-county HPSAs and lowest for non-HPSA counties. For MUA designations in non-metropolitan counties, the counties designated as whole-county MUAs had the highest average AAPCC rate in 1997, and the partial-county MUAs and non-

designated counties had similar rates. Finally, among the frontier counties, the average AAPCC rates also were similar in 1990, diverging over time such that the non-designated frontier counties had the highest AAPCC rates for both the HPSA and MUA designations.

Part A Share of AAPCC Capitation Rates

The second aspect of the AAPCC rates that we examined was variations across counties in the shares of the rates that are attributable to Part A and Part B per capita spending in fee-for-service Medicare. We also wanted to assess the extent to which these shares may have changed over time, as the outpatient and inpatient service mix changed across the country. The measure we used for this analysis was the Part A AAPCC expressed as a percentage of the total AAPCC (the sum of Part A and Part B amounts).

As shown in Tables 4.4 and 4.5, there have been few difference across metropolitan, non-metropolitan, and frontier counties in the average Part A share of the AAPCC rates. The Part A share increased slightly from 1990 to 1997 for all categories of counties, and they also converged over that time period. In 1990, the Part A shares were an average 60.9 percent of total AAPCCs for large metropolitan counties and a higher 64.1 percent for remote non-metropolitan counties with no town (a difference of 5.2 percent). In 1997, the shares were an average 65.4 percent of total AAPCCs for large metropolitan counties to 65.9 percent for remote counties with no town (only 0.8 percent difference). The 1997 Part A shares for individual counties varied moderately from those averages, ranging from 51.5 percent to 77.5 percent for metropolitan counties and from 48.9 percent to 80.5 percent for non-metropolitan counties.

Table 4.4
**Part A Share of AAPCC Capitation Rates, by Metropolitan,
 Non-Metropolitan, and Frontier Counties, 1990, 1994 and 1997**

	Percentage of AAPCC for Part A Costs		
	1990	1994	1997
Metropolitan			
Large counties	59.0%	64.0%	65.4%
Small counties	60.9	63.5	64.9
Non-metropolitan			
Adjacent, city 10,000+	60.9	64.1	65.8
Adjacent, no city 10,000+	62.7	64.5	65.7
Remote, city 10,000+	61.7	64.0	65.6
Remote, town 2,500-10,000	62.6	64.0	65.7
Remote, no town	64.1	65.1	65.9
Frontier counties			
Non-metro, not frontier	62.1	64.3	65.7
Frontier	62.8	64.2	65.5

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Averages are weighted by the Medicare population in each county.

We might expect the Part A share to decrease as hospital inpatient utilization declined and outpatient activity increased, yet we found an increase in the Part A share. This finding suggests that any decline in hospital inpatient activity was more than offset by increased utilization of other Part A services. The increase in use of skilled nursing and home health services during this decade could be the source of such an offset.

Looking at counties that are designated as HPSAs or MUAs, few differences in the Part A share of the AAPCCs were found, as reported in Table 4.5. The only consistent pattern found was the slightly higher Part A shares for counties designated as whole-county HPSAs or whole-county MUAs. Yet most of the differences were too small to be important from a policy perspective. The Part A shares increased slightly (1.0 percent or less) for designated and non-designated counties between 1990 and 1997. Among the frontier counties, however, we observe that counties designated as either whole- or partial-county HPSAs or MSAs had lower rates of increases in the Part A share, compared to frontier counties without such a designation.

Table 4.5
Part A Share of AAPCC Capitation Rates, by Metropolitan
and Non-Metropolitan Shortage Areas, 1990, 1994, and 1997

	Average Part A Share of AAPCC Rates			Annual Percentage
	1990	1994	1997	Change
				1990-1997
Health Professional Shortage Areas				
	(1991 HPSA)	(1993 HPSA)	(1997 HPSA)	
Metropolitan				
Not HPSA	60.5%	64.0%	65.4%	1.1
Whole County	63.2	64.6	67.0	0.8
Partial County	59.4	63.7	65.1	1.3
Non-metropolitan				
Not HPSA	62.4	64.4	66.0	0.8
Whole County	63.4	64.8	66.3	0.6
Partial County	61.2	63.8	65.2	0.9
Frontier				
Not HPSA	62.5	64.3	66.1	0.8
Whole County	63.8	64.3	65.5	0.4
Partial County	62.5	64.1	65.1	0.6
Medically Under-Served Area (MUA)				
Metropolitan				
Not MUA	60.7	64.1	64.9	1.0
Whole County	60.5	62.8	64.5	0.9
Partial County	59.6	63.8	65.3	1.3
Non-metropolitan				
Not MUA	61.7	63.4	65.5	0.9
Whole County	62.9	62.7	66.1	0.7
Partial County	61.5	63.6	65.3	0.9
Frontier				
Not MUA	62.0	64.6	66.3	1.0
Whole County	63.6	64.6	65.5	0.4
Partial County	61.9	62.8	64.4	0.6

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Averages are weighted by the Medicare population in each county. Change in average Part A share of AAPCC rates is measured as average compounded annual percentage change from 1990 to 1997.

Volatility of AAPCC Rates

Conceptually, we would expect to see greater volatility in AAPCCs for counties with smaller Medicare populations because a few unpredictable health care events during a year are more likely to affect the average costs estimated for smaller populations. Thus, we are interested in examining the magnitude of year-to-year differences in AAPCCs within each county, as well

as the variation in these differences across counties within each category of metropolitan, non-metropolitan, and frontier counties.

As described in the Methods section, we calculated 5-year average measures of volatility in AAPCC rates for each of the years 1990 through 1995. For example, the volatility measure for 1990 was calculated using AAPCCs for the years 1988 through 1992. The numerator for the measure was the sum of the absolute deviations of the 1988, 1989, 1991, and 1992 AAPCCs from the 5-year average AAPCC for 1988 through 1992 (i.e., centered on 1990). The denominator was the 5-year average AAPCC. These standardized measures of relative volatility can be compared across years because they control for increases in the AAPCC levels over time, thus isolating the volatility effect.

We report in Table 4.6 the means and standard deviations for the relative volatility of AAPCCs, as well as changes in the means from 1990 to 1995. The 1995 AAPCCs for non-metropolitan counties were more volatile than those for metropolitan counties, as shown by the means for the relative volatility measures. Although the differences in means appear small, there was an 11.6 percent difference between the largest non-metropolitan mean (12.1) and the smallest metropolitan mean (10.7) in 1990, and a 15.9 percent difference between the same measures for 1995. Thus, the metropolitan/non-metropolitan differences in AAPCC rate volatility increased between 1990 and 1995. The standard deviations of the volatility measures also were larger for non-metropolitan counties than metropolitan counties for both 1990 and 1995, indicating a wider variation across non-metropolitan counties in AAPCC rate volatility. This variation also is seen in the ranges in AAPCC volatility across individual counties. The relative volatility in the 1995 AAPCCs varied from 1.9 percent to 22.1 percent across metropolitan counties and from 0.5 percent to 28.7 percent across non-metropolitan.

The 1990 AAPCCs for the frontier counties are 8.7 percent ($=10.5/11.5-1$) less volatile than the non-frontier non-metropolitan county AAPCCs, and the 1995 AAPCCs are 18.7 percent less volatile (Table 4.6). Yet the standard deviations of the frontier county volatility measures are 30 percent larger than those for non-frontier non-metropolitan counties. The average volatility findings are the opposite of what we would expect for counties with very small populations.

Table 4.6
Volatility of AAPCC Capitation Rates, by Metropolitan, Non-Metropolitan,
and Frontier Counties, 1990, 1994 and 1997

	Volatility of AAPCC Rates				Annual Percentage Change in Mean 1990-1995
	1990 AAPCC Rates		1995 AAPCC Rates		
	Mean	Std. Dev.	Mean	Std. Dev.	
Metropolitan					
Large counties	10.7	2.1	9.5	2.2	-2.4
Small counties	10.7	2.9	10.1	2.4	-1.1
Non-metropolitan					
Adjacent, city 10,000+	12.1	3.3	10.9	2.9	-2.1
Adjacent, no city 10,000+	11.5	3.4	11.3	3.2	-0.4
Remote, city 10,000+	11.1	3.0	10.7	3.2	-0.7
Remote, town 2,500-10,000	11.3	3.6	11.1	3.5	-0.4
Remote, no town	11.0	4.4	11.2	3.8	0.4
Frontier counties					
Non-metro, not frontier	11.5	3.4	11.2	3.2	-0.5
Frontier	10.5	4.4	9.1	3.7	-2.8

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Averages are weighted by the Medicare population in each county. Change in average volatility of AAPCC rates is measured as average compounded annual percentage change from 1990 to 1997.

Examining this issue with the information in Table 4.7, we found heterogeneity in the sizes of Medicare populations in frontier counties, although all had small numbers of beneficiaries. In addition, we found that the AAPCCs for frontier counties with 300 beneficiaries or less were more volatile than those for other frontier counties, and AAPCCs for counties with 1,200 beneficiaries or more were the least volatile. Furthermore, variation in AAPCC volatility across frontier counties declines with increases in the beneficiary populations, as reflected in the standard deviations for the volatility measures by size category. Thus, although the average AAPCC volatility for frontier counties indeed is lower than those for other non-metropolitan counties, we do find the expected higher volatility related to the “small numbers” within the group of frontier counties.

Table 4.7
Volatility of 1995 AAPCC Capitation Rates for Frontier Counties,
by Size of Medicare Population

	<u>Frontier Counties</u>		<u>Relative Volatility of the 1995 AAPCCs</u>	
	Number	Percentage	Mean	Standard Deviation
All frontier counties	377	100.0	9.1	3.7
Medicare population:				
300 or less	56	14.9	9.8	5.4
301 to 600	75	19.9	9.5	4.5
601 to 900	86	22.8	9.9	4.4
901 to 1,200	57	15.1	9.6	4.1
1,201 or more	103	27.3	8.5	3.1

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Averages are weighted by the Medicare population in each county.

Relationships between AAPCC volatility and HPSA or MUA counties are summarized in Table 4.8, including comparisons by metropolitan, non-metropolitan, and frontier county categories for 1990, 1993, and 1995. Within each category, means and standard deviations for the volatility measure are presented for whole-county and partial-county HPSAs (or MUAs) and for other counties not designated as a HPSA or MUA.

We highlight three findings from Table 4.8. First, for both metropolitan and non-metropolitan counties, the AAPCCs for counties designated as partial-county HPSAs or MUAs were more volatile than those for counties with whole-county designations. Second, the reverse pattern was found for frontier counties in 1990, but these differences fade over time.

Finally, we find contrasting trends between metropolitan and non-metropolitan counties in the rates and directions of change in AAPCC volatility between 1990 to 1995. Average AAPCC volatility decreased for metropolitan counties over time, whether or not they were designated as HPSAs or MUAs, but the strongest decreases were for metropolitan counties designated as whole-county HPSAs or whole county MUAs. Declines in volatility were found to be smaller for non-metropolitan counties regardless of HPSA or MUA designation. Frontier counties had the largest declines in AAPCC volatility from 1990 to 1995, including those for counties designated as whole-county HPSAs (-3.7 percent), whole-county MUAs (-5.1 percent), or not designated as a HPSA (-4.0 percent).

Table 4.8
Volatility of AAPCC Capitation Rates, by Metropolitan
and Non-Metropolitan Shortage Areas, 1990, 1993, and 1995

	Volatility of AAPCC Rates (mean and standard deviation)			Annual Percentage Change
	1990	1993	1995	1990-1995
Health Professional Shortage Areas				
	(1991 HPSAs)	(1993 HPSAs)	(1995 HPSAs)	
Metropolitan				
Whole County	10.5 (2.5)	11.6 (2.9)	9.9 (2.3)	-1.2
Partial County	13.9 (3.6)	12.6 (3.2)	11.9 (2.8)	-3.1
Not HPSA	10.7 (2.3)	11.4 (2.8)	9.6 (2.3)	-2.1
Non-metropolitan				
Whole County	11.5 (3.3)	11.3 (3.1)	10.9 (3.0)	-1.1
Partial County	12.4 (3.8)	11.9 (3.4)	12.3 (3.7)	-0.2
Not HPSA	11.0 (3.3)	10.5 (3.3)	10.7 (3.1)	-0.6
Frontier				
Whole County	11.0 (3.6)	8.4 (3.8)	9.1 (3.9)	-3.7
Partial County	9.4 (4.5)	8.6 (3.8)	9.2 (4.0)	-0.4
Not HPSA	10.8 (4.7)	8.6 (3.6)	8.8 (3.4)	-4.0
Medically Under-Served Area (MUA)				
Metropolitan				
Whole County	10.4 (3.0)	11.4 (3.2)	9.8 (2.7)	-1.2
Partial County	13.0 (3.4)	12.9 (3.1)	11.5 (3.1)	-2.4
Not MUA	10.6 (2.9)	11.5 (2.9)	10.0 (2.5)	-1.2
Non-metropolitan				
Whole County	11.0 (3.7)	10.0 (3.5)	10.2 (3.5)	-1.5
Partial County	11.7 (4.0)	11.4 (3.8)	11.8 (4.0)	0.2
Not MUA	10.4 (3.5)	10.2 (3.4)	10.3 (3.1)	-0.2
Frontier				
Whole County	12.5 (4.5)	8.9 (4.1)	9.6 (5.1)	-5.1
Partial County	9.7 (4.5)	9.0 (4.3)	9.6 (4.5)	-0.2
Not MUA	9.3 (3.7)	7.6 (3.3)	9.2 (3.6)	-0.2

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Averages are weighted by the Medicare population in each county.

DETERMINANTS OF AAPCC LEVELS

In this multivariate analysis, we build upon results of the bivariate analyses to estimate the independent contributions of various factors to levels of AAPCC rates in metropolitan, non-metropolitan, and frontier counties. Because the AAPCCs are derived from historical Medicare health care spending for fee-for-service beneficiaries, this analysis allows us to estimate the relative importance of various factors on these spending patterns. These analyses provide useful information in their own right, and they also will provide a foundation for subsequent work to

estimate the relative contributions of Medicare special payments to non-metropolitan providers to overall levels of the 1997 AAPCC rates.

Using weighted least squares regression methods, we estimated three separate models with the 1997 AAPCC rates as the dependent variables and an array of county-level geographic, demographic, and provider supply variables as the predictors. The first model includes all counties in our analysis, which allows us to make direct comparisons of effects on Medicare fee-for-service spending across all metropolitan and non-metropolitan counties. The second and third models are estimated separately for metropolitan and non-metropolitan counties. This approach allows us to “free” all the coefficients on predictor variables to test the extent to which the effects of predictors differ within metropolitan and non-metropolitan county groups.³

The results of the three regression models, presented in Table 4.9, reveal some clear contrasts between metropolitan and non-metropolitan counties in the factors associated with variations in AAPCC rates. Differences in the predictive power of the models highlight these differences, where both the all-county and metropolitan models explain more than 40 percent of the variation in AAPCCs across counties, but the non-metropolitan model explains only 13.6 percent of the variation. These results indicate there are other important determinants of Medicare costs for non-metropolitan fee-for-service beneficiaries that remain unmeasured, which may include health care preferences of the beneficiaries, access issues, and possibly the contributions of Medicare special payments for non-metropolitan providers. We plan to revisit these models later in the project with additional variables on special payments, as another approach to assessing their contribution to the AAPCC rates.

Differences that the bivariate analyses identified in AAPCC rates across county categories were present in the regression estimates for all three regression models. The reference (omitted) county category variable for the all-county and metropolitan models was the small metropolitan county; for the non-metropolitan model it was the remote county with no town. We found higher AAPCC rates for large metropolitan counties and smaller rates for all categories of non-metropolitan counties, when compared with the small metropolitan county rates, although

³ In specifying the models, we tested for collinearity among the predictor variables. Although we found some correlations among individual variables, few were correlated so strongly to cause problems for model viability.

the coefficients for the non-metropolitan counties adjacent to MSAs were not statistically significant. Frontier county status did not have a significant effect on AAPCC rates. Effects found in the separate metropolitan and non-metropolitan models were consistent with these all-county model results.

In the model for all counties, designations as HPSAs or MUAs had large positive effects on AAPCC levels, as shown by their large coefficients and strong statistical significance. Other factors that were positively associated with AAPCC rates included the percentage of Medicare beneficiaries and provider-to-population ratios for physicians, hospitals, and home health agencies. In addition, we found a positive interaction effect between physician-to-population ratios and large metropolitan county, yielding a coefficient on the physician ratio variable equal to 0.178 ($=0.050+0.128$) for large metropolitan counties and equal to 0.050 for all other counties. We found significant negative effects for SNF and nursing home supply ratios.

Although statistically significant, the estimated effects of provider ratios tended to be small in size, as reflected in the small coefficients generated. For example, according to estimates for the all-county model, an increase in 10 physicians per 100,000 population would be associated with \$17.80 increase in the AAPCC for a large metropolitan county and an increase of \$5.00 for all other counties. One additional hospital per 100,000 population would be associated with only a \$1.57 increase in the AAPCC.

The unexpected absence of effects for some variables provide useful insights. Neither rural health clinic ratios nor status as a frontier county were significantly associated with AAPCC rates. One might expect to see a positive effect on AAPCCs for rural health clinics—at least in the non-metropolitan model—to the extent they improve access to care and, therefore, utilization rates. On the other hand, residents of frontier counties would be expected to use less health care because of access barriers, which would yield lower AAPCC rates than other non-metropolitan counties.

We selected variables to include in the models from among the identified groups of similar variables (e.g. hospitals versus hospital beds).

Table 4.9
Estimation of Factors Associated With Levels of AAPCC Capitation Rates, 1997

Variable	All Counties		Metropolitan Counties		Non-Metro Counties	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Per capita income	-0.001*	-2.06	-0.001	-1.60	0.007	1.32
Percentage Medicare	2.841***	7.30	4.319***	5.30	0.301	0.82
Physician ratio	0.050**	2.69	0.043	1.27	0.031	1.46
Hospital facility ratio	1.574*	1.94	-0.206	-0.05	0.910**	2.40
SNF facility ratio	-5.552***	-11.52	-10.519***	-7.31	-2.566***	-9.48
Nursing home ratio	-3.794***	-8.58	-7.846***	-4.01	-2.306***	-10.33
Home health agency ratio	1.459**	3.07	3.553*	2.26	0.945***	3.75
Rural health clinic ratio	0.274	0.60	-2.636	-0.75	0.228	1.10
Whole county MUA	29.093***	5.27	25.841*	1.94	29.717***	7.54
Partial county MUA	29.153***	7.32	33.306***	4.02	5.028	1.41
Whole county HPSA	21.617**	2.95	31.767	1.40	6.976	1.68
Partial county HPSA	18.128***	5.56	20.345***	3.05	-4.112	-1.40
Large metro county	72.399***	12.44	69.412***	6.51		
Adjacent, city 10,000+	-0.250	-0.02			21.297***	3.31
Adjacent, no city 10,000+	-16.644	-1.87			12.441*	2.10
Remote, city 10,000+	-38.771**	-2.79			-5.704	-0.86
Remote, town 2,500+	-35.889**	-2.54			-3.648	-0.61
Remote, no town	-29.377	-1.52			(ref)	
Frontier county	-16.772	-1.12			-21.930***	-3.24
Large metro x MD ratio	0.128***	5.52	0.129**	3.09		
Intercept	375.472***	37.34	383.479***	18.14	364.015***	29.10
Number of observations		3,078		816		2,262
Adjusted R-squared		0.488		0.425		0.136

* p<0.05 ** p<0.01 *** p<0.001

SOURCE: Area Resource File for 1999 with relevant Medicare data added.

NOTE: Weighted least squares regression models with the 1997 AAPCC rates as the dependent variable. Physician ratios Full interaction terms for physician ratios with each county category were tested, but only the statistically significant interactions are reported in the table.

We also found that some variables were significant in only one of the separate metropolitan or non-metropolitan models, although they were significant in the all-county model. For example, the percentage of Medicare beneficiaries and physician-to-population ratios were significant predictors only in the metropolitan model, as were designation as partial-county HPSA or partial-county MUA. The hospital-to-population ratio was significant only for the non-metropolitan model, and the home health agency ratio and designation as a whole county MUA were more strongly significant for the non-metropolitan model than the metropolitan model.

These multivariate results offer useful perspectives on the diversity of factors that influence Medicare AAPCC rates in counties across the country. Yet caution should be used in interpreting these results, especially when attempting to identify direct or indirect “drivers” of Medicare fee-for-service spending for its beneficiaries. Many of the predictor variables in the model must be viewed as proxies for underlying causative factors, the most obvious examples being the county category variables and designations as HPSAs or MUAs. Our goal in the remainder of this research is to help shed additional light on some of these factors as we work with facility and utilization data for beneficiaries residing in non-metropolitan counties.

MEDICARE MANAGED CARE ENROLLMENTS

When considering the levels and distributions of Medicare AAPCC capitation rates across the counties in the country, an important policy implication is the extent to which variations in the AAPCC rates influenced access to health plans and enrollments by Medicare beneficiaries. We use enrollment data for 1993 and 1997 to examine this issue here, which allows us to compare 1997 enrollments across counties, and also to assess how managed care changed in the four years between 1993 and 1997. The data used for the analysis are the quarterly plan enrollment files published by HCFA on its website. We used the files containing year-end enrollments for each of the years of interest.

In Table 4.10 we present Medicare health plan enrollment profiles for 1993 and 1997 for metropolitan, non-metropolitan, and frontier counties, according to the same format used in earlier tables. Two basic enrollment measures are provided for each year: the percentage of counties served by at least one health plan during the year and the percentage of beneficiaries residing in the county who were enrolled in a Medicare health plan. For enrollment rates, we provide an average enrollment across all counties in each category as well as an average across only those counties that had at least one health plan.

The essentially urban nature of Medicare managed care is shown in the enrollment information in Table 4.10. For both years, the percentages of counties with at least one Medicare health plan were much higher for metropolitan counties than non-metropolitan counties, and the metropolitan/non-metropolitan contrast is yet greater for enrollment rates. Overall enrollment rates in 1997 were 18.9 percent for metropolitan county residents and only 3.5 percent for non-metropolitan county residents. Although enrollment rates were lower in 1993, the distribution of

enrollments were the same as for 1997. As might be expected, managed care penetration was low in frontier counties, yet health plans were not total absent from these counties. In 1993, 15.5 percent of frontier counties had at least one health plan, and the percentage rose to 20.1 percent of frontier counties by 1997. Enrollment rates for these counties were similar to those for the remote non-metropolitan counties.

Table 4.10
Medicare Health Plan Enrollments for Metropolitan, Non-Metropolitan,
and Frontier Counties, 1993 and 1997

	1993 Medicare Health Plans			1997 Medicare Health Plans		
	Percentage of Counties with a Plan	Percentage All Counties	Enrollment If at Least 1 Health Plan	Percentage of Counties with a Plan	Percentage All Counties	Enrollment If at Least 1 Health Plan
Metropolitan	66.6	9.2	10.5	84.1	18.9	19.9
Large counties	82.9	12.6	13.2	94.5	24.0	24.2
Small counties	57.0	4.1	5.5	77.9	11.5	13.0
Non-metropolitan	25.7	1.6	4.3	36.7	3.5	6.5
Adjacent, city 10,000+	48.6	1.7	3.0	65.3	5.2	7.1
Adjacent, no city 10K+	27.5	1.5	4.1	42.9	3.9	7.2
Remote, city 10,000+	34.3	2.2	5.8	48.9	3.0	5.4
Remote, town 2,500-10,000	23.3	1.6	5.5	30.6	2.2	5.7
Remote, no town	10.6	1.0	6.1	14.3	1.1	5.1
Frontier counties						
Non-metro not frontier	27.9	1.7	4.3	40.1	3.6	6.6
Frontier	15.5	1.3	4.1	20.1	2.8	7.5

SOURCE: Area Resource File for 1999 with relevant Medicare data added; quarterly enrollment reports for Medicare managed care plans.

Medicare health plan enrollment rates tended to be higher in counties with higher AAPCC rates, as shown in Table 4.11, and this effect was found within each category of metropolitan, non-metropolitan, and frontier counties. For example, the average AAPCC rate was \$418 for large metropolitan counties with no health plans in 1997, while it was \$536 for large metropolitan counties that had at least one health plan. These averages are weighted by the number of Medicare beneficiaries residing in each county, who could enroll in a health plan if one were available. We also estimated AAPCC rates for counties with at least one plan, weighting by the number of plan enrollees, to examine the enrollee distributions by level of AAPCC. To continue the example of large metropolitan counties, we obtain higher average

AAPCC rate of \$542 when weighted by the number of plan enrollees, indicating that enrollments are skewed toward counties with higher AAPCCs.

Table 4.11
Average 1997 AAPCC Rates for Metropolitan, Non-Metropolitan, and Frontier Counties, by the Presence or Absence of a Medicare Health Plan

	No Plan in the County (Beneficiary wt)	<u>One or More Plan in County</u> Beneficiary Weighted	Plan Enrollee Weighted
Metropolitan			
Large counties	\$418	\$536	\$542
Small counties	400	436	453
Non-metropolitan			
Adjacent, city 10,000+	388	403	409
Adjacent, no city 10K+	379	402	418
Remote, city 10,000+	370	377	375
Remote, town 2,500-10,000	368	387	417
Remote, no town	368	394	419
Frontier counties			
Non-metro not frontier	376	396	409
Frontier	354	363	384

SOURCE: Area Resource File for 1999 with relevant Medicare data added; quarterly enrollment reports for Medicare managed care plans.

Finally, we look specifically at the health plans that served Medicare beneficiaries residing in non-metropolitan counties. As of the end of 1997, there were a total of 398 Medicare health plans, of which 229 plans had enrollees living in non-metropolitan counties. This compares to a total of 204 health plans in 1993, of which 103 served non-metropolitan enrollees. In Table 4.12, we present the distributions of the health plans that served non-metropolitan beneficiaries during 1993 and 1997, based on the percentage of urban enrollees in each plan's Medicare membership. In both years, beneficiaries in metropolitan counties were the dominant portion of plan enrollees for all but a small fraction of these health plans. Although more plans served non-metropolitan areas in 1997, their mix of metropolitan and non-metropolitan enrollee was similar to the health plans in 1993. In 1997, Medicare enrollments for 63.8 percent of the plans included 90 percent or more metropolitan beneficiaries, compared to 65.1 percent for plans in 1993.

Despite the predominance of metropolitan enrollees in health plans serving non-metropolitan areas, a small percentage of health plans were drawing most of their enrollees from

residents of non-metropolitan counties. These plans may be viewed as true rural health plans, unlike their counterparts that reached into fringe non-metropolitan counties from a metropolitan enrollment base. In 1997, metropolitan enrollees were less than half the total enrollments for 19 health plans (8.3 percent). Although there were only 8 such plans in 1993, they were 7.8 percent of the plans serving non-metropolitan areas—quite similar to the 1997 share.

Table 4.12
Distributions of Medicare Health Plans Serving Non-Metropolitan Counties,
by Percentage of Metropolitan Plan Enrollees, 1993 and 1997

Percentage of Metropolitan Enrollees	1993 Health Plans		1997 Health Plans	
	Number	Percent	Number	Percent
Less than 40	7	6.8	14	6.1
40-49	1	1.0	5	2.2
50-59	4	3.9	7	3.1
60-69	4	3.9	9	3.9
70-79	6	5.8	14	6.1
80-84	6	5.8	16	7.0
85-89	8	7.8	18	7.9
90-94	4	3.9	26	11.4
95 or More	63	61.2	120	52.4
Total	103	100.0	229	100.0

SOURCE: Area Resource File for 1999 with relevant Medicare data added; quarterly enrollment reports for Medicare managed care plans.

Of the 35 health plans with at least 30 percent non-metropolitan enrollees in 1997, only 11 plans were contracting with HCFA under risk contracts, under which they receive capitation payments based on the AAPCC rates and they bear full financial risk for the health care costs for their Medicare enrollees. The remainder of the plans had cost contracts (11 plans) or Health Care Prepayment Plans (HCPP) contracts (13 plans), where they managed enrollees' health care but did not bear the same financial risk as risk contracting health plans. Given the financial risk involved in covering health benefits for small populations, the health plans appear to have made good use of cost and HCPP contracts to mitigate their risk while serving non-metropolitan populations.

Section 5.

ISSUES AND IMPLICATIONS

The analyses presented in this report are the only ones in this project that make direct comparisons between non-metropolitan and metropolitan areas. We have found these comparisons to be quite important in reinforcing the clear differences in profiles of metropolitan and non-metropolitan counties both with respect to provider supply and mix and in Medicare spending levels for its fee-for-service beneficiaries. These differences have persisted over the past decade, although there has been some convergence in the AAPCC rates for metropolitan counties and counties adjacent to metropolitan counties.

The results of our regression models highlight these contrasts. The models for all counties and for metropolitan counties explained a large percentage of the variation in AAPCC rates across counties, but the model for non-metropolitan counties explained much less. In addition, many factors for the models for all counties and for metropolitan counties had significant effects on AAPCC rates, but far fewer factors were significant in the model for non-metropolitan counties. These results could be interpreted in two ways. There is a reasonable probability that other factors exist that we did not measure but are predictors of AAPCC rates in non-metropolitan areas. On the other hand, the county-level AAPCC rates in non-metropolitan areas may be the net result of such a diversity of local service use patterns that it may not be possible to explain much more of the variation in county rates than our models capture. For example, some remote counties may have many small urbanized locations (communities or cities) within them, each of which has enough providers to support the demand for primary health care, but others may have only one or two urbanized locations that make access more difficult for beneficiaries living outside of those locations. In this example of diversity, two counties could have similar county-level averages of provider supply, but the rates of utilization (and resulting AAPCC rates) would be different.

We also have identified a measurement issue related to the limited clustering of non-metropolitan counties for different types of classification such as categories of non-metropolitan counties, designations as HPSAs and MUAs, and frontier counties. Conceptually, we would expect these counties to converge into a reasonably consistent set of groups based on factors

such as proximity to urban health care or status as underserved areas. We did not find it in this phase of our research. Consistent with this issue, there also were few clear patterns of provider supply among non-metropolitan counties, although numbers of providers clearly are smaller in the remote counties and the counties with no city of at least 10,000 population. For future analyses, therefore, we will continue to explore utilization and cost differences for all these designations.

Positive associations were found between physician and hospital supply and AAPCC rates but negative associations were found for SNFs, nursing homes and home health agencies. Although effects on AAPCCs were small in size, they do suggest that the mix of acute care and post-acute care services in non-metropolitan counties may be an important factor in access to care for Medicare beneficiaries and resulting service utilization and costs. The local mix in these services also would be likely to affect beneficiaries' choices to obtain acute care services locally or from more distant providers.

HPSAs and MUAs are, by definition, underserved areas. Therefore, there should be lower utilization rates by Medicare beneficiaries in these areas, which would be observable in lower AAPCC rates. The absence of strong relationships between AAPCC rates and either MUAs or HPSAs may reflect flaws in the criteria for these designation. For example, the designated areas may not be the most underserved areas, or there may be enough other underserved areas that were not designated to dilute observed differences in AAPCC rates between the two groups. Alternatively, we could hypothesize that these designations indeed had accomplished what was intended—increasing access to care for residents of the designated areas.

Another surprising finding was the weak evidence for both under-supply of providers and low utilization and costs for residents of frontier counties. We pursued examination of frontier counties far enough to confirm that the Medicare populations in these counties are indeed quite small. Yet most of the provider supply measures were similar to those other non-metropolitan counties. Frontier county AAPCCs in 1990 were, on average, similar to AAPCCs for other non-metropolitan counties, but they increased at a slower rate from 1990 to 1997, indicating some differences in trends of access or utilization for their Medicare beneficiaries. One hypothesis that might explain some of these findings is that residents of frontier counties tend to settle in concentrated communities that are surrounded by large areas of unoccupied land. These

communities offer them a support infrastructure that might include a level of health care services that a more dispersed population would not be able to sustain.

The provider supply data in the ARF are aggregated at too high a level to allow further exploration of issues of supply and access specifically for Medicare beneficiaries. We will pursue these issues in later analyses, using Medicare claims to attempt to improve our understanding of access, utilization, and costs for beneficiaries residing in HPSAs, MUAs, and frontier counties.

This set of findings regarding the characteristics of non-metropolitan counties and trends in AAPCC rates for these counties highlight the continuing challenges we will face in identifying and measuring the factors that have contributed to lower service utilization in rural areas compared with urban areas. We used county boundaries for the analysis of historical trends in AAPCC rates because these rates were set at the county level. Yet as we have discussed in this report, it is well understood that county boundaries are a poor choice for defining groups of homogeneous rural areas, especially given the large land areas included in rural counties in many of the states. With each of those land areas there are diverse local communities surrounded by remote areas, each with their unique supply of health care providers and service networks. As we work with utilization data for beneficiaries to analyze the effects of Medicare special payment policies, one of our goals will be to continue to search for systematic patterns of health care based on characteristics of the local non-metropolitan areas, in particular those that are designated as underserved.

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Appendix A.

DEFINITIONS OF RURALITY

Historically, two principal definitions of rural have been used by the Federal government. The first definition is the “urban-rural” classification of populations developed by the Bureau of the Census. The Bureau specifies “urbanized areas” and defines as urban all territory, population, and housing units located in those areas. All other areas not classified as urban are considered to be rural. An urbanized area consists of one or more places plus adjacent fringe areas with a population density of at least 1,000 persons per square mile that together have a minimum of 50,000 persons (Ricketts, et al., 1998).⁴

The second definition is the “metropolitan-non-metropolitan” classification of counties developed by the Office of Management and Budget (OMB). Metropolitan areas contain core counties with one or more central cities of at least 50,000 population or with a Census Bureau-defined urbanized area and a total area population of 100,000 or more, as well as fringe counties that are economically tied to the core counties. All other counties are considered to be non-metropolitan.

Policy analysis and research studies generally have worked with these definitions or adaptations from them, but the populations that are defined as rural differ substantially depending on which definition is used as the basis for classification. Therefore, the choice of definition is an important aspect of study design, and should support the basic research or policy issues being addressed.

For the analyses of Medicare rural payment policies, the county-based definition of metropolitan/non-metropolitan groupings is a useful organization because many Medicare payment policies and related data sources are based on county boundaries. This definition loses much of the granularity of the urbanized area definition, however, which differentiates between

⁴ The primary source for this discussion is a technical report entitled “Definitions of Rurality” by Thomas Ricketts, Karen D. Johnson-Webb, and Patricia Taylor, published by the Federal Office of Rural Health Policy in 1998.

areas with concentrated populations versus more sparsely distributed populations, for which local health care services are likely to be quite different.

Two methods have been available to classify the metropolitan and non-metropolitan counties according to degrees of rurality. The OMB developed the Urban Influence Codes (UICs), and the Department of Agriculture developed the Rural-Urban Continuum Codes (RUCCs). The categories used by these two methods are listed in Table A.1. The methods differ in how they measure a county's urbanized populations for categorizing the county. The UICs work with the size of the largest urbanized area in a county, whereas the RUCCs sum the total population for all urbanized areas in a county. Thus, the RUCCs would classify a county with many urbanized areas with small populations totaling 20,000, but without a city of at least 10,000 population, as more highly urbanized than the UICs would classify that county.

Table A.1
Two Classification Methods for Metropolitan and Non-Metropolitan Counties

Code	Definition
Urban Influence Codes	
1	Large-central and fringe counties of metropolitan areas of 1 million population or more
2	Small-counties in metropolitan areas of fewer than 1 million population
3	Adjacent to a large metropolitan area with a city of 10,000 or more
4	Adjacent to a large metropolitan area without a city of 10,000 or more
5	Adjacent to a small metropolitan area with a city of 10,000 or more
6	Adjacent to a small metropolitan area without a city of 10,000 or more
7	Not adjacent to a metropolitan area and with a city of 10,000 or more
8	Not adjacent to a metropolitan area and with a town of 2,500 to 9,999
9	Not adjacent to a metropolitan area and without a town of at least 2,500
Rural-Urban Continuum Codes	
0	Central counties of metropolitan areas of 1 million population or more
1	Fringe counties of metropolitan areas of 1 million population or more
2	Counties in metropolitan areas of 250,000 to 1 million population
3	Counties in metropolitan areas of fewer than 250,000 population
4	Adjacent to a metropolitan areas, urban population of 20,000 or more
5	Not adjacent to a metropolitan areas, urban population of 2,000 or more
6	Adjacent to a metropolitan areas, urban population of 2,500 to 19,999
7	Not adjacent to a metropolitan areas, urban population of 2,500 to 19,999
8	Adjacent to a metropolitan areas, less than 2,500 urban population
9	Not adjacent to a metropolitan areas, less than 2,500 urban population

SOURCE: Ricketts, Johnson-Webb, and Taylor, 1998.

Rural health researchers tend to prefer the UICs to classify degrees of rurality for non-metropolitan counties because the availability of health service resources is strongly affected by the presence or absence of a city of substantial population. We chose to use the UICs for this analysis, for this reason. However, we recognize that the use of county-level boundaries sacrifices the ability to measure variations in urbanicity within each non-metropolitan county, which weakens our ability to capture effects of related variations in health services and utilization.

The USDA recently released a new definition of “urban” and “rural” areas called the Rural-Urban Commuting Area Codes (RUCAs), which were developed jointly by USDA’s Economic Research Service and the HHS Office of Rural Health Policy. Like the UIC and RUCC systems, the RUCA codes are based on measures of urbanization, population density, and daily commuting. However, this set of 10 codes—3 codes for metropolitan areas and 7 for non-metropolitan areas—uses the much smaller census tract as its base unit instead of the county and metropolitan area. These codes are listed in Table A.2. The primary codes refer to the primary or single largest community share of a census tract. These codes are subdivided “to identify areas where primary flow is local but over 30 percent commute in a secondary flow to a larger area core” (ERS web site on RUCA). The 7 non-metropolitan codes form a unidimensional scale of rurality. Analysts are just beginning to experiment with the RUCAs, and we hope to explore its applicability in subsequent analyses for this project.

Additional information about the various coding methods for classifying areas based on degree of rurality may be found on the web site of the Economic Research Service, US Department of Agriculture (www.ers.usda.gov). Some addresses are listed here for reference.

What Is Rural?	www.ers.usda.gov/Briefing/Rurality/WhatisRural/
Urban Influence Codes	www.ers.usda.gov/briefing/rurality/UrbanInf/
Rural-Urban Continuum Codes	www.ers.usda.gov/briefing/rurality/RuralUrbCon/
Rural-Urban Commuting Area Codes	www.ers.usda.gov/briefing/rural/data/desc.htm
Urbanized Area:	www.ers.usda.gov/briefing/rural/data/urbanar.htm

Table A.2
Rural-Urban Commuting Areas (RUCAs)

Primary Code	Sub-Code	Definition
1		Metropolitan-area core: primary flow within an urbanized area (UA)
	1.0	No additional code
	1.1	Secondary flow 30% to 50% to a larger UA
2		Metropolitan-area high commuting: primary flow 30% or more to a UA
	2.0	Primary flow to a 1.0 UA
	2.1	Primary flow to a 1.1 UA
	2.2	Combined flows to two or more UAs adding to 30% or more
3		Metropolitan-area low commuting: primary flow 5% to 30% to a UA
	3.0	No additional code
4		Large town core: primary flow within a place of 10,000 to 49,999
	4.0	No additional code
	4.1	Secondary flow 30% to 50% to a UA
5		Large town high commuting: primary flow 30% or more to a place of 10,000 to 49,999
	5.0	Primary flow to a 4.0 large town
	5.1	Primary flow to a 4.1 large town
6		Large town low commuting: primary flow 5% to 30% to a place of 10,000 to 49,999
	6.0	No additional code
7		Small town core: primary flow within a place of 2,500 to 9,999
	7.0	No additional code
	7.1	Secondary flow 30% to 50% to a UA
	7.2	Secondary flow 30% to 50% to a large town
	7.3	Secondary flow 5% to 30% to a UA
	7.4	Secondary flow 5% to 30% to a large town
8		Small town high commuting: primary flow 30% or more to a place of 2,500 to 9,999
	8.0	Primary flow to a 7.0 small town
	8.1	Primary flow to a 7.1 small town
	8.2	Primary flow to a 7.2 small town
	8.3	Primary flow to a 7.3 small town
	8.4	Primary flow to a 7.4 small town
9		Small town low commuting: primary flow 5% to 30% to a place of 2,500 to 9,999
	9.0	No additional code
	9.1	Secondary flow 5% to 30% to a UA
	9.2	Secondary flow 5% to 30% to a large town
10		Rural areas: primary flow to a tract without a place of 2,500 or more
	10.0	No additional code
	10.1	Secondary flow 30% to 50% to a UA
	10.2	Secondary flow 30% to 50% to a large town
	10.3	Secondary flow 30% to 50% to a small town
	10.4	Secondary flow 5% to 30% to a UA
	10.5	Secondary flow 5% to 30% to a large town
99		Not coded: Tracts with little or no population and no commuting flows