THE POTENTIAL EFFECTS OF MANAGED

COMPETITION IN RURAL AREAS

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Abstract

This paper assesses the extent to which managed competition could be successful in rural areas. Using 1990 HCFA patient origin data, over eight million rural residents were found to live in areas potentially without provider choice. Almost all of these areas were served by providers who compete for other segments of their market. Restricting use of out of state providers would severely limit opportunities for choice. These findings suggest that most residents of rural United States would receive cost benefits from a managed competition system even if they could not chose their provider, but consideration should be given to boundary issues when forming alliances.

INTRODUCTION

Many of the health care reform bills that were considered during 1993 and 1994 relied on "managed competition" as a mechanism to insure quality while holding down costs. Although the term "managed competition" has come to generically embody many aspects of health care reform, it specifically implies the creation of a constrained competitive market among insurers/providers who contract with some sort of "collective agent".[1] An underlying assumption of this theory is that consumers are provided with a choice of plans and providers, and that through exercising this choice, plans and providers will be forced to compete with each other on both price and quality.

There is debate among researchers and policy makers over the applicability of managed competition to many rural areas. Some have voiced concerns that in rural areas access to health care resources may be too limited to afford any meaningful competition. In examining this issue, Kronick and colleagues[2] determined that 29 percent of the population lived in areas, mostly nonmetropolitan, which were too sparsely populated to support three competitive plans. The authors concluded that these people would not be able to share in the benefits of a health reform plan which was based on managed competition. In addition, another 29 percent of the population lived in areas with enough population density to support competing plans, but these plans would have to share hospital providers. Under the assumption that competition will reduce health care expenditures, this could result in a decreased ability to control costs; 40 percent of national expenditures for health services and

3

supplies in 1991 were devoted to hospital services[3], and the authors suggest that multiple plans offering care through a single hospital provider will not result in meaningful competition.

An alternative view of the impact of managed competition on rural areas focuses on the potential for this model to foster the creation of new health networks and to increase primary care providers in rural areas.[4] Although the managed competition model could benefit rural areas in these ways, significant regulatory intervention on the part of either the collective purchasing agents, or state or federal governments would be necessary to ensure access to affordable care in areas which are too sparsely populated to support provider or plan competition.[5]

When assessing the applicability of managed competition to rural areas, it is important to separate the concepts of provider competition, consumer choice, and collective purchasing, as the first is analyzed from the provider's perspective, the second applies to the consumer, and the provision for collective purchasing will have an impact on both providers and consumers. For example, estimates of the population thresholds necessary to support managed competition suggested by Kronick and colleagues rest on several key assumptions; the most prominent is that the lack of consumer choice of providers automatically results in no benefit from managed competition for that population. Although consumers in some sparsely populated areas may not have a choice of either provider or plans, lack of choice does not necessarily rule out potential benefit from competition if collective purchasing occurs; if price discrimination between consumers served by the same

provider is not allowed, there may still be benefits from a managed competition system as long as the plans or providers are competitive for other segments of their markets. The existence of collective purchasing agents, which will most likely be defined at the state level, could also negatively effect both consumer choice and provider competition if access to providers is restricted by certain boundaries.

To assess the potential for the managed competition model to succeed in rural areas, critical questions need to be addressed. First, to what extent do rural residents currently have a choice of providers? Second, for those individuals with limited provider options, do their local providers compete for other segments of the market? And finally, if state-level health care reform includes some type of collective purchasing agents, what would be the impact on consumer choice and access if restrictions or financial penalties are placed on crossing state boundaries to receive health care?

This study addresses these questions with a focus on inpatient hospital services, because data limitations preclude the analysis of outpatient services. As it is neither possible nor desirable for all rural hospitals to provide highly technical specialty care (such as transplants) the analysis attempts to exclude data which represent extraordinary use. The market for inpatient hospital services is analyzed across two dimensions; the degree of provider choice available, as evidenced by consumer utilization patterns, and, for areas that use only one provider, the extent to which that provider is competitive for other segments of their patient population. Additionally, the reduction in consumer choice which could occur if collective

5

purchasing agents restrict travel across state borders will be examined.

There are a number of ways in which provider availability could be assessed. The easiest and most simplistic method of assessing provider availability is to examine physician-to-population ratios in selected geographic areas. An example of this is provided in Kronick, et al., where ratios were by county aggregates, Metropolitan Statistical Areas, without consideration of actual hospital use that could be identified through patient origin analysis or an assessment of the ability of aggregates of adjacent nonmetropolitan counties to contain sufficient population. Ratio-based estimates of the potential for competition obscure a significant amount of geographic variation in provider types, care-seeking behavior, and barriers to access. An alternative method would be to use overlapping hospital market areas to define the level of consumer choice. Hospital market areas have been defined by a number of different methods, including fixed or variable radius measures or by forming clusters of geographic areas.[6] Within these methodologies, areas served by several hospitals but with small relevance to any hospital are often assigned to a single hospital's market area. Although this assignment may be appropriate from the hospital's perspective, it does not accurately reflect the consumer's choice set. Additionally, areas of little consequence to any given hospital may be disproportionately rural and are particularly important here.

This study analyzes markets based on patient origin data for general hospitals, by assigning ZIP code areas to one or more hospitals based on actual use. These data reflect use patterns that are the result of patient choice and the realities of local

6

physician referral and admitting patterns. Thus, regular inpatient use is an indicator of the choice available to consumers and patients.

DATA SOURCE AND SAMPLE CONSTRUCTION

Data for this study came from the 1990 HCFA Hospital Market Service Area file (HMSA), PPSVII and PPSVIII Capital Data Sets (Medicare cost reports), the AHA Annual Survey of Hospitals Database, and 1990 Census files. The HMSA file provided total number of discharges from each unique patient origin ZIP code/hospital combination. Hospital type was determined from the PPSVII and PPSVIII files, and hospital ZIP codes were obtained from the AHA file. Latitude and longitude of ZIP code centroids, obtained from Atlas Pro® software, were used to compute the approximate distance traveled to receive care. Populations were assigned to each ZIP code area using data from the 1990 Census.

ZIP codes areas were categorized as nonmetropolitan based on the 1990 county designation from the US Office of Management and Budget metropolitan-nonmetropolitan designation system; the term "rural" is used to refer to nonmetropolitan, although that is not strictly consistent with accepted definitions of "rural". Although a designation based on the ZIP code alone would have been preferable, the necessary data were not available. The result of this categorization may be an understatement of the rural population, as rural ZIP code areas which are contained within a county which is designated as metropolitan are excluded from the analysis.[7]

The study sample is comprised of all unique patient origin ZIP code-short-term general hospital combinations for 19,833 nonmetropolitan ZIP code areas in the 48 contiguous United States. Nonmetropolitan ZIP code areas which had no Medicare discharges were not represented in the study sample. Three states, Connecticut, New Jersey, and Rhode Island, have no nonmetropolitan counties, and so do not have ZIP code areas included in the study sample. Observations for individuals residing in either Alaska or Hawaii were eliminated from the analysis for several reasons. The geographic isolation of these states made any analysis of inter-state care seeking irrelevant. Additionally, due to Hawaii's unique health care system and Alaska's sparse population, it was felt that both states would be extreme outliers.

A multi-stage criterion, using both distance and percent of total ZIP code area discharges, was used to try and eliminate hospital stays for extraordinary care, such as transplants, which is most often unavailable in many smaller hospitals; this care is also often received at some distance from where rural people live. First, all observations where distance between patient and hospital ZIP code centroid was greater than 250 miles were eliminated. Next, observations within patient ZIP code areas were rank-ordered according to the percent of total ZIP code area discharges they represented. Beginning with the largest percentage, all observations necessary to account for 75 percent of the ZIP code area's discharges were included in the sample. In this manner, actual patient preferences for care were reflected, even if the distance traveled to receive care was far. (For example, if 30% of the discharges were to a hospital 80 miles away, those cases would be included in the sample as they

8

obviously represent current patterns of care.) The choice of 75 percent as a cutoff

was reached after focused consideration of the number and location of ZIP code-

hospital pairs which would or would not be included in the sample under alternative

cutoffs. Still, the choice is somewhat arbitrary; there is no precedent in the literature

for establishing cutoff points for market assignment from the consumer's point of

view, although in studies which focus on hospital-based market share, cutoffs are

generally at 60 or 75 percent.[8]

Finally, criteria needed to be applied to the observations which accounted for

the remaining 25% of the ZIP code area's discharges, in an attempt to delete

extraordinary care discharges but still include in the sample observations which

represented reasonable alternatives for routine hospital care. It was assumed that if

observations were for care received at a distant hospital, or they only accounted for a

small percentage of a given ZIP code area's total discharges, then they were for

extraordinary care. Therefore, double criteria of meeting both distance and

percentage of discharge standards were applied. If an observation was for discharges

at a hospital less than 50 miles away, and if more than 10% of the discharges from

the ZIP were represented, then the observation was kept in the sample. The distance

cutoff of 50 miles is generous, and allows for geographic differences in perceptions of

what constitutes a reasonable distance to travel for care.[9]

RESULTS

There were 2,259 nonmetropolitan ZIP code areas where all Medicare

admissions which met the criteria for inclusion in the study sample were to a single hospital. (For the remainder of this paper, these areas will be referred to as ZIP code areas which use one provider, or ZCOPs.) This represented 11.4% of all nonmetropolitan ZIP code areas which had Medicare acute care general hospital discharges in 1990. Approximately 8,077,988[10] individuals lived in these areas. For 77,847 of these individuals (<1%), residing in 96 ZCOPs, the only source of inpatient care was an out-of-state institution. ZCOPs were found in all states with nonmetropolitan counties in the contiguous United States. North Carolina had the highest total population residing in ZCOPs, while in Maryland, ZCOPs accounted for the largest percentage of all nonmetropolitan ZIP codes areas in the state. A detailed listing by state is presented in Exhibit 1. Explicit comparisons across states are difficult, as states vary in the proportion of ZIP codes that are rural, population density in rural areas, and the land area encompassed by a ZIP code.

The mean distance between ZCOP and hospital ZIP code centroids was 17.7 miles (standard deviation 23.3), and for 81 percent of the ZCOPs the distance to care was 25 miles or less. Patients residing in ZCOPs traveled farther, on average, when care was received at a hospital which was located in a metropolitan county as opposed to a nonmetropolitan one (see Exhibit 2). Among ZCOPs, 1,997 (88.4%) were served by nonmetropolitan hospitals. Of these ZCOPs, 86.5% were within 25 miles of the provider, with a mean distance to care of 13.94 miles (standard deviation 16.53). The mean distance to care for individuals from ZCOPs who sought care from hospitals located in metropolitan areas was substantially greater at 45.93 miles

(standard deviation 41.13) and only 38.9 percent of these ZCOPs were within 25 miles of their provider. Individuals residing in ZCOPs where care was received from an out-of-state hospital were much more likely to receive care from a metropolitan hospital; 31.25% of these ZIP code areas were served by urban hospitals, as opposed to only 10.73% of the ZCOPs where care was received from an in-state provider.

Consumer choice. There are several possible reasons why all admissions from a particular ZIP code area were to only one hospital: 1) lack of access--the next closest hospital may be quite far away, or there may be geographic or social barriers, 2) consumer preferences--there may be another hospital nearby, but for some reason people chose not to use it, 3) physician referral patterns, and 4) restrictions placed by insurers--the majority of individuals within a given ZIP code may belong to a single HMO or PPO, and are not allowed choice of hospital provider. Unfortunately, data limitations preclude assessment of the impact of the last possible explanation, but given that the analysis is of Medicare enrollees, insurer restrictions should play only a minimal role at most.

Using straight-line distance measures, rough estimates of the impact of geographic access and either consumer preferences or physician referral patterns on the decision not to seek care from alternative providers can be made. The maps in Figure 1 display the locations of the ZCOP centroids, categorized by the straight-line distance to the closest alternative provider. For 11 percent of the ZCOPs (population 783,551), the next closest hospital was 35 or more miles away, suggesting that for the individuals residing in these areas, there was no other reasonable choice of provider.

The closest alternative provider was between 25 and 35 miles away from 16 percent of the ZCOPs (population 1,247,726), and 73 percent of the ZCOPs had a second hospital within twenty-five miles. It is important to note that the distances discussed here represent straight-line distances from ZIP code centroids; the actual distance an individual must travel may be substantially different, as straight-line distances cannot account for road layout and geography.

Analysis of the extent to which residents of ZCOPs by-passed closer hospitals sheds light on the possible impact of consumer preferences and/or physician referral patterns. Residents in 626 (27.7%) of the ZCOPs did not go to the closest hospital. For these 626 ZCOPs, the mean straight-line distance to the by-passed hospital is 16.1 miles (standard deviation 10.5), while the distance to the hospital which was actually used is 38.0 miles (std. dev. 33.7).[11] In contrast, for the 1,633 ZCOPs where discharges are from the closest hospital, residents traveled only 9.9 miles (std. dev. 9.9) on average to receive care, and the mean distance to the next closest alternative is 23.3 miles (standard deviation 12.1). As shown in Figure 1, by-passing behavior was most frequent when the distance to the closest alternative provider was small. These results are expected; as the distance to the closest provider increases, it becomes less likely that an individual would by-pass that provider in favor of one even more distant. Due to data limitations, it cannot be determined whether the observed by-passing behavior is a result of consumer preferences, physician referral patterns, or both.

Provider competition. The residents of the 2,259 ZIP code areas which use

12

one provider were served by 255 hospitals. Of these hospitals, 89 percent were located in nonmetropolitan counties. The hospitals serving ZCOPs also served ZIP code areas where residents received care from more than one hospital. The percentage of a hospital's total admissions that is accounted for by residents of ZCOPs may be inversely related to the degree of competition that is faced by the hospital. In most of the hospitals which served ZCOPs, residents of these areas accounted for a very small percentage of total admissions, indicating that the hospital competed with at least one other institution for the majority of its patient base. Residents of ZCOPs accounted for less than 5 percent of admissions from 224 of the 255 hospitals. For 19 hospitals, ZCOP residents account for between 5-50 percent of admissions. However, for 12 hospitals serving 45 ZCOPs (population 169,092), over 75% of the total admissions were accounted for by patients from the ZCOPs, suggesting a non-competitive market.

Closer inspection of these 12 hospitals reveals that they are all in either Massachusetts or New Hampshire, and many of them are located in geographically inaccessible areas, such as on islands or surrounded by mountains. The total number of beds in these institutions ranges from 31 to 258, with a mean of 96. All of the hospitals have some form of intensive care unit beds (although often only 2-5), but only one has a cardiac care unit. The occupancy rate in 1987 ranges from 26 to 81 percent, with a mean of 54 percent. Three of the hospitals were designated as a distressed isolated hospital by Health Care Investment Analysts.[12] These hospitals appear to be an anomaly and are not generally representative of any "type" of

hospital.

Impact of boundary restrictions. In response to national reform proposals, the

issue of state boundaries delimiting managed competition areas has been raised.[13]

The relevance of this issue has increased as reform becomes more likely at the state

level. To assess the potential impact of restrictions on seeking care in another state,

all hospital/patient ZIP code area pairs where patients crossed state borders to

receive hospital care were deleted from the sample. With this restriction in place, the

percentage of all nonmetropolitan ZIP code areas which received services from only

one hospital rose from 11 to 17.10. In 1990, 10,782,476 people resided in these

restricted ZIP code areas which used one provider (RZCOPs), a 34 percent increase

from the population in ZIP codes areas which used one provider (ZCOPs) without

restrictions. Also, when the analysis was restricted to in-state providers, the average

distance to the closest alternative provider is greater than in the unrestricted model.

The locations of the ZCOP centroids, categorized by the straight-line distance to the

closest alternative provider, are shown in Figure 2. For 15 percent of the RZCOPs (as

compared to 11 percent of ZCOPs), the next closest in-state hospital was 35 or more

miles away. Similarly, the residents of 20 percent of RZCOPs were 25-35 straight-line

miles from an alternative provider, as opposed to only 16 percent of the ZCOPs.

The distribution of RZCOPs across states is shown in Exhibit 3. The impact of

restrictions on inter-state care varies substantially across states: although these

restrictions would have almost no impact on the rural residents of Maine and

Massachusetts, the rural population which would use one provider would increase by

14

1,669 percent in Nevada (although the absolute number of affected individuals is fairly small).

In addition, as shown in Exhibit 4, there were 258 ZIP code areas (population 310,317) which had no in-state provider at all (hereafter referred to as NIPZAs). If restrictions were placed on crossing state borders to receive hospital services, the residents of these areas would have to develop totally new care-seeking patterns. For 164 of these ZIP code areas, the closest in-state provider is within 25 miles, implying that factors other than geographic access may account for current border-crossing patterns.

ZIP code areas with no adequate access. Throughout this analysis, ZIP code areas where residents sought care from more than one hospital were not considered as lacking provider choice. This classification is problematic when the distance traveled to all providers is beyond what would be considered "accessible". In these cases, although the ZIP code areas technically exhibited behavior consistent with having provider choice, the distance traveled would suggest otherwise, as any consumer has a choice of providers if they are willing to travel far enough. There were 650 nonmetropolitan ZIP code areas, predominantly in the western half of the country, where the minimum distance traveled to receive inpatient care was greater than 35 miles. Of these ZIP code areas, 83 were ZCOPs, where all residents received care from a single hospital. In 179 ZIP code areas, residents chose between two hospitals, and in 388 ZIP code areas, three or more hospitals were utilized.

DISCUSSION

Interpretation of the findings in this paper are subjective; at issue is whether the designation of a ZIP code area as a ZCOP reflects a true lack of choice or simply indicates consumer preferences. Clearly the distance to the closest alternative hospital provides insight into the possible lack of choice, but the development of a standard for defining accessibility has not progressed beyond "informed estimates." Bosanac, et al. suggest that 30 minutes travel time to a general hospital defines 'accessibility', a standard supported by the Graduate Medical Education Advisory Committee.[14] Fifteen miles is a common standard used by authors defining hospital markets, with the implicit assumption that this standard also applies to accessibility.[7] Application of any universal standard to national data is problematic, as both perceptions of reasonable travel times and geographic conditions which affect the translation of distance into travel times vary across regions. Another complicating factor is that the definition of accessible is dependent in part upon the type of services which are being sought.

Given that the distance measures in this analysis are all straight-line, and most likely understate the true distance traveled, it seems reasonable to conclude that the 2,031,277 rural ZCOP residents (approximately 7 percent of the rural population) who have been identified as being at least 25 miles from an alternative provider do not have a meaningful choice of hospitals. For the 6,046,711 individuals residing in ZCOPs where the straight-line distance to an alternative provider is less than 25 miles, it is less clear as to whether or not there is an accessible alternative provider.

However, even under the most generous assumption, that all 8 million individuals who reside in ZCOPs have no reasonable access to other providers (whether due to geographic, social, or economic obstacles), the study results only partially support voiced concerns regarding the viability of managed competition in many rural areas.

Although 8 million individuals represents a significant portion of the rural population (approximately 28 percent), it is substantially below the 29 percent of the national total, or 72,125,610 persons, whom Kronick et al. found would not benefit from competition. Furthermore, although these individuals may not directly participate in a competitive market by exercising a choice of provider, they could still benefit from managed competition. Residents of ZCOPs who receive care from hospitals that compete for other segments of their market (all but 169,092 ZCOP residents) will still receive a cost benefit from managed competition. For this benefit to occur, health care reform must include some provision for collective purchasing or other regulatory measures that do not allow the same provider to discriminate on price to different patients for similar services.

If collective purchasing is included in health care reform, close attention must be paid to areas where patients are currently crossing state or other legislatively imposed boundaries to receive care. If individuals are allowed to continue to cross boundaries, there are legitimate concerns that hospitals may price discriminate against those patients who reside in areas covered by an agent which differs from that of the hospital's primary market area. Of even greater concern is the possible impact on access to care which could occur if boundary crossing is restricted. The

study results, which show that a substantial number of people could be affected by restrictions on boundary crossing, represent the lower bound in terms of the size of the affected population. If states themselves are sub-divided, the number of individuals who cross boundaries to receive care will increase.[15] This shows the difficulty in using any arbitrary political border as a line of service demarcation.

Limitations. The analysis has a number of limitations which affect the accuracy of identifying problem areas. First, the distances between ZIP code centroids, which serve as a proxy for travel time, only provide an approximation of the real distance that must be traveled to receive services, and hence of travel time itself. The precision in the distance estimates is sensitive to differences in ZIP code land areas, the effect of local geography on travel time, and road configurations. Geographic barriers such as rivers or mountains are not accounted for in the data. Also, the patient's ZIP code on Medicare files is a mailing address, and so may be different from the ZIP code of residence. Second, the inability to assign nonmetropolitan status at the ZIP code rather than county level probably results in an under-estimation of the number of ZCOPs, RZCOPs, and NIPZAs. Finally, the degree to which results from Medicare data can be generalized to the general population is uncertain. Several studies have shown that within the Medicare population, willingness to travel to receive hospital services decreases with age, but it is not known if this finding can be generalized to the non-Medicare population. One comparison of travel patterns for hospital care of individuals under 65 years of age to those 65 years and older suggests there is no significant difference between these age

18

groups, a finding supported by a study comparing Medicare and non-Medicare patient flows in California.[16]

Policy implications. This analysis provides critical information for those policy makers who are responsible for health care reform, by showing that there is a way to identify those rural populations which currently use one hospital, many of whom will only be able to benefit from managed competition through significant regulatory intervention. If reform does not include mechanisms to prevent price discrimination, an integrated service network approach might be the more appropriate mechanism for meeting the needs of these rural populations. Also, the data indicate that there are very serious problems with boundary setting in any system that includes nonmetropolitan places. The analysis does show that areas where problems are likely to exist can be identified, and this makes possible the option of providing some systematic alternatives to replace the role of competition in cost control and quality assurance.

This research represents a beginning in the effort to identify those areas which would require special consideration when designing health reform plans that rely on competition and purchasing pools. The next important step is to turn attention towards the provision of primary care, as conclusions regarding hospital service provision may not be applicable to the smaller market areas of primary care.

1. A. Enthoven and R. Kronick, "A Consumer-Choice Health Plan for the 1990s," *New England Journal of Medicine* 320 (1989):29-37,94-101.

2. R. Kronick, D. Goodman, J. Wennberg, and E. Wagner, "The Marketplace in Health Care Reform: The Demographic Limitations of Managed Competition," *New England Journal of Medicine* 328 (1993):148-152.

3. Statistical Abstract of the United States 1993. 113th edition. U.S. Department of Commerce.

4. J. Christianson and I. Moscovice, "Health Care Reform and Rural Health Networks," *Health Affairs* (Fall 1993):59-80.

5. B. Fuchs, "Health Care Reform: Managed Competition in Rural Areas," Congressional Research Service (April 1994).

6. For a discussion of radii defined market areas see D. Garnick, H. Luft, J. Robinson, and J. Tetreault, "Appropriate Measure of Hospital Market Areas," *Health Services Research* 22 (1987):69-89; and C. Phibbs and J. Robinson, "A Variable-radius Measure of Local Hospital Market Structure," *Health Services Research* 28 (1993):315-324. Clustering methods are discussed in D. Makuc, B. Haglund, D. Ingram, J. Kleinman, and J. Feldmans, "Health Service Areas for the United States" Hyattsville, MD: National Center for Health Statistics, 1991; and K. Adams and G. Wright, "Hospital Choice of Medicare Beneficiaries in a Rural Market: Why not the Closest?," *The Journal of Rural Health* 7 (1991):134-152.

7. The degree to which this categorization is problematic depends in part on the size of the county. Of particular concern are large counties in the Western U.S. which may include one MSA but be mostly rural.

8. B. Goody, "Defining Rural Hospital Markets," *Health Services Research* 28 (1993): 183-200.

9. Sensitivity analyses were performed to determine the robustness of the study results to changes in the sample inclusion criteria. Details are presented in Appendix 1. After observations accounting for the first 75 percent of discharges were included in the sample, changing the criteria for inclusion or exclusion of subsequent observations had only minimal effect on the number of ZIP code areas which are relevant to the analyses. However, changing the threshold total percentage of discharges that were automatically included in the sample resulted in dramatic differences in the number of relevant ZIP code areas. This finding implies that there are many ZIP code-hospital pairs which each account for only a small percentage of the total ZIP code discharges and which also include ZIP code to hospital distances greater than 50 miles.

10. This figure may be an under-estimation of the total population residing in ZCOPs. Some ZIP code areas had zero population reported in the census, with individuals who used this ZIP code counted in the population of surrounding ZIP codes areas. To the extent that surrounding ZIP code areas are also ZCOPs, the reported total ZCOP population is accurate. If none of the surrounding ZIP code areas are ZCOPs, the total population in ZCOPs would increase by approximately 374,000 (population estimates from Demographics, U.S.A.).

11. A sample of these ZIP code areas were individually examined to determine if there were geographic obstacles which prevented residents from utilizing the hospital which was "closest" according to straight-line distance calculations. This was not found to be the case. What was found was that may of these areas had easy access to a major highway which linked them to a larger urban area.

12. Lewin/ICF. Access to care in areas served by isolated rural hospitals. Washington, D.C.: Department of Health and Human Services; 1991 Report No. ASPE/HP 89-001, PB91-183574.

13. Health Care Alliances: Issues relating to geographic boundaries. Washington, D.C.: U.S. General Accounting Office; 1994 Report No. GAO/HEHS-94-139.

14. E. Bosanac, R. Parkinson, and D. Hall, "Geographic Access to Hospital Care: A 30-Minute Travel Time Standard," *Medical Care* 14 (1976): 616-624; Summary Report of the Graduate Medical Education National Advisory Committee, Wash DC (1981).

15. J. Holahan and S. Zuckerman, "Border Crossing for Physician Services: Implications for Controlling Expenditures," *Health Care Financing Review* 15 (1993):101-122; W. Yip and H. Luft, "Border Crossing for Hospital Care and its Implications for the Use of Statewide Data," *Social Science Medicine* 36 (1993):1455-1465.

16. D. Makuc, B. Haglund, D. Ingram, J. Kleinman, and J. Feldmans, Health service areas for the United States. Hyattsville, MD: National Center for Health Statistics. Vital Health Statistics Series 2(11), 1991 Nov. DHHS Publication No. (PHS) 92-1386; K. Adams and G. Wright, "Hospital Choice of Medicare Beneficiaries in a Rural Market: Why not the Closest?," *The Journal of Rural Health* 7 (1991):134-52; K. Adams, R. Houchens, G. Wright, and J. Robbins, "Predicting Hospital Choice for Rural Medicare Beneficiaries: The Role of Severity of Illness," *Health Services Research* 26 (1991):583-612; M. Radany and H. Luft, "Estimating Hospital Admission Patterns Using Medicare Data," *Social Science and Medicine* 37 (1993):1431-1439.

Exhibit 1
ZIP Code Areas Which Use One Provider (ZCOPs), by State[1]

State	Total ZIPs in Sample[2]	ZCOP (N)	ZCOP (%)	ZCOP Population	Average Pop./ZIP
Alabama	357	15	4.2	78,628	5,242
Arizona	203	20	9.9	82,832	4,142
Arkansas	539	47	8.7	147,738	3,143
California	359	30	8.4	76,141	2,538
Colorado	314	63	20.1	89,232	1,416
Delaware	40	7	17.5	77,166	11,024
Florida	232	22	9.5	157,347	7,152
Georgia	496	41	8.3	316,080	7,709
Idaho	276	29	10.5	138,445	4,774
Illinois	810	59	7.3	276,958	4,694
Indiana	498	66	13.3	309,221	4,685
Iowa	813	44	5.4	150,274	3,415
Kansas	597	51	8.5	180,385	3,537
Kentucky	892	132	14.8	299,644	2,270
Louisiana	354	14	4.0	40,109	2,865
Maine	322	46	14.3	78,501	1,707
Maryland	132	59	44.7	164,169	2,783
Massachusetts	96	21	21.9	71,528	3,406
Michigan	558	46	8.2	201,582	4,382
Minnesota	653	56	8.6	149,028	2,661
Mississippi	424	35	8.3	193,319	5,523
Missouri	778	43	5.5	73,928	1,719
Montana	345	70	20.3	199,732	2,853
Nebraska	507	52	10.3	207,995	4,000
Nevada	75	16	21.3	2,941	184
New Hampshire	142	29	20.4	116,964	4,033
New Mexico	324	70	21.6	234,445	3,349
New York	677	119	17.6	464,995	3,908
North Carolina	607	90	14.8	529,336	5,882
North Dakota	350	42	12.0	49,199	1,171
Ohio	587	46	7.8	177,846	3,866
Oklahoma	494	40	8.1	219,036	5,476
Oregon	261	57	21.8	265,705	4,661
Pennsylvania	715	96	13.4	337,094	3,511
South Carolina	260	30	11.5	249,867	8,329
South Dakota	368	63	17.1	114,428	1,816
Tennessee	392	12	3.1	35,425	2,952
Texas	1061	67	6.3	129,418	1,932
Utah	210	37	17.6	115,222	3,114
Vermont	250	66	26.4	133,475	2,022
Virginia	674	102	15.1	373,983	3,667
Washington	291	42	14.4	278,646	6,634
West Virginia	798	75	9.4	102,244	1,363
Wisconsin	546	51	9.3	226,376	4,439
Wyoming	156	41	26.3	161,361	3,936
Total	19,833	2259	11.4	8,077,988	3,576

[1] Sample has been trimmed in an attempt to exclude admissions which were for extraordinary care.

[2] Total does not include nonmetropolitan ZIP codes which had no Medicare discharges in 1990.

Exhibit 2

Distance to Hospital from ZIP Code Areas Which Use One Provider (ZCOPs)

Distance to Hospital	All ZCOPs		ZCOPs Served by Rural Hospitals		ZCOPs Served by Urban Hospitals	
	N	%	N	%	N	%
0 - 5 miles	557	24.7	554	27.7	3	1.1
6 - 15 miles	844	37.4	797	39.9	47	17.9
16 - 25 miles	429	19.0	377	18.9	52	19.8
over 25 miles	429	19.0	269	13.5	160	61.1

State	Total ZIPs in Sample[4]	RZCOP (N)	RZCOP (%)	RZCOP Population	% Change with Restriction
Alabama	357	31	8.7	126,396	61
Arizona	203	25	12.3	108,444	31
Arkansas	539	90	16.7	300,478	103
California	359	58	16.2	174,451	129
Colorado	314	76	24.2	99,518	12
Delaware	40	14	35.0	117,720	53
Florida	232	27	11.6	186,013	18
Georgia	496	50	10.1	381,379	21
Idaho	276	68	24.6	233,614	69
Illinois	810	135	16.7	440,757	59
Indiana	498	75	15.1	332,873	08
Iowa	813	80	9.8	233,139	55
Kansas	597	76	12.7	251,720	40
Kentucky	892	170	19.1	368,728	23
Louisiana	354	17	4.8	61,749	54
Maine	322	47	14.6	78,501	0
Maryland	132	78	59.1	205,198	25
Massachusetts	96	22	22.9	71,542	0
Michigan	558	51	9.1	211,587	5
Minnesota	653	130	19.9	287,510	93
Mississippi	424	47	11.1	230,895	19
Missouri	778	74	9.5	114,384	55
Montana	345	81	23.5	210,490	5
Nebraska	507	79	15.6	232,985	12
Nevada	75	29	38.7	52,015	1,669
New Hampshire	142	39	27.5	131,137	12
New Mexico	324	91	28.1	320,058	37
New York	677	152	22.5	539,552	16
North Carolina	607	126	20.8	590,930	12
North Dakota	350	46	13.1	55,137	12
Ohio	587	70	11.9	311,529	75
Oklahoma	494	110	22.3	372,823	70
Oregon	261	74	28.4	320,170	20
Pennsylvania	715	130	18.2	403,286	20
South Carolina	260	41	15.8	274,740	10
South Dakota	368	83	22.6	138,503	21
Tennessee	392	23	5.9	60,239	70
Texas	1061	67	6.3	129,672	0
Utah	210	45	21.4	129,292	12
Vermont	250	130	52.0	239,154	79
Virginia	674	155	23.0	504,839	35
Washington	291	57	19.6	325,750	17
West Virginia	798	167	20.9	289,236	183
Wisconsin	546	79	14.5	290,698	28
Wyoming	156	83	53.2	243,645	51
TOTAL	19,833	3,398	17.0	10,782,476	

[3] The sample has been trimmed in an attempt to eliminate admissions for extraordinary care.

[4] Total does not include nonmetropolitan ZIP codes which had no Medicare discharges in 1990.
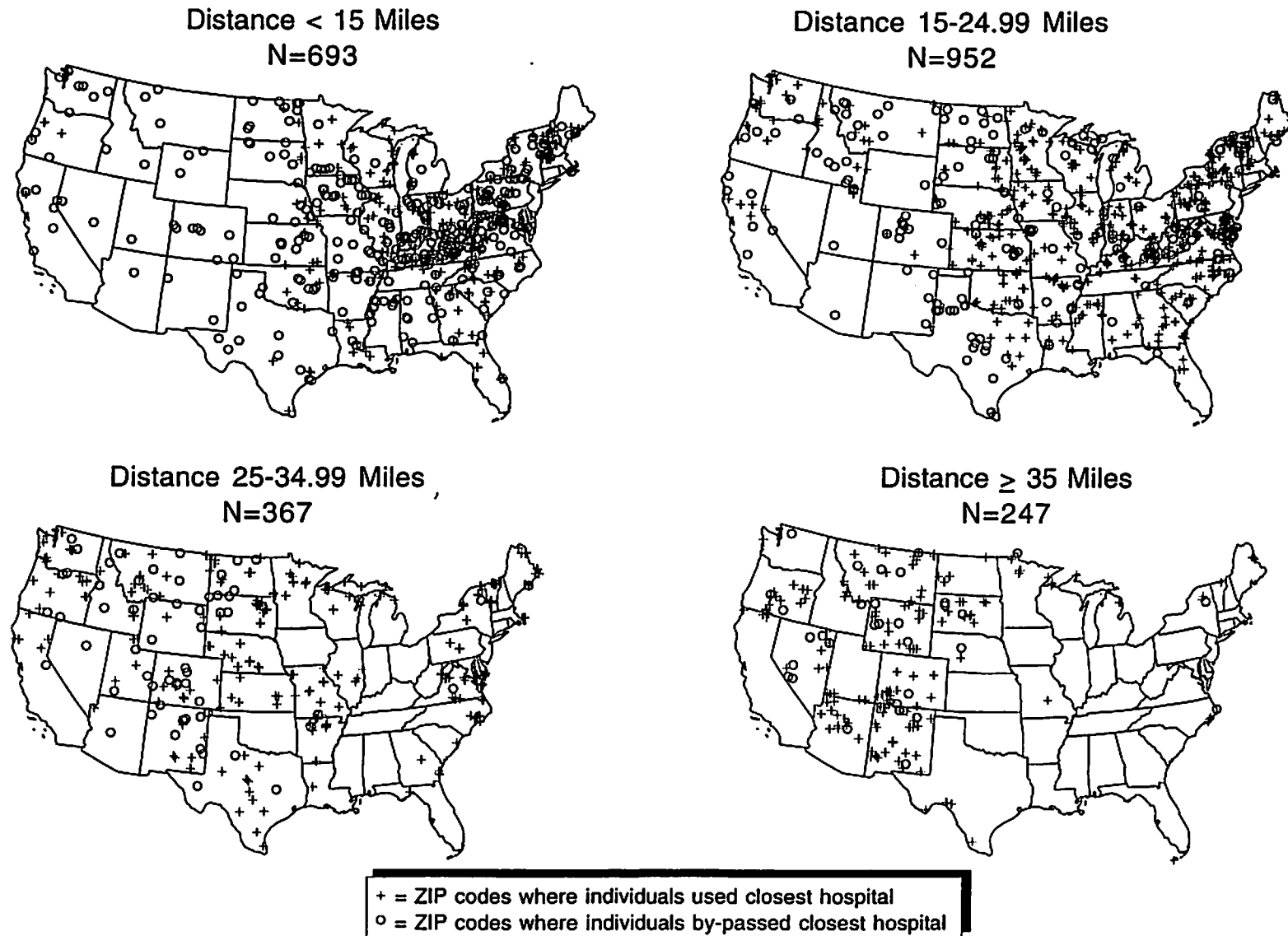
Exhibit 4
ZIP Code Areas with No In-State Provider (NIPZA), by State

State	Total ZIPs in Sample[5]	NIPZA (N)	NIPZA (%)	NIPZA Population
Alabama	357	0	0	0
Arizona	203	13	6	21,883
Arkansas	539	5	1	4,153
California	359	11	3	9,377
Colorado	314	1	0	183
Delaware	40	0	0	0
Florida	232	1	0	199
Georgia	496	0	0	0
Idaho	276	3	1	2,456
Illinois	810	10	1	28,935
Indiana	498	4	1	396
Iowa	813	6	1	4,706
Kansas	597	7	1	15,675
Kentucky	892	2	0	1,372
Louisiana	354	1	0	542
Maine	322	0	0	0
Maryland	132	0	0	0
Massachusetts	96	0	0	0
Michigan	558	9	2	29,018
Minnesota	653	16	2	30,570
Mississippi	424	1	0	598
Missouri	778	16	2	18,637
Montana	345	4	1	882
Nebraska	507	9	2	9,382
Nevada	75	5	7	3,709
New Hampshire	142	0	0	0
New Mexico	324	6	2	275
New York	677	5	1	3,084
North Carolina	607	4	1	5,332
North Dakota	350	3	1	538
Ohio	587	8	1	3,783
Oklahoma	494	11	2	23,162
Oregon	261	6	2	18,867
Pennsylvania	715	5	1	4,844
South Carolina	260	0	0	0
South Dakota	368	14	4	8,470
Tennessee	392	0	0	0
Texas	1061	2	0	851
Utah	210	2	1	3,707
Vermont	250	28	11	25,610
Virginia	674	8	1	13,679
Washington	291	3	1	493
West Virginia	798	17	2	8,902
Wisconsin	546	6	1	4,612
Wyoming	156	6	4	1,435
TOTAL	**19,833**	**258**	**1.3**	**310,317**

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[5] Total does not include nonmetropolitan ZIP codes which had no Medicare discharges.

Figure 1

ZIP Codes Which Use One Provider in the Contiguous United States: Distance to Closest Alternative Provider

Distance < 15 Miles
N=693

Distance 15-24.99 Miles
N=952

Distance 25-34.99 Miles
N=367

Distance ≥ 35 Miles
N=247

+ = ZIP codes where individuals used closest hospital
o = ZIP codes where individuals by-passed closest hospital

Appendix 1

Sensitivity Analyses on Sample Inclusion Criteria:
Number of ZIP Code Areas Identified in Each Category

Keep in sample if closer than stated miles & accounts for at least stated % of discharges	ZCOPs[1] N=2,259	RZCOPs[2] N=3,398	NIPZAs[3] N=256
25 miles, 5%	2,341	3,404	233
25 miles, 10%	2,572	3,721	266
25 miles, 15%	2,695	3,851	279
35 miles, 5%	2,080	3,126	214
35 miles, 10%	2,466	3,617	263
35 miles, 15%	2,651	3,813	279
50 miles, 5%	1,809	2,813	202
50 miles, 10%[4]	2,259	3,398	258
50 miles, 15%	2,614	3,772	277

Automatically include			
60% of discharges	4,168	5,324	315
75% of discharges[4]	2,259	3,398	258
85% of discharges	1,330	2,240	203

[1] Limited choice ZIP code areas

[2] Limited choice ZIP code areas if border crossing is restricted

[3] ZIP code areas with no in-state provider

[4] Criterion used in analysis

Figure 2

ZIP Codes Which Use One Provider If State Border Crossing Is Restricted: Distance to Closest Alternative Provider

Distance < 15 Miles
N=823

Distance 15-24.99 Miles
N=1396

Distance 25-34.99 Miles
N=659

Distance ≥ 35 Miles
N=520

+ = ZIP codes where individuals used closest in-state hospital
○ = ZIP codes where individuals by-passed closest in-state hospital