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Full length research paper

Who are the Patients? Exploring Approaches to Rural Hospital Market Area Determination

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For rural hospitals, market area determination is an essential step in crafting effectual policy and furthering research. Competing methodologies for determining a hospital's market area produce different results. Using a sample research question dealing with the overlap of public lands and rural hospital market areas, we use a Breaking Point model and a Zip Code model to determine the market area for rural hospitals in 6 western states. Using GIS analysis, we overlaid these market areas with public lands to determine the percentage of market area comprised of public land. We find the difference in the variables of interest between the models to be significant at the 0.05 level. We propose a standard for approaching and choosing from competing models in the methodological steps of future research and policy: 1) A description of several potential models available for the analysis; 2) A critical evaluation of each model's inherent strengths and weaknesses; 3) A heuristic comparison of the applicability of each model to the specific problem; and 4) A defense of (and acknowledgment of threats to) the chosen model's validity in reference to the specific issue addressed by the research or agency.

Keywords: Market Area Determination, Health Services Research, Hospitals, Health Policy

INTRODUCTION

There are many competing models for determining a rural hospital's service area. Both researchers and government agencies determine rural hospital market areas to identify, study, and address issues faced by specific hospitals and those they serve. Depending on which market area model they use, researchers and agencies can reach significantly different conclusions about a hospital's market area, and thus different research or policy conclusions. Not all models are created equal, and a model may be appropriate for one issue and inappropriate for another. Given this variation, models should be carefully evaluated in light of the research or policy question. Market area analysis is an essential step in understanding rural health care, and the stakes are high as rural health care lags behind.

Both the quality and quantity of health care available in the rural United States lag relative to more densely populated areas. Health care reform has consistently been an important issue in American politics for decades, and academic research in the field generally attempts to inform political decisions. Despite the increased political and academic discussion of the issue of rural health, both substantive policy results and research are deficient. In 2009, the US Department of Agriculture noted, "the gap between urban and rural mortality rates is increasing." Using mortality rates as a proxy for access to and availability of health care, the discrepancy between urban and rural health care was noted as early as 1990, and

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has continued to grow (Jones et al. 2009). The academic literature frequently refers to “important gaps” in the current portrait of rural health care (Robert et al. 2002).

Much of the attention in research has focused on problems that rural (especially minority, mentally disabled, or elderly) populations face(Rosenthal and Fox, 200; Edelman and Menz, 1996; Lishner et al., 1996). There is a dual problem, however: what challenges confront rural hospitals? Although there has been progress in this area as well, the picture is still incomplete. Certain challenges are applicable across all rural areas, such as the general shortage of physicians and nurses or financing. However, not all problems are so easily generalized: a hospital in rural Kentucky faces an entirely different and equally complex set of patient interactions than does a hospital in rural Alaska. In order to examine, quantify, study, and eventually address the effects of the challenges rural hospitals confront, it is necessary to determine a hospital’s market area.

A “hospital market area” refers to the geographic area where a hospital’s potential patients reside or will be drawn from. No standard practice exists for determining hospitals market area. Multiple criteria and methods exist, and “researchers are hard-pressed to choose between them” (Guagliardo, 2004) The result is some confusion in the literature; confusion that stymies governmental agencies attempt to improve access, service, and the myriad of problems that face health care provision. Market areas are one of the criteria used in determining which health care providers are eligible for special programmatic considerations. Hewitt observed that federal agencies do not share a common methodology for market area definition in rural areas and that, further, “even within agencies different definitions may be used” (Hewitt, 1989). Ricketts et al. note the use of “small area geographies,” such as census tracts, census block groups, counties, zip codes and zip code clusters (Ricketts et al, 1996). In a more general taxonomy of geographic health care methods, Kwan et al. discussed the differences in analysis using locational, individual, aggregate and point-based frameworks for market area definitions (Kwan et al, 2003). Some communities argue that the resulting confusion leads to under service by health care providers (Mueller et al., 2003; NMHPC, 2005; Ricketts, 2002).

The task of this paper is to demonstrate that different processes for determining market areas lead to different market boundaries, and policy outcomes. To do so, we will use the two different two different market area methodologies to explore hospital market boundaries in the rural west.

The Rural West

In the western United States, public land ownership patterns (including large areas of federal or Indian lands) create barriers or pressures on the medical delivery system that would not exist in their absence. National policymakers often design rural health policy without reference to geographic diversity or landownership considerations that may impact how the rural market area is defined.

Federal lands are a common feature of most western states, with approximately 50% of the land in the West under federal ownership. Nearly every policy decision in counties dominated by these lands must take into account how that decision will interact with federal land use agencies. This is especially true in those regions marked by growing pressure from tourism attracted to those public lands. Most localities provide services primarily from revenue sources generated by local citizens, such as property tax. Where tourists increase demand on these services in competition with local demands, policymakers must turn to alternative sources of revenue, deny local needs or make other tradeoffs that stretch the capacity of these scarce budget resources. The federal government compensates for some of these externally imposed demands with Payment in Lieu of Taxes (PILT) funds, but most of these revenues are directed towards specific services that are locally supplied, such as maintenance of road systems that traverse federal lands[i]. The increased costs of providing medical services are not as easily observed as being linked to land use, and, thus, these expenses have not been high on the list of competing demands counties address with these funds.

However, high public and federal land densities further complicate the complex health service scenarios in many western states. Public lands pose tax limitations, and transient population using public lands for recreation increase the demand for health services. Moreover, the counties most impacted by the presence of federal lands are frequently those where rural health services are most economically precarious. While much has been accomplished in recent years to further our understanding of the challenges facing rural health systems, little has been done to examine the effects of methodological diversity in determining hospital boundaries on rural health provision

This question (used here to demonstrate how different market area models can affect the results of research and policy) considers the spatial association between rural hospitals and federal lands. We determine how much of each hospital’s market area consists of federal land, and use that ratio to test for a difference in actual market areas. If different models produce different public to private land ratios within a hospital’s market area, the results of any policy exploration will likely vary based on the model chosen. We use two market determination methods with an integrated GIS approach to determine the ratio of federal lands in rural hospitals in at least three counties in the following states: Colorado, Montana, Nevada, New Mexico, Oregon, and Utah.

Data collection

To conduct out evaluation we collected data for our geographic analysis from a variety of sources. GIS Federal Land Data were derived from the United States Geological Survey (USGS) Federal Lands and Indian Reservations of the United States shape-files available for public and private download online[ii]. Data were downloaded from the USGS site for national, state, county and city entities, including land area, land use, roads, federal lands, private lands and topography. These existing datasets were combined and analyzed in a GIS environment to yield the desired data for this research.

We calculated road distances between cities were calculated from maps downloaded from mapquest. Com[iii] and verified with published maps from Delorme[iv,v,vi,vii,viii,ix]. All hospital data, health care inpatient data and zip code of residence data were collected from the American Hospital Directory website[x] (American Hospital Directory).

METHODOLOGIES

Spatial interaction model

Spatial interaction models were first developed to study why consumers would choose one retail location over another. These models range from simple to complex, and have been used in a variety of ways in both the health care and retail industries over the last century (Cromley and McLafferty, 2002). In particular, gravity models have found particular favor with researchers (NMHPC, 2005). Gravity models attempt to quantify possible interaction between any point and all other service points within a reasonable distance while discounting the potential with increasing distance. Because gravity models take into account all alternate service points, they often provide the most valid measures of rural or urban accessibility. When studying geographic health care issues, gravity models are an ideal choice because they: 1) allow interaction to be measured in a cumulative fashion regardless of arbitrary borders or boundaries; and 2) because utilization of health care services by patients drops off with increasing distance (distance decay).

One simple and accepted gravity model used in health care is Reilly's Law of Retail Gravitation (Reilly, 1931; Converse, 1949; Northam, 1975; Myles, 2003) .Reilly's Law is a form of gravity model originally used to measure trade between two cities. Geographers and medical researchers have found that it also works well for studying the geographic aspects of health care. Specifically, Reilly's Law Gravity Model helps to quantify the trade area (or market area) of a hospital. It assumes that larger bodies have greater "gravity" and "attractiveness" to potential customers.

In a gravity model framework, the boundary of a service area is called a breaking point and denotes the end of one service area and the beginning of another along a transportation route between the two. By calculating the breaking points between different hospitals along connecting transportation routes, a service area can be formed by connecting the breaking points surrounding a hospital. Hospitals of equal size will have a breaking point exactly halfway between them that denotes the service area boundary. Two hospitals of unequal size will have the breaking point closer to the smaller hospital showing the greater influence of the larger hospital (Boyce, 1974). Breaking points are calculated as follows (Figure 1).

Hospital market areas calculated with Reilly's Law Gravity Model yield a tributary area surrounding a hospital in which that hospital can expect to draw patients based on its size. As rural hospitals compete to provide for the needs of the communities they serve, market area designations provide a means to guide advertising, ambulatory service, outreach and other services to the appropriate populations.

As noted in Cromley and McLafferty, certain proxies are appropriate for the "population" portion of the Reilly's Law Gravity Model equation. Specifically, as a proxy for population, we used hospital size determined by the number of beds. The number of beds a hospital has on-site is an accepted and standard way of measuring hospital size within the health care industry.

A number of proxies are appropriate for the "distance" portion of the equation. For example, Zwart et al. found that travel distance and travel time may be used as proxies in applications such as this (Zwart et al, 1999). Travel distance data is more readily available and more accurate than travel time data, and since no more precision would be gained from using travel time, travel distance was used. Thus, distances were calculated between rural hospitals along all transportation routes linking them to other hospitals. For example, if there were four roads that a person could take to leave a city that a rural hospital is in, the distance along each of those roads to the next closest hospital was used in the equation. Although different transportation routes may be used, most people in rural settings access hospitals by car. As a result, roads were used as the transportation route for this analysis.

Data put into the Reilly's Law Gravity Model equation yielded the breaking point or boundary of the market area along the road in miles from the larger of the hospitals. This point was entered into a geographic information system (GIS) on a map of the area in question (Figure 2).

Figure 2. Analysis Process for "Hospital A" Using Reilly's Law Gravity Model

The breaking points on every road leaving a town with a rural hospital were plotted in the GIS and the points were connected with lines. As discussed, this produced a polygon with an area. Each polygon represented the market area as calculated using Reilly's Law Gravity

$$BP = \frac{\text{distance between city a and b}}{1 + \sqrt{\frac{\text{pop. b}}{\text{pop. a}}}}$$

BP is distance from city a to breaking point

Figure 1. Breaking Points Calculations

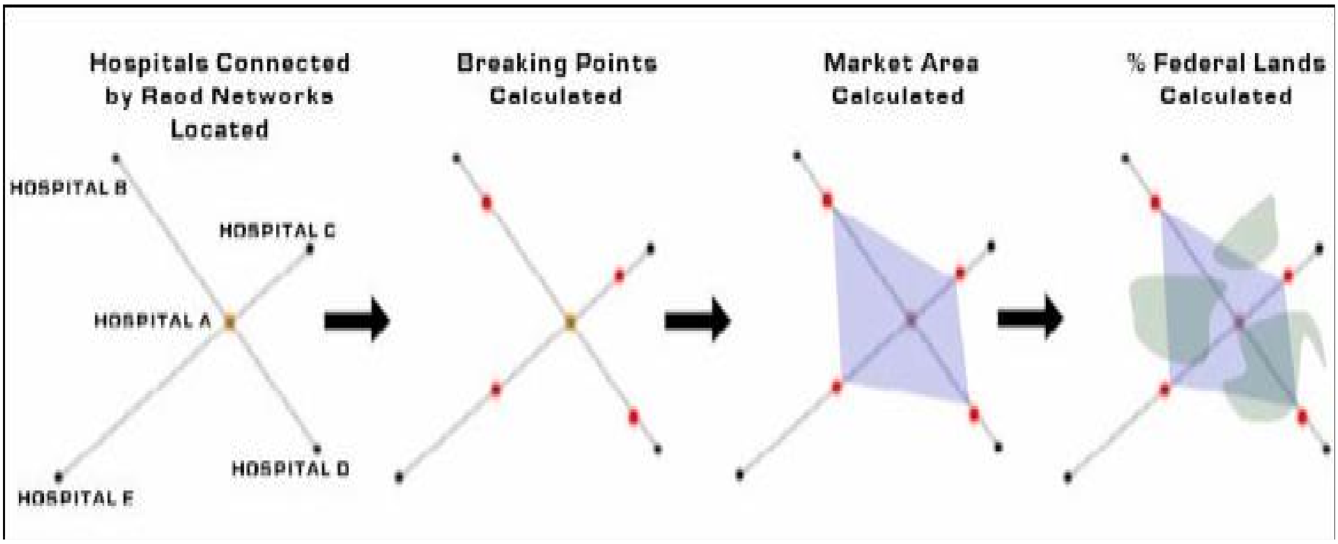

Figure 2. Analysis Process for "Hospital A" Using Reilly's Law Gravity Model

Model and was overlain on top of a map of federal land[xi].

Using the GIS, the percent of federal land within each of the polygons was calculated for each hospital in at least three counties in each of Colorado, Montana, Nevada, New Mexico, Oregon and Utah (See Appendix 1).

Zip Code Model

Our second approach relies on findings by researchers in health care geographics that have had success using zip code data (Ricketts et al., 1997; Wennberg, 1998; Bow et al., 2004). In particular, Bow et al. concluded that "postal code locations are a reasonably accurate proxy for address location." Additionally, Lou demonstrated the use of zip code centroids in a "floating catchment method" of calculating accessibility of patients to doctors in assessing physician shortages in health care (Lou, 2004). Ricketts et al. advised and instructed on the use of zip codes as "discrete regions" for basic units of analysis. Since the Health Insurance Portability and Accountability Act (HIPAA) of 1996 makes zip code data the most precise available to health care researchers, zip code data is of particular importance to a joint geographic and health care study such as this one. In fact, Rushton et al. noted the particular problems many researchers have faced in acquiring appropriate geo-spatial data for health care applications and encouraged further work in this area (Rushton et al., 2000).

We include this approach using inpatient zip code data for two reasons. First, zip code data is the only patient location market data available under HIPAA regulations; and, second, inpatient data is the most reliable source of information for application, as studies have found that urgent and emergent care scenarios that usually require inpatient status are more likely to occur at the hospital closest to the patient's residence (Johnson, 2003). Inpatient zip code data was acquired from the American Hospital Directory for the year 2003[xii].

All zip codes of residence provided in the AHD dataset were plotted in the GIS and became the zip code market area for this hospital (Figure 2). Thus, Southwest Memorial's zip code market area is a geographic aggregation of the zip codes in which the majority of its patients reside.

Once the zip code market area boundary was constructed using GIS tools, the percent of federal land within the market area was calculated (See Appendix 1), similar to the Reilly's Law Gravity Model. Likewise, the boundaries and areas were calculated for each hospital in at least three counties in each of the six western states using the Zip Code Model. Figure 3. Analysis Process for "Hospital A" Using Zip Code Model

RESULTS

Our hypothesis is that these two methods of determining market area will produce dissimilar results. Visual inspection of the maps clearly demonstrates that the market areas are not identical. Our sample research question provides a ready method of quantifying the difference. Each market area was overlaid with a map of federally administered lands, and the percentage of federal lands composing the hospital's market area was determined. Using these percentages as a proxy for determined market areas, we compared the results between the two models and graphed the difference for the 23 hospitals (Figure 4)[xiii].

Figure 4. Proportion Comparison of the Federal Lands Yielded by the Zip Code Model (FedLand-Z) Minus the Federal Lands Yielded by Reilly's Law Gravity Model (FedLandG).

A higher proportion of federal lands derived from the Zip Code Model yielded positive values, and negative values indicated a higher proportion in the Reilly's Law Gravity model. A zero-value means the models gave identical results. Figure 4 shows that there is wide variation between the models, with the Zip Code Model generally giving higher proportions of federal lands. In addition to the visual analysis, we used the Wilcoxon Signed Rank Test for Comparing Paired Samples to determine if the difference in the proportions is statistically significant. The Wilcoxon Signed Rank Test for Paired Samples measures whether the observed difference in proportions is due to chance (Rice, 1995; Weiers, 1998). The null hypothesis is that the population median of the differences in proportions is zero. In other words, calculating the percentage of federal land would be equal whether using the Gravity Model or the Zip Code Model. The alternative is that the population median of the differences in proportions is different from zero, or that use of the two different models would yield different proportions of federal land within the market areas. The test is two-sided, so the difference between the population medians could be positive or negative.

The calculated z-statistic is 2.033 with a p-value less than 0.0424. At a 0.05 level of confidence, the null hypothesis of no difference is rejected, and we conclude that the Zip Code Model and Reilly's Law Gravity Model do not yield equal proportions of federal lands in the identified health care service market areas, and the different measures are likely to have substantively different effects on the provision of rural health care.

Discussion

When approaching problems faced by rural hospitals, market area analysis is an essential step in reaching solutions. As demonstrated above, Reilly's Law Gravity Model and the Zip Code Model produce significantly different proportions of federal lands within the identified market area. These findings can be generalized across other available market area models. In research, the choice of model often affects the result. For governmental agencies, the differences could potentially result in the inclusion or exclusion of hospitals in programs aimed at ameliorating some of the challenges faced by rural health care providers.

Determining the hospital's market area is as important as any other methodological step, as it directly affects the results. Each model has a unique set of benefits and limitations. In order to be achieve the most valid of all possible conclusions, any determination of a rural hospital's market area by researchers or government must include the following:

1) A description of several potential models available for the analysis;
2) A critical evaluation of each model's inherent strengths and weaknesses;
3) A heuristic comparison of the applicability of each model to the specific problem;
4) When feasible, a difference of means test can see whether or not the variable of interest changes significantly between the candidate models; and
5) A defense of (and acknowledgment of threats to) the chosen model's validity in reference to the specific issue addressed by the research or agency.

This treatment is essential as researchers begin to fill the important gaps in knowledge, and as government officials attempt reforms to rural health care systems. Below, we will apply the criteria and evaluate each approaches strengths and limitations.

Evaluation of models' strengths and limitations.

One reason Reilly's Law Gravity Model could be chosen was because of its ability to account for fixed boundary service areas in a geographically dispersed population. However, because Reilly's Gravity Model is dependent

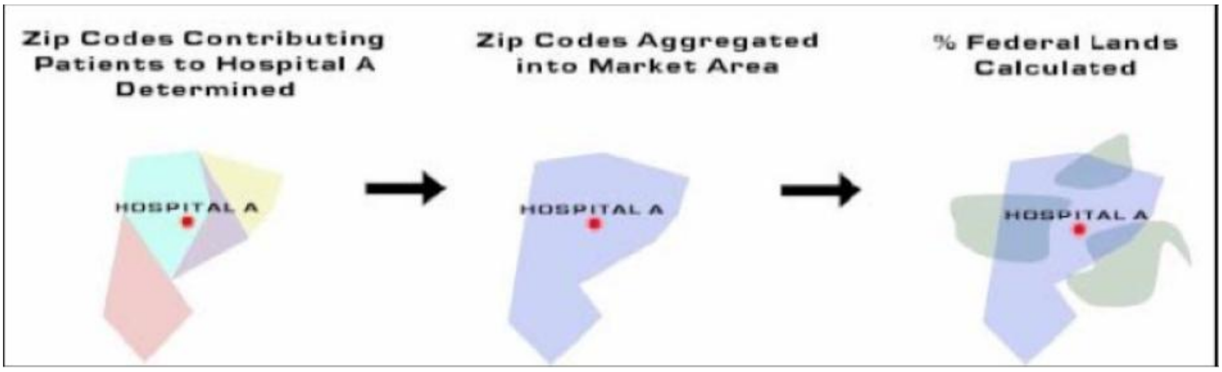

Figure 3. Analysis Process for "Hospital A" Using Zip Code Model

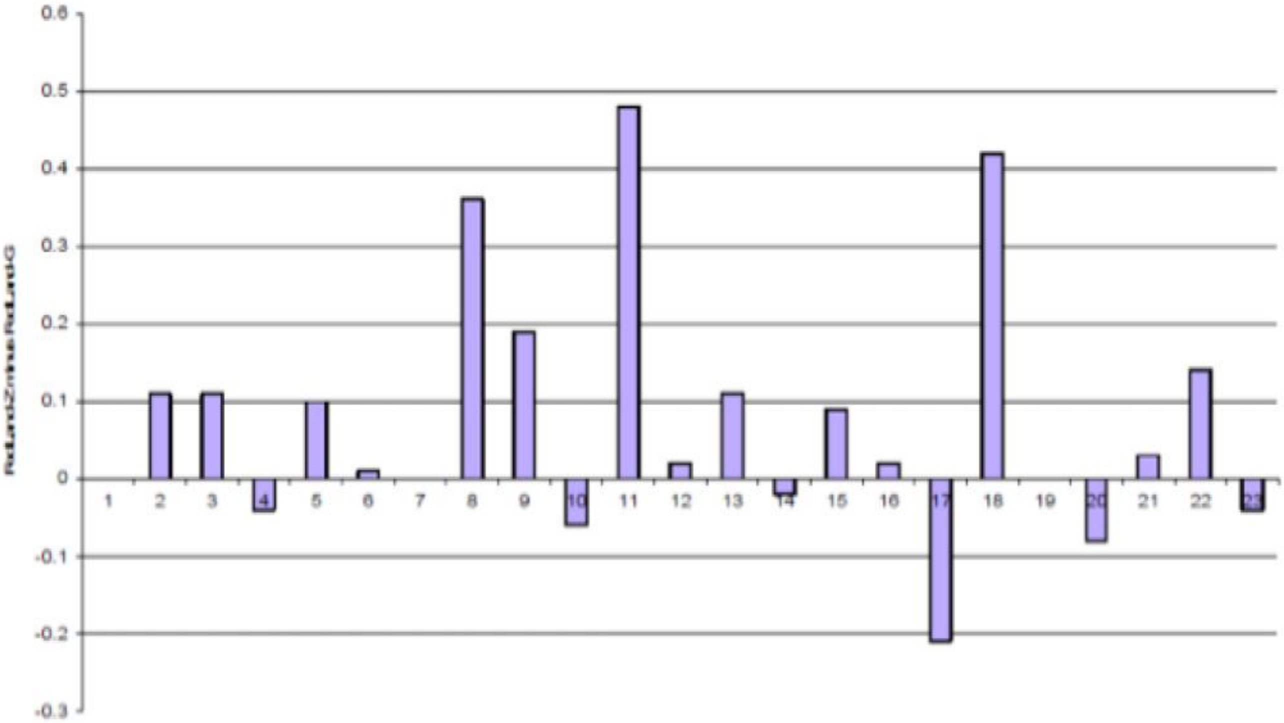

Figure 4. Proportion Comparison of the Federal Lands Yielded by the Zip Code Model (FedLand-Z) Minus the Federal Lands Yielded by Reilly's Law Gravity Model (FedLandG)

on transportation routes between hospitals, it experienced serious limitations when few transportation routes existed, such as in Gold Beach, Oregon or Fort Morgan, Colorado. Indeed, the market areas for these towns yielded no area whatsoever when computed with Reilly's Law Gravity Model. Additionally, due to the constraints of the model, Gunnison, Colorado's market area was calculated to be completely south of the city that actually hosts the hospital, giving a warped and inaccurate view of the actual amount of federal land within its market area. Finally, Lovelock, Nevada's calculated market area using Reilly's Law Gravity Model was quite narrow, and the fact that it yielded any area at all is only due to the fact that the transportation route curved instead of being straight. Despite these anomalies intrinsic to using gravity models, in most other regions included in our sample we have reason to believe market areas were modeled quite accurately. For example, five hospitals were modeled in Utah using Reilly's Law Gravity Model and all five show the city with the hospital being modeled towards the center of the calculated area. The calculated areas transcend arbitrary political boundaries and account for distance decay, giving a view of that hospital's influence that may not be accounted for using other methods. This is important in the sense that in rural areas where road networks are relatively sparse and where the boundaries between service areas may have significant spillovers, the traditional gravity model may prove more or less useful depending on the unique geography of the region.

The Zip Code Model could be chosen because it geographically allocates known inpatient data and provides market areas based on the actual residences of individuals seeking health care services. This data, however, is strategically tied to the hospital patient base and not all patients go to their local hospital when they are sick or injured. In addition, to focus on core geographic regions the Zip Code Model truncates the data at 10 or more patients per year from the zip code area for it to be included in the boundary determination algorithm. This could affect the size of the calculated area within the zip code areas by omitting some zip codes with low populations that are actually inside the market area. For example, the aggregation of zip codes for Fort Morgan, Colorado was quite small but may have increased in size if a different parameter were used for zip code inclusion. Additionally, omitting zip codes that contributed fewer than 10 patients per year may negatively affect the accuracy of modeling hospitals (such as Allen Memorial Hospital in Moab, Utah) that rely on tourism injuries to bolster patient numbers. Indeed, since it is unlikely that 10 or more inpatient admissions will occur from the same zip code for tourism related injuries, it is possible that these patients go unaccounted for using this model.

The Zip Code Model is also arbitrary, following artificial postal boundaries that have little or no influence on rural health care choices. Despite the weaknesses of the Zip Code Model, zip codes remain the most precise units of measure available to health care researchers for reasons of patient privacy. The Zip Code Model uses that the patient's actual area of residence rather than the expected area of residence that is used in the gravity model. Zip Code Models also account for differences in health care preferences. For example, although a patient may live closer to one hospital, for various reasons that patient may choose care at a hospital further away. This may account for the gap in the Whitefish, Montana zip code area, or for the overlaps visible in the Fort Morgan and Brush, Colorado zip code areas. Because of the additional flexibility provided by the Zip Code Model, on average, it tends to yield a higher proportion of federal lands within the market boundary, and likely larger market areas.

Comparison of the Models

Although the Breaking Point Model was inappropriate in certain cases (such as where it produced no market area), the market areas it modeled transcended political boundaries. The Zip Code Model, alternatively, depends on arbitrary postal boundaries. A relative strength of the Zip Code Model is that it allows for overlapping market areas, and overlap is likely the reality. The Zip Code Model is derived from inpatient data, whereas the Breaking Point Model is a theoretical construct. As such, the Zip Code Model account for changes in patient preferences, whereas the Breaking Point Model assumes that the only factors patients consider when choosing a hospital are number of beds and location.

Choosing and Defending a Model

As noted above, the choice of the model directly affects experimental results and policy determinations. We return to assertion that the choice of model affects the outcome of research and eventually policy. Since each model has its own array of strengths and weaknesses, the best choice is not immediately apparent. In fact, the "best" model varies based upon the application. As such, we do not demonstrate which motel is "better" and defend our preferred model but instead we have demonstrated how the choice of model can change hospital market boundaries, and policy outcomes.

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Footnotes

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X. Access to this database is available to paid subscribers only. American Hospital Directory. Medicare Prospective Payment System. June 10, 2005. Online, http://www.ahd.com/pps.html [Last Accessed July 1, 2005]
XI. GIS Maps of each hospital market area are available from the authors on request.
XII. Zip codes with less than 10 inpatient admissions are not reported and were not used in this study.
XIII. Hospitals administered by the Indian Health Services (3 of the hospitals studied) are not required to report inpatient data, and Milford Valley Hospital did not collect inpatient data during or prior to 2003. As such, the zip-code model was inapplicable to these hospitals, and they are omitted from analysis.

Appendix 1 – Tables

1.1- Proportion of Federal Lands in Market Area Using Gravity Model

Hospital	Town	State	FedLand-G
East Morgan County Hospital	Brush	CO	.00
Southwest Memorial Hospital	Cortez	CO	.54
Colorado Plains Medical Center	Fort Morgan	CO	.00
Gunnison Valley Hospital	Gunnison	CO	.84
Big Sandy Medical Center	Big Sandy	MT	.00
PHS Indian Hospital	Crow Agency	MT	.00
Missouri River Medical Center	Fort Benton	MT	.03
Big Horn County Memorial Hospital	Hardin	MT	.00
Kalispell Regional Medical Center	Kalispell	MT	.29
Granite County CAH	Philipsburg	MT	.60
North Valley Hospital	Whitefish	MT	.62
Cibola General Hospital	Grants	NM	.05
Acoma Canoncito Laquna PHS Hospital	San Fidel	NM	.22
Guadalupe County Hospital	Santa Rosa	NM	.03
Socorro General Hospital	Socorro	NM	.43
Northeastern Nevada Regional Hospital	Elko	NV	.71
Pershing General Hospital	Lovelock	NV	.37
PHS Owyhee Community Health Facility	Owyhee	NV	.69
Nye Regional Medical Center	Tonopah	NV	.97
Harney District Hospital	Burns	OR	.60
Curry General Hospital	Gold Beach	OR	.00
Mountain View Hospital District	Madras	OR	.25
Beaver Valley Hospital	Beaver	UT	.77
Milford Valley Health Care Services	Milford	UT	.81
Allen Memorial Hospital	Moab	UT	.83
San Juan Health Services District	Monticello	UT	.43
Castleview Hospital	Price	UT	.64

1.2 - Proportion of Federal Lands in Market Area Using Zip Code Model

Hospital	Town	State	FedLand-Z
East Morgan County Hospital	Brush	CO	.00
Southwest Memorial Hospital	Cortez	CO	.54
Colorado Plains Medical Center	Fort Morgan	CO	.11
Gunnison Valley Hospital	Gunnison	CO	.80
Big Sandy Medical Center	Big Sandy	MT	.10
PHS Indian Hospital*	Crow Agency	MT	N/A
Missouri River Medical Center	Fort Benton	MT	.04
Big Horn County Memorial Hospital	Hardin	MT	.00
Kalispell Regional Medical Center	Kalispell	MT	.65
Granite County CAH	Philipsburg	MT	.79
North Valley Hospital	Whitefish	MT	.56
Cibola General Hospital	Grants	NM	.53
Acoma Canoncito Laquna PHS Hospital*	San Fidel	NM	N/A
Guadalupe County Hospital	Santa Rosa	NM	.05
Socorro General Hospital	Socorro	NM	.54
Northeastern Nevada Regional Hospital	Elko	NV	.69
Pershing General Hospital	Lovelock	NV	.46
PHS Owyhee Community Health Facility*	Owyhee	NV	N/A
Nye Regional Medical Center	Tonopah	NV	.99
Harney District Hospital	Burns	OR	.39
Curry General Hospital	Gold Beach	OR	.42
Mountain View Hospital District	Madras	OR	.25
Beaver Valley Hospital	Beaver	UT	.69
Milford Valley Health Care Services**	Milford	UT	N/A
Allen Memorial Hospital	Moab	UT	.86
San Juan Health Services District	Monticello	UT	.57
Castleview Hospital	Price	UT	.60

1.3 - Proportion of Federal Lands within the Hospital Market Areas Calculated with Reilly's Law Gravity Model and the Zip Code Model

Hospital	Town	State	Zip Code Model	Gravity Model
East Morgan County Hospital	Brush	CO	.00	.00
Southwest Memorial Hospital	Cortez	CO	.54	.54
Colorado Plains Medical Center	Fort Morgan	CO	.11	.00
Gunnison Valley Hospital	Gunnison	CO	.80	.84
Big Sandy Medical Center	Big Sandy	MT	.10	.00
PHS Indian Hospital	Crow Agency	MT	N/A	.00
Missouri River Medical Center	Fort Benton	MT	.04	.03
Big Horn County Memorial Hospital	Hardin	MT	.00	.00
Kalispell Regional Medical Center	Kalispell	MT	.65	.29
Granite County CAH	Philipsburg	MT	.79	.60
North Valley Hospital	Whitefish	MT	.56	.62
Cibola General Hospital	Grants	NM	.53	.05
Acoma Canoncito Laquna PHS Hospital	San Fidel	NM	N/A	.22
Guadalupe County Hospital	Santa Rosa	NM	.05	.03
Socorro General Hospital	Socorro	NM	.54	.43
Northeastern Nevada Regional Hospital	Elko	NV	.69	.71
Pershing General Hospital	Lovelock	NV	.37	.37
PHS Owyhee Community Health Facility	Owyhee	NV	N/A	.69
Nye Regional Medical Center	Tonopah	NV	.99	.97
Harney District Hospital	Burns	OR	.39	.60
Curry General Hospital	Gold Beach	OR	.42	.00
Mountain View Hospital District	Madras	OR	.25	.25
Beaver Valley Hospital	Beaver	UT	.69	.77
Milford Valley Health Care Services	Milford	UT	N/A	.81
Allen Memorial Hospital	Moab	UT	.86	.83
San Juan Health Services District	Monticello	UT	.57	.43
Castleview Hospital	Price	UT	.60	.64

* Hospitals administered by Indian Health Service are not required to collect or report inpatient data. ** Milford Valley Hospital did not report inpatient data for 2003 or previous years.