Critical Access Hospitals and Retail Activity: an Empirical Analysis

Lara Brooks and Brian Whitacre

Lara Brooks
Oklahoma State University
Department of Agricultural Economics
526 Ag Hall
Stillwater, OK 74078
Ph: (405)744-4857
Fax: (405)744-9835
lara.brooks@okstate.edu

Brian Whitacre
Oklahoma State University
Department of Agricultural Economics
513 Ag Hall
Ph: (405)744-6083
Fax: (405)744-9835
brian.whitacre@okstate.edu

Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Orlando, FL, February 6-9, 2010

Critical Access Hospitals and Retail Activity: an Empirical Analysis

Healthcare plays a large role in the United States economy. Healthcare expenditures accounted for 16 percent of the gross domestic product in 2006, with hospital care accounting for nearly one third of these expenditures (American Hospital Association, 2008). This is a substantial increase from 1990 where healthcare expenditures accounted for 12.3 percent of the gross domestic product (Department of Health and Human Services, Centers for Medicare and Medicaid Services, 2009). In addition to the strong and increasing presence in the overall economy, hospitals and the healthcare they provide play crucial roles in economic development due to their ability to influence employment and enhance quality of life in their communities (Doeksen et al.,1998; Avery, 2002).

This effect becomes increasingly important in rural areas. A high-quality health sector is vital for rural communities to attract industry, businesses, new residents, and retirees. While contributing to an improved quality of life, the health sector also has direct impacts on the employment and income of the local community (Doeksen et al., 1998). Rural hospitals, often the face of health care in rural communities, play a vital yet underappreciated role in economic development. Oftentimes, a rural hospital follows only the local school system as the largest employer in the community while employing the some of the highest paid individuals in the community (Novack, 2003; Doeksen, Cordes, and Shaffer, 1992).

The economics of rural health provision suggest that rural hospitals require intervention beyond the free market. Many rural hospitals have utilized and are even sometimes dependent upon federal and state-level programs that subsidize their existence. The Balanced Budget

Refinement Act (BBRA) of 1999 provided assistance to rural hospitals in remote areas by introducing the Critical Access Hospital program (CAH) (Zimmerman and McAdams, 2004). However, as competition for federal and state tax dollars has increased, programs receiving significant amounts of aid are often targeted for cuts or at least subjected to high levels of scrutiny. Some have even questioned the efficacy of tax-based health programs, such as whether nonprofit hospitals actually cover the cost of the tax subsidies they receive (Morrisey, Wedig, and Hassan, 1996). Others have questioned the amount of help states provide in terms of rural healthcare delivery (Slifkin, 1999). To combat these efforts, rural health advocates should seek to quantify all relevant economic contributions of their hospitals. While most analytical work on this topic focuses on general income and employment measures, a community's retail activity can also be greatly impacted by the presence of a hospital. This paper focuses on and empirically quantifies the under-analyzed relationship between critical access hospitals and community retail activity.

Retail activity can be spurred by out-of-town hospital users who shop while in the area, multiplier impacts of hospital employee paychecks, and even the creation of retail stores that may cater to hospital patients and families (a local card or gift store, for example). The American Hospital Association (2008) found that hospitals have an impact of $76.7 billion on retail trade throughout the United States by using a traditional multiplier-based analysis. At the opposite end of the spectrum, a hospital closure is extremely detrimental to retail activity in small communities. For example, Doeksen et al. (1998) estimate that Perry, a rural community in Oklahoma, could experience a loss of over $2 million in retail sales if the hospital were to close. While the closing of a hospital is excruciating in terms of job losses and anxiety about the proximity of emergency health services, the potential loss of sales tax collections from lower retail activity is an additional blow to the community. Traditional multiplier analysis or case studies such as these demonstrate some of the economic impacts of a hospital's presence; however, they do not empirically estimate differences between communities with and without a hospital. For example, is it the case that the presence of a rural hospital has a larger impact on retail activity than, say, the presence of a Wal-Mart? This paper uses Oklahoma data to address that shortcoming and further quantify some of the economic relationships associated with rural hospitals. At an aggregate level, documenting these impacts can provide significant support for policies with a rural hospital focus.

Background

Previous research has shown that income received by healthcare employees has a positive impact, both direct and secondary, on retail sales (Doeksen and Schott, 2003). While numerous studies readily estimate potential retail sales impacts from the local healthcare sector on a case-by-case basis, there is a lack of empirical research demonstrating that the presence of a critical access hospital has a statistically significant impact on actual retail activity (Brooks et al., 2009; Office of Rural Health and Primary Care, 2008; Kentucky Rural Health Works, 2003). In other words, no studies that we are aware of sought to estimate whether rural communities with hospitals generate higher retail sales (or have a higher number of retail establishments) than those without.

Most studies on the economic impact of hospitals use multiplier-oriented analysis, where historical data and Input / Output software programs such as IMPLAN are used to estimate the linkages between economic sectors (Minnesota IMPLAN Group, Inc., 2000). These studies can tell us, for instance, that each $1.00 in hospital payroll creates an additional $0.48 throughout the rest of the community economy. This technique can be applied to the total hospital payroll to create an aggregate income impact, and historical estimates of the percentage of income spent on retail sales can then be used to estimate the hospital's impact on retail. These methods generated retail impacts of $2 million and $6.4 million, respectively, in the rural communities of Perry and Atoka, Oklahoma (Doeksen et al., 1998; Doeksen and Schott, 2003). Similarly, however, such impact studies could be performed for other industries, such as evaluating the economic impact of a manufacturing plant. Is it the case, then, that areas with hospitals have an advantage over areas with other types of infrastructure? This paper attempts to answer those questions.

This paper varies from previous research on the relationship between critical access hospitals and retail sales by analyzing a full complement of rural communities (some with hospitals, some without) to uncover variables that influence retail activity. Of particular interest is whether the presence of a CAH statistically influences various types of retail activity, and if so, by how much. As previously noted, most available research utilizes Input/Output analysis to determine the impact of a critical access hospital on a local economy. This is important to quantify the estimated dollar amount impact a particular CAH has on an economy and provides useful political talking points; however, at an aggregate level, such studies provide little more than anecdotal evidence.

Although anecdotal evidence is useful at times, some studies have questioned the efficacy of the entire CAH program. While the BBRA legislation was designed to offer financial support to rural hospitals, several CAHs utilize a local subsidy in addition to the benefits received from a CAH designation.   In fact, CAHs in Kansas experienced an *increase* in local subsidies of 38.4 percent between 1994 and 2001 (Zimmerman and McAdams, 2004). This is the opposite effect that was expected from the CAH program. Additionally, the CAH hospitals in Kansas that received the greatest amount of subsidies were the ones with fewer beds and fewer admissions; raising the question of whether supporting these hospitals is adversely impacting the overall level of care in rural parts of the state (Zimmerman and McAdams, 2004). These situations are most likely mirrored in Oklahoma (where data for this study was collected). In 2007, Oklahoma municipal and county governments contributed nearly $833 million to support hospitals, an amount higher than the $620 million in contributions for hospitals in Kansas (United States Bureau of the Census, 2009). The available data does not indicate how much of this amount was allocated for rural hospitals or even CAHs. However, Zimmerman and McAdams found in 2001 that CAHs in Kansas received $227,130 on average per hospital compared to an average of $85,985 per non-CAH hospital (Zimmerman and McAdams, 2004). Defending this type of financial support requires large scale analysis of the communities receiving the aid. Evidence that the presence of a CAH significantly increases retail activity in a community would be a useful tool in this defense.

There is not an abundance of statistical, empirical analysis on this topic. Probst et al. (1999) used econometric modeling to comparatively determine the effects of a hospital closure. They found that counties where a hospital had previously closed experienced lower incomes and slower employment growth than counties without a hospital closure. This research provides insight into income and employment loss, but does not focus specifically on the impact these hospitals have on retail sales. Generally, research to date focuses on the potential economic impact of the health sector, or of losing a hospital. This paper will expand the literature to more closely examine the relationship between critical access hospitals and retail activity.

Methods

Variables. 84 Oklahoma towns were selected for the study by virtue of meeting certain specifications: all towns included had to collect sales tax during the years of 2000 to 2005; the average population from 2000 to 2005 must fit within the range of 1,000 to 5,000; and they had to be considered "rural." For the purpose of this study, rural is defined by using Rural-Urban Commuting Area Codes (RUCA Codes) from the USDA, effectively eliminating smaller towns with a high dependency on nearby urban areas. We restricted our analysis to towns with populations between 1,000 and 5,000 due to the high incidence of hospitals in towns with populations over 5,000.

Hospitals with a Critical Access designation were utilized for this study. CAHs were selected since they are located in more remote areas, are by definition smaller facilities, and are more typical for communities between 1,000 and 5,000. CAHs are generally at least 35 miles from another hospital and have a maximum of 25 beds (Lawler, Doesksen, and Schott, 2003). The 2009 Oklahoma State Department of Health's Medical Facility Directory indicated that 20 of the 84 towns were homes to CAHs during the time of the analysis (Oklahoma State Department of Health, 2009). Figure 1 displays the location of the selected towns and also indicates which of these towns have a critical access hospital. As Figure 1 shows, the included towns are geographically dispersed across the state.

[Figure 1 about here]

Retail sales estimates were obtained by using sales tax collections at the town/city level from the Oklahoma Tax Commission. To account for yearly fluctuations associated with traditional business cycles, average retail sales from 2000 to 2005 were used. A total of four models are utilized to determine the influence that CAHs have on various measures of retail activity. These models use (1) total retail sales, (2) the total number of retail establishments, (3) the number of micro (1-4 employees) retail establishments as dependent variables, and (4) the number of small (5-19 employees) retail establishments. These variables present a picture of the type of retail activity CAHs may be influencing in addition to more traditional summary-level measurements. The number of total retail, micro retail, and small retail establishments were derived from the U.S. Census Bureau through the Zip-Code Business Patterns. Again, an average from 2000-2005 was used to smooth potential data fluctuations.

The economic literature suggests that any number of variables can influence retail activity. Retail sales are very likely correlated with the number of total retail establishments in a community (Ferber, 1958). County seats are often centers of activity for non-metropolitan areas, so a dummy variable controlling for their presence is included to help obtain a precise estimate on the impact of a CAH. Unemployment rates are also included as high levels of unemployment are likely to reduce retail activity.

Dependency on a particular sector, such as farming or manufacturing, can also affect retail activity. Micro-businesses were found to be more prevalent and contributed more to local sales in farming/rural areas (Muske and Woods, 2004). Dummy variables for county-level dependencies on farming, manufacturing, and government sectors were taken from the USDA and applied to the current data set.

The presence of Wal-Mart in a rural community not only presents mixed emotions, but also mixed economic results. Goetz and Rupasingha (2006) found that the presence of Wal-Mart decreases social capital and can potentially reduce economic growth for communities. Artz and Stone (2006) found that the presence of a Wal-Mart Supercenter in a nonmetropolitan community can decrease local grocery store sales by nearly 17 percent within the first 2 years of opening. Irwin and Clark (2006) found similar results of Wal-Mart being a detriment to small retailers, but they do state that the opening of a new Wal-Mart has the opportunity to stimulate retail sales for the community by attracting outside shoppers.

Geography can also influence retail activity. Oklahoma is roughly split in half by Interstate 35, so a location dummy variable for a location east of Interstate 35 is included. The eastern part of the state has experienced significantly more growth since 1990, so this variable will attempt to uncover the influence of a town's location in the state. In addition, a continuous variable for distance from an interstate was included to further dissect the importance of location.

Demographic characteristics of community residents were also considered in variable selection. Three categorical age variables are included (with the proportion over age 65 excluded as a default) to determine if age composition significantly impacts retail activity. Income can be assumed to have a positive impact on retail sales, so average household income is included as an independent variable. Household size can also play a role in retail activity, but a potentially negative one since larger households can share the purchase of some items. All data with the exception of the farm, manufacturing, and government dependent counties and the unemployment rate is at the community or zip code level. Industry dependent data and unemployment rates were only available at the county level. Table 1 lists other variables used in the econometric models along with the type and data source.

[Table 1 about here]

Descriptive Statistics. When comparing communities with a CAH to those without, t-tests on variable means uncover several significant differences (Table 2). Average household size was significantly higher in communities without a CAH. Further, there were significant discrepancies in age, with larger proportions of younger groups (under 19 and 20-44) present in communities without a CAH. This is intuitive, since proximate health care is increasingly important for older (45+) age categories. Communities with a CAH have longer to travel to get to an interstate and also exhibited higher levels of micro business establishments. Interestingly, there is no statistically significant difference in retail sales or total retail establishments, likely due to the wide variations observed in different communities as evidenced by the large standard deviations.

[Table 2 about here]

Econometric Models.

Four different dependent variables are used in our analysis to see whether CAH status impacts various measures of retail activity. These variables include: (1) community level retail sales (RS), (2) number of retail establishments (RTEST), (3) number of micro retail establishments (MICROBUS), and (4) number of small retail establishments (SMBUS). Given the continuous nature of the dependent variables, ordinary least squares (OLS) modeling is used to determine the impacts that the selected independent variables have on the various retail measures. The OLS model takes the form:

$$y_i = B' X_i + \varepsilon_i$$

Where y_i depicts the dependent variables that will be utilized for community i, X_i is a vector of independent variables that are hypothesized to impact the retail activity of a community, B' symbolizes the parameter estimates for the vector X_i, and ε_i is the associated error term. For example, in Model (1), y_i represents average retail sales in community *i,* which is melded based on characteristics of community i (X_i).

The dependent variables for y_i are the four previously mentioned measures of retail activity. The explanatory variables represented in vector X are very similar for each of the four models. Dummy variables for critical access hospitals (CAH), Wal-Mart (WM), and county seat (CS) are present in all four models. CAH and CS are expected to have a positive impact in all four models, while WM is expected to have a positive impact on retail sales but not on retail establishments. There are three county-level industry specific variables: farm dependent (FARM), manufacturing (MANUF), and government dependent (GOVT). There are two location variables: I35 is a dummy variable for if the community is located east of Interstate 35, and DST represents the actual number of miles the community is located from an interstate. DST is expected to have a negative impact in each of the four models since distance from a major roadway; lessens a community's ability to attract shoppers.

Three continuous variables pertaining to local economic and demographic data are included in each of the models. HOUSHLDINC refers to the median household income on the community level. This variable is expected to have a positive impact on retail activity since higher income levels suggest greater ability to spend on retail items. Given the dramatically different units for both this variable and retail sales, both are converted to logarithmic form so that the OLS normality assumption holds. HOUSHLDSZ represents the average household size on the community level. This value is expected to be negative since the household per capita income has the possibility of being lower with a higher number of occupants. UNEMP represents the average (2000-2005) unemployment rate, which likely has a negative relationship with retail activity.

All four models also include the proportion of residents in these age categories: UNDER19, TO44, and TO64. The age group of over 65 is used as the default category in this sample. It is expected that the age group of 20-44 and 45-64 would have a positive impact on retail activity since these two groups account for the majority of the workforce. Finally, the number of retail establishments is included in the model for retail sales since the number of stores will certainly impact total sales.

Results

The four models listed above attempt to identify the impact (if any) that CAHs have on retail activity through actual retail sales and the number of total, micro, and small retail establishments per town. Heteroskedasticity was addressed using the Breusch-Pagan Test. Table 3 displays the results for all four models.

In Model (1), the dependent variable is the log of average retail sales. CAHs have a positive and significant impact on this variable, which was anticipated since most case studies assert their importance. The Wal-Mart variable (WM) also presents a very similar parameter estimate while still being highly significant. The similarity of the parameter estimates implies that the presence of a CAH has a comparable effect on retail sales as the presence of a Wal-Mart. Given the log-linear nature of model (1), the interpretation of a dummy variable is not completely straightforward. Here the percentage impact on retail sales is given by the formula 100*[exp(0.2576-1)]=29.4% (Halvorsen and Palmquist, 1980). Thus, retail sales are 29.4% higher in communities with CAHs, and 28.9% higher in communities with Wal-Mart.

Other significant variables in model (1) exhibit their expected signs. This includes the number of retail establishments (RTEST) and household income (HOUSHLDINC), which have a positive impact; and household size (HOUSHLDSZ) which has the expected negative sign.

There were three age variables included in the model, with the over 65 group serving as a default. Since the total population is represented as a proportion, the interpretation of age parameters will be different compared to other parameters shown in Table 3. In model (1), only the under 19 group was significant with a positive parameter estimate. The parameter estimate for the age group of under 19 is 5.36. To correctly interpret this parameter, it must be applied in the context of a standard deviation "shift" in the proportion for that age group. Therefore, the impact of a shift in the age breakout will be found by multiplying the standard deviation (found in Table 2) by the parameter estimate (Miller and Rodgers, 2008). After taking the parameter estimate of 5.36 and the standard deviation of 0.019, the more readily interpretable parameter of the age group under 19 becomes 0.2116. This implies that if the proportion of the under 19 category were to shift by one standard deviation (from 28% to 29.9%), retail sales in the community would increase by 21.16 percent. Table 4 displays the "standardized" age results for the age parameter in each of the four models.

Models (2), (3), and (4) produce strikingly similar results, which is not surprising given that all dependent variables are related to general retail activity. In each case, the presence of a CAH is positive and statistically significant. The associated parameters suggest that the presence of a CAH leads to an additional 5.1 retail establishments (Model 2), and roughly an additional 2.3-2.5 micro and small business establishments (Models 3 and 4). In each of these models, the presence of a Wal-Mart is also positive and highly significant. This impact was somewhat unexpected, since the majority of research on the topic has indicated that Wal-Mart can hurt small businesses, but other research has suggested that Wal-Mart may actually encourage niche businesses (Artz and Stone, 2006; Irwin and Clark, 2006). The age categories are all significant and negatively related to the number of retail establishments, suggesting that higher proportions of younger residents would lead to a reduction in retail establishments. By default, however, this implies that larger proportions of older residents would lead to more establishments. Only one other variable is ever significant for total and small retail establishments, which is the dummy variable for whether or not a county is manufacturing dependent. This suggests that micro and small establishments can thrive alongside a strong manufacturing presence.

[Table 3 about here]

[Table 4 about here]

Discussion and Conclusion

Generally, the econometric models confirm that CAHs do have statistically significant and positive impacts on retail activity, including the amount of retail sales and the number of retail establishments. In all four models, CAH and Wal-Mart were the only variables that were consistently statistically significant and positive. This suggests that, even after other factors are accounted for (such as the presence of a county seat, or a strong manufacturing sector), having a CAH in a community leads to higher levels of retail activity. The empirical results strengthen previous economic impact studies typically performed on single communities using Input / Output analysis.

This research incorporates data that somewhat limit the level of analysis. While retail sales, local sales tax collections, and retail establishments were utilized in this study, the type of sales or retail establishments were not evaluated. Future research could examine more in-depth measures of sales tax collections by including Standard Industrial Classification codes or types of retail establishments by North American Industrial Classification System codes. Further, while this study has demonstrated the impact that CAHs have on total retail activity, more in-depth research could explore what types of "niche" markets compliment CAHs and thus make good additions to those communities with a hospital. Finally, our analysis is limited to the single state of Oklahoma, and future efforts may attempt to replicate our findings on a regional or national scale.

A few important policy implications arise from this research. It is important for a CAH to stay open in a rural community for healthcare reasons. However, other positive externalities that occur from the presence of a CAH are often overlooked. This research concludes that towns with a CAH have statistically higher levels of retail sales and more retail establishments (including those with less than 20 employees). These results suggest that a CAH not only attracts patients, but also shoppers that make purchases at local retail establishments. From a policy perspective, subsidizing CAHs is beneficial to the local retail sector as well as the more commonly recognized health aspect.

An analysis of exactly how much support is too much for a local CAH is beyond the scope of this paper. However, our research demonstrates that the presence of a CAH increases retail sales and boosts the number of retail establishments in rural communities. Providing adequate levels of funding support is therefore essential for promoting economic activity in the retail sector. Previous research indicates that education, engagement, and awareness of the local health sector can all increase community support, including higher utilization of local facilities and continued local financial support (Zimmerman, McAdams, and Halpert, 2004). Higher-level financial support, such as that for the CAH program itself, requires assessment of the program impact on an aggregate scale. This paper adds to the body of evidence on CAH benefits, and makes an economic argument for their continued funding.

References

American Hospital Association. *Beyond Health Care: The Economic Contribution of Hospitals*. Trendwatch. Washington DC; April 2008.

Artz, G.M., and K.E Stone. Analyzing the Impact of Wal-Mart Supercenters on Local Food Store Sales. *American Journal of Agricultural Economics*. 2006: 88(5): 1296-1303.

Avery, S. Rural Hospitals' *Contributions to Health Care and Local Economies*. CHA Special Report. California Healthcare Association; July 2002.

Brooks, L, B. Whitacre, S. Ralstin, A. Woodruff, C. Kaiser, and V. Schott. *The Economic Impact of the Health Sector on the Okeene Municipal Hospital Medical Service Area*. Oklahoma Rural Health Works. January 2009.

Department of Health and Human Services, Centers for Medicare and Medicaid Services-National Health Expenditure Data Page. Internet site. http://www.cms.hhs.gov/NationalHealthExpendData/. (Accessed September 25, 2009).

Doeksen, G.A., S. Cordes S, and R. Shaffer . *Health Care's Contribution to Rural Economic Development*. Report to US Federal Office of Rural Health: Rockville, MD: 1992.

Doeksen, G.A., T. Johnson, D. Biard-Holmes, and V. Schott. A Healthy Health Sector is Crucial for Community Economic Development. *Journal of Rural Health*. 1998;14(1):66-72.

Doeksen, G.A., and V. Schott. Economic Importance of the Health-Care Sector in a Rural Community. *Rural and Remote Health*. 3(online), 2003:135. http://www.rrh.org.au/articles/subviewnew.asp?ArticleID=135. (Accessed October 23, 2009).

Ferber, R. Variations in Retail Sales Between Cities. *The Journal of Marketing*. 1958: 22(3): 295-303.

Goetz, S.J., and A. Rupasingha. Wal-Mart and Social Capital. *American Journal of Agricultural Economics*. 2006: 88(5): 1304-1310.

Halvorsen, R, and R. Palmquist. The Interpretation of Dummy Variables in Semilogarithmic Equations. *American Economic Review*. 1980: 70(3): 474-475.

Irwin, E, and J. Clark. The Local Costs and Benefits of Wal-Mart. Department of Agricultural, Environmental and Developmental Economics. Ohio State University. February 2006.

Kentucky Rural Health Works. *The Economic Impact of the Local Health Care System on the Casey County Economy*. Kentucky Rural Health Works, UK Department of Agricultural Economics, KY State Office of Rural Health, UK Center for Rural Health, and UK Cooperative Extension Service. February 2003.

Lawler, M.K., G.A. Doeksen, and V. Schott. Impact of Conversion to Critical Access Hospital Status for Oklahoma's Rural Hospitals. *Journal of Rural Health*. 2003;19(2):135-138.

Miller, J.E., and Y.V. Rodgers. Economic Importance and Statistical Significance: Guidelines for Communicating Empirical Research. *Feminist Economics*. 2008: 14(2):117-149.

Minnesota IMPLAN Group, Inc. User's Guide, Analysis Guide, Data Guide: IMPLAN Professional Version 2.0 Social Accounting & Impact Analysis Software, 2nd ed. June 2000.

Muske, G, and M. Woods. Micro Businesses as an Economic Development Tool: What They Bring and What They Need. *Journal of the Community Development Society*. 2004: 35(1): 97-116.

Morrisey, M.A., G.J. Wedig, and M. Hassan. Do Nonprofit Hospitals Pay Their Way? *Health Affairs*. 1996. 15(4): 132-144.

Novack, N.L. Bridging the Gap in Rural Healthcare. *The Main Street Economist*. Center for the Study of Rural America, Federal Reserve Bank of Kansas City. 2003.

Office of Rural Health and Primary Care. *Economic Impact of the Johnson Memorial Health Services and Related Health Sectors of Lac qui Parle County.* Minnesota Department of Health. June 2008.

Oklahoma State Department of Health. *Medical Facilities Directory*. Oklahoma City, OK; April 2009.

Probst, J.C., M.E Samuels, J.R. Hussey, D.E. Berry, and T.C. Ricketts. Economic Impact of Hospital Closure on small rural counties, 1984 to 1988: Demonstration of a Comparative Analysis Approach*.* *Journal of Rural Health*. 1999;15(4):375-390.

Slifkin, R. State Laws and Programs that Affect Rural Health Delivery. *Rural Health in the United States* .Ricketts TC III, ed. NY: Oxford Press; 1999: 84-94.

United States Bureau of the Census. State and Local Government Finance. Internet site: http://www.census.gov/govs/estimate/index.html. (Accessed November 18, 2009).

Zimmerman, M.K., and R. McAdams. Public Support for Rural Health Care: Federal Programs and Local Subsidies. *Chronic Care, Health Care Systems and Services Intergration: Research in the Sociology of Health Care.* Kronenfield JJ, ed. Vol. 22. NY: Elsevier; 2004: 22-45.

Zimmerman, M.K., R. McAdams, and B.P. Halpert. Funding Health Services in the Rural United States: Federal Policies and Local Solutions. *Critical Issues in Rural Health.* Glasgow N, Morton LW, and Johnson NE, eds.. Ames, IA: Blackwell; 2004: 211-224.

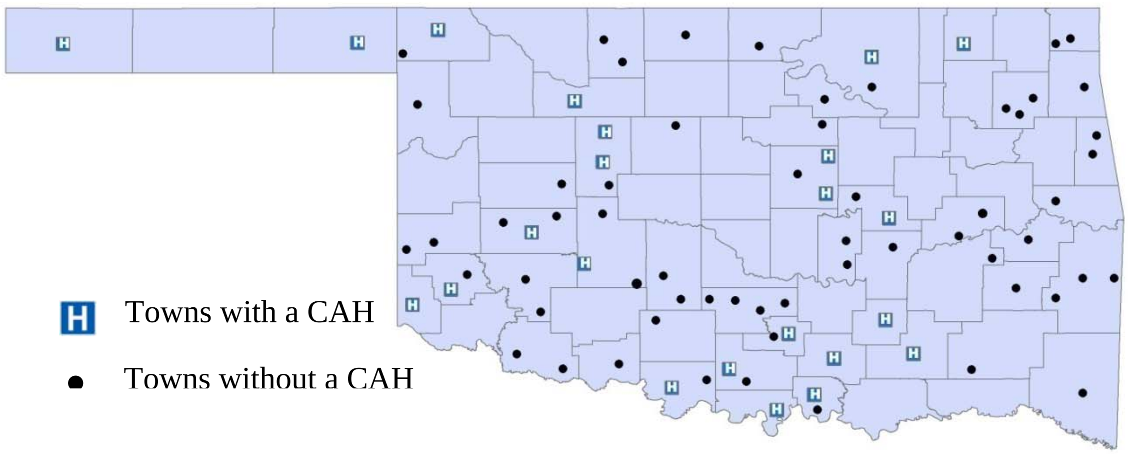

Figure 1. Location of Towns used in Study

Table 1. Independent and Dependent Variables

Variable	Type	Description	Data Source
Independent Variables			
CAH	0/1	Critical Access Hospital	Oklahoma Department of Health
WM	0/1	Wal-Mart present in town/city	Walmart.com
CS	0/1	County Seat	OK County Data
I35	0/1	Location Variable for East of I-35	Oklahoma Dept. of Transportation
FARM	0/1	Farming Dependent County	USDA ERS
MANUF	0/1	Manufacturing Dependent County	USDA ERS
GOVT	0/1	Government Dependent County	USDA ERS
HOUSHLDINC	Continuous	Household Income (2000)	Census
HOUSHLDSZ	Continuous	Household Size (2000)	Census
UNDER19	Continuous	Percentage of population under 19 (2000)	Census
TO44	Continuous	Percentage of population under 20-44 (2000)	Census
TO64	Continuous	Percentage of population 44-64 (2000)	Census
UNEMP	Continuous	Average Unemployment Rate (2000-2005)	BLS
DST	Continuous	Distance (miles) from Interstate	GIS
RTEST	Continuous	Average Number of Retail Establishments (2000-2005)	Census
Dependent Variables			
RS	Continuous	Average Total Retail Sales (2000-2005)	Oklahoma Tax Commission
RTEST	Continuous	Average Number of Retail Establishments (2000-2005)	Census
MICROBUS	Continuous	Average Number of Micro Retail Est. (1-4 Employees) (2000-2005)	Census
SMBUS	Continuous	Average Number of Small Retail Est. (5-19 Employees) (2000-2005)	Census

Table 2. Descriptive Statistics

	Observations with CAH		Observations without CAH		
	Mean	Std. Dev.	Mean	Std. Dev.	
CAH	1	0	0	0	
POPULATION	2,719	1,071	1,992	1,004	
WM	0.167	0.381	0.133	0.343	
CS	0.458	0.509	0.383	0.49	
I35	0.458	0.509	0.55	0.502	
FARM	0.292	0.464	0.2	0.403	
MANUF	0.125	0.338	0.167	0.376	
GOVT	0.125	0.338	0.1	0.303	
HOUSHLDINC	25,957	4,999	23,757	4,334	
HOUSHLDSZ	2.381	0.077	2.421	0.144	**
UNDER19	0.281	0.019	0.288	0.045	**
TO44	0.305	0.04	0.319	0.063	**
TO64	0.212	0.017	0.206	0.024	*
UNEMP	4.532	1.116	4.846	1.072	
DST	37.183	37.789	22.911	21.095	**
RTEST	21.41	8.298	15.892	11.256	
RS	23,109,477	14,441,310	15,154,173	14,169,663	
MICROBUS	10.438	3.933	8.017	5.563	*
SMBUS	9.007	3.737	6.444	4.539	

* Means are statistically different at the *P* = .10 level
** Means are statistically different at the *P* = .05 level.

Table 3. Model Results

	Model (1) DV: Log of Average Retail Sales			Model (2) DV: Total Retail Establishments			Model (3) DV: Micro Business Retail Establishments			Model (4) DV: Small Business Retail Establishments		
	Parameter	S.E.	P-value	Parameter	S.E.	P-value	Parameter	S.E.	P-value	Parameter	S.E.	P-value
CAH	0.2576	0.0949	0.0084**	5.1145	1.9907	0.0124**	2.4461	1.0360	0.0210**	2.2632	0.8585	0.0103**
WM	0.2538	0.1424	0.0791**	14.7705	2.5726	<.0001**	6.2875	1.3388	<.0001**	5.5371	1.1094	<.0001**
CS	-0.0485	0.0844	0.5675	1.5478	1.8437	0.4041	0.6804	0.9595	0.4806	0.7630	0.7951	0.3406
I35	0.1260	0.1296	0.3347	3.6417	2.8139	0.1999	2.2758	1.4644	0.1247	1.2837	1.2135	0.2938
FARM	-0.0495	0.1284	0.7009	-3.5302	2.7883	0.2097	-0.7655	1.4510	0.5995	-1.9793	1.2024	0.1043
MANUF	-0.1437	0.1289	0.2687	4.7037	2.7742	0.0945*	2.0780	1.4437	0.1546	2.2118	1.1964	0.0688*
GOVT	-0.1186	0.1458	0.4185	-2.8236	3.1840	0.3783	-1.9686	1.6570	0.2389	-1.2713	1.3731	0.3578
Log(HOUSHLDINC)	0.7153	0.2808	0.0131**	-0.2986	6.1696	0.9615	-1.5670	3.2107	0.6271	1.0900	2.6606	0.6833
HOUSHLDSZ	-0.9231	0.4676	0.0525*	-0.8346	10.2732	0.9355	-0.2151	5.3462	0.9687	-0.5259	4.4303	0.9059
UNDER19	5.3587	2.5756	0.0412**	-109.6426	55.0236	0.0503*	-49.2742	28.6345	0.898*	-48.7421	23.7287	0.0438**
TO44	2.4200	1.5650	0.1217	-85.6834	32.7972	0.0110**	-41.9985	17.0678	0.0164**	-34.9767	14.1437	0.0159**
TO64	-2.8414	2.8657	0.3249	-167.3303	59.6474	0.0065**	-70.4925	31.0407	0.0263**	-81.0465	25.7227	0.0024**
UNEMP	-0.0188	0.0565	0.7404	0.1578	1.2404	0.8991	0.1826	0.6455	0.7782	-0.0461	0.5349	0.9316
DST	0.0396	0.0370	0.2877	-0.7741	0.8064	0.3405	-0.5942	0.4197	0.1613	-0.1230	0.3478	0.7247
RTEST	0.0632	0.0055	<.0001**									
Intercept	8.3946	3.1461	0.0095**	111.2034	67.8077	0.1056	64.7342	35.2874	0.0709*	37.6021	29.2418	0.2028
R-Squared	0.8380			0.4796			0.4082			0.4387		

* Significant at the *P* = .10 level

** Significant at the *P* = .05 level

Table 4. Standardized Age Parameters

	Model (1) DV: Average Retail Sales	Model (2) DV: Total Retail Establishments	Model (3) DV: Micro Business Retail Establishments	Model (4) DV: Small Business Retail Establishments
UNDER19	0.2116**	-4.3299*	-1.9459*	-1.9249*
TO44	0.1380	-4.8873**	-2.3956**	-1.9950**
TO64	-0.0620	-3.6501**	-1.5377**	-1.7679**

* Significant at the *P* = .10 level
** Significant at the *P* = .05 level