

**A Case Study: Organizational and Environmental Factors Associated with Alabama Rural Hospitals' Reported Levels of Financial Distress**

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## ABSTRACT

Community hospitals are major forces in their geographic economies by providing jobs, consuming a high amount of locally produced goods and services, and making the overall community a more desirable place to live and conduct business. For example, it is not uncommon for a rural hospital to employ as high as 4 percent of a county's total workforce. Despite the importance of rural hospitals to their communities, they continue to close at an alarming rate. As such, it is important to identify the internal and external factors that may contribute to rural hospitals' financial duress, which may lead to closure or other market exit strategies.

This study examined the financial condition of Alabama's operating rural, acute-care hospitals from 2010 to 2014 (5 years) to identify organizational characteristics and environmental factors that may affect the hospital experiencing financial distress.

We found that a majority of Alabama's rural hospitals reported some level of concern regarding their financial sustainability due to distress and there was a significant association between ownership and hospital age. Hospitals with a for-profit ownership have a significantly higher odds ratio of being in financial distress when compared with not-for profit hospitals. There was also a significant relationship between a hospital's age and financial distress.

By identifying the two variables that were significantly associated with financial distress, (ownership and hospital age), this study showed that there is sufficient support to recommend that these factors be considered by healthcare managers and financial professionals working in this sector.

**Keywords:** Altman Z-Score, hospital financial distress

## Introduction and Background

Rural hospitals differ from their urban counterparts with regard to two main areas. First, their facilities tend to be smaller, older, and more prone to staff shortages than those in an urban environment (ACHRG, 2008; RHA, 2016). Second, the patients served by rural hospitals are usually older, of lower income, and less healthy than those in urban locations. (ACHRG, 2008; Kaufman et al., 2015; Reschovsky & Staiti, 2005; RHA, 2016). There have been 51 rural, acute care hospital closures across the United States between 2010 and 2014, and the numbers are increasing (Demko, 2015; NRHA, 2016). It is important that we study this increase in rural hospital closures because there are more issues than just health care access associated with the existence of a rural hospital in a community. For instance, Kaufman et al., (2015), Longo and Chase (1984), and Holmes, Slifkin, Randolph, and Poley (2006) argued that a community hospital is a major force in the local economy by providing jobs, consuming a large amount of community provided goods and services, and making the community a more desirable place to live and conduct business.

According to the National Rural Health Association (NRHA), the Alabama Department of Public Health (ADPH), and the North Carolina Rural Health Research Program (NC-RHRP), financial benefits are associated with the presence of a hospital in the community, especially in rural counties lacking substantial employment opportunities from other sources (AHA, 2005, 2011; Holmes et al., 2006; Longo et al., 1984). According to Holmes et al. (2006) and the AHA (2005), it is not unusual for a rural hospital to employ as high as 4% of a county's total workforce. Despite the importance of rural hospitals to their communities they continue to close at an alarming rate (Holmes, 2014; Lackey, 2014). The purpose of this study was to identify internal and external factors that may contribute to rural hospitals' financial duress, which may lead to closure or other market exit strategies

According to the NRHA, there were more rural hospital closures in 2013 than in the previous 15 years (Holmes, 2014). Why are rural hospitals closing in such large numbers? There are several arguments that attempt to address this question, most centering on the financial challenges associated with health reform initiatives enacted since 2010. According to Thomas, Holmes, and Pink (2016), urban hospitals have reported increased profit margins since 2012, whereas rural hospitals have experienced decreasing margins. In 2014, rural hospitals reported average profit margins of 2% as opposed to 5.9% for their urban counterparts. These changes are directly attributable to reductions in Medicare and Medicaid reimbursement payments, and declining inpatient volumes (Thomas, Holmes & Pink, 2016).

One could argue that hospitals most at risk for financial distress would be smaller hospitals (26-50 beds) with older facilities and a higher percentage of elderly patients, an apt description of most rural hospitals (Azok, 2013; Demko, 2015; Guggliotta, 2015). Azok (2013), Guggliotta (2015), and Demko (2015) suggested that recent reimbursement payment changes, especially in those states not expanding Medicaid, are causing financial distress in smaller, rural hospitals.

Financial distress is not a new phenomenon for rural hospitals. They have struggled with decreasing profit margins since the enactment of the Medicare Perspective Payment System (PPS) in 1983 (Lee & Alexander, 1999; Lillie-Blanton et al., 1992; Shortell, Morrison, & Friedman, 1990; Williams, Hadley, & Pettingill, 1992), but many of the current rural hospitals' negative operating margins are associated with the financial changes contained within recent healthcare

reforms (i.e., Affordable Care Act) (Thomas et al., 2016). For example, hospitals located in the southern region of the United States - Texas, Mississippi, Alabama, Tennessee, and Georgia – states that chose not to expand Medicaid have collectively experienced the closure of 32 rural hospitals since 2010 (NC-RHRP, 2016). These five states comprise almost half of the total closures to date (68 as of July, 2016).

During the past decade, numerous studies have posited that certain environmental factors may affect the survivability of hospitals (Gifford & Mullner, 1988; Hannan & Freeman, 1984; Henderson & Taylor, 2003; Nyhan, Ferrando, & Clare, 2001; Pfeffer, 1973; Stinchcombe, 1965; Succi, Lee, & Alexander, 1997). This study expands on previous research to explore the environmental factors and organizational characteristics associated with reported financial distress in rural Alabama hospitals.

This study examined the financial condition of Alabama's operating rural, acute-care hospitals from 2010 to 2014 (5 years) for the purpose of identifying organizational characteristics and environmental factors that may impact the hospital experiencing financial distress. Alabama was selected as the site for this study because it is one of the 19 states that chosen not to expand its Medicaid program. By using a single state cluster analysis, all of the studied hospitals operated in the same macro (state and national) environment thereby minimizing other policy effects. This study used the hospitals' published financial statements for extracting the information needed for calculating the entity's Altman Z-Score, which was used as a proxy for financial distress.

The Altman Z-Score has been used over the past four decades in multiple industries, including health care, to predict financial distress (Altman, 1968). The model uses a weighted combination of liquidity, profitability, efficiency, productivity, and asset turn-over ratios (Altman, 1983). For many years, financial indicators (or ratios) have been an important tool for understanding how an organization is performing in comparison to other organizations (Horrigan, 1968). There are a number of standardized indicators (or ratios) used by financial analysts and investors to evaluate the capability and strength of an organization. The Altman Z-Score uses a number of these indicators in a weighted model to forecast the financial wellbeing of an organization.

Since 1968, there have been updates and adjustments for use of the model with different ownership types (for-profit, not-for-profit) (Altman, 1983), different industries (railroad, retail, and service) (Altman, 1973; Hayes, Hodge, & Hughes, 2010; Kim & Gu, 2006), and within different national economies (England, Germany, Canada, and Japan) (Altman, 1983). The Z-Score version used in this study was the Altman Z''-Score (i.e., Z double-prime). It creates a forecast of financial distress by using indicator ratios for liquidity, profitability, efficiency, and productivity. This version was developed for use in service industries to provide a better fit for an industry that may also include not-for-profit entities (Al-Sulaiti & Almwajeh, 2007; Calandro, 2007; Carton & Hofer, 2006; Eastaugh, 1992; Kumar, R., & Kumar, K., 2012; Langabeer, 2008; Ramamonjjarivelo et al., 2015; Ramamonjjarivelo, Weech-Maldonado, Hearld, & Pradhan, 2014; Rufus, 2003). The Altman Z''-Score formula is reflected in Figure 1:

**Figure 1: Altman Z"-Score**

$$Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

**Where**

**Z'' = Overall Index Score**

**X1 = Working Capital / Total Assets (Liquidity)**

**X2 = Retained Earnings / Total Assets (Profitability)**

**X3 = Earnings Before Interest and Taxes / Total Assets (Efficiency)**

**X4 = Book Value Total Equity / Total Liabilities (Productivity)**

Evaluation scoring for the Z"-Scores calculated in this study follows Altman's recommendation for use in service industries—with organizations returning a score equal to or less than 1.1 are considered to be in financial distress, a score that is greater than 1.1 but less than or equal to 2.8 are considered to be in an area of "concern", and a score greater than 2.8 is considered to be financially sound (Altman, 1983; Carton et al., 2006; Eastaugh, 1992; Langabeer, 2008). Hospitals in our study which had a calculated Z"-Score less than or equal to 1.1 were considered to be in financial distress and designated as having a "Low Z"-Score." This "Low Z"-Score" was then used to create a binary dependent variable for use in a logistic regression analysis model with both organizational characteristics and county level factors.

#### Alabama's Hospital Industry

At the time of this study, there were 126 hospitals operating in Alabama of which 92 were short-term acute care general hospitals. Of these hospitals, 39 were in urban locations and 53 are designated as rural (AHA, 2015, ALAHA, 2015, NC-RHRP, 2015).

For this study's population only rural, acute-care, non-U.S Government hospitals were included. A designated rural hospital was one (a) having a location not included in any Metropolitan Statistical Area (MSA); (b) having a mailing zip code associated with a Rural Urban Commuting Area (RUCA) code (CMS, 2015; RUCA, 2015; RAC, 2015; USDA, 2014;) that meets or exceeds a value of four; or (c) having the state government decree the hospital is, and shall be considered, rural (CMS, 2015; HRSA, 2015;). Alabama's 53 short-term acute-care, rural hospitals are dispersed over 45 counties within the state, serve 41% of the state's population, and cover 90% of the land mass (Census, 2010, 2012; USDA, 2015; Zhou, Barlow, Prevatt, & Zhang, 2010). (See Map, Figure 2)



**Figure 2: Rural – Metro Map**  
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## **The Study**

There are several studies that address the survival of hospitals (Gifford & Mullner, 1988; Henderson & Taylor, 2003; Nyhan et al., 2001; Ramamonjiarivelo et al., 2015; Ramamonjiarivelo et al., 2014; Succi et al., 1997). Some studies focus on community attachment (Drain et al., 2001; Gifford et al., 1988; Henderson et al., 2003) while others focus on organization management type (Lee & Alexander, 1999; Pfeffer, 1973) or founding conditions (Aldrich, 1990; Singh et al., 1990).

This study expands the work of Succi et al. (1997), Ramamonjiarivelo et al. (2014), and Ramamonjiarivelo et al. (2015). These researchers argued that a hospital's long-term survival is contingent upon its financial wellbeing, and that this financial wellbeing is dependent upon factors at the organizational level as well as those in the external environment.

The organizational characteristics chosen for this study were hospital ownership, age, and size (i.e., number of staffed beds). The environmental factors of interest were county population, county average per-capita income, the median age of the county's population, and the number of physicians in the county.

### Hospital Ownership

Ownership has been a variable of interest for a number of years when studying the health and survival of hospitals, with for-profit organizations being substantially more susceptible to financial ills and closure than either not-for-profit or local government ownership (Gifford & Mullner, 1988, Pfeffer, 1973; Succi et al., 1997). Each of these studies posited that hospital survival was linked to ownership effects ranging from sources of capital to community acceptance and support. For example, the works of both Gifford and Mullner (1988) and Succi et al. (1997) maintained that a hospital's ownership has an impact on its profitability and survival, with not-for-profit hospitals being less subject to the effects of financial hardship and closure than for-profits because their ties to the community provide additional support.

### Hospital Age

Hospital age has been a major variable of interest in the study of hospital survival for a number of years (Gifford & Mullner, 1988; Nyhan et al., 2001). All of these studies support that a hospital's age should be evaluated as a potentially significant factor for association with its success or failure. Both Nyhan et al. (2001) and Gifford et al. (1988) posited that newer hospitals could be subject to a "liability of newness" (p. 299) making them more susceptible to failure than older, better established organizations (D'Aunno & Zuckerman, 1987; Freeman, Carroll, & Hannan, 1983; Hannan, 1998, 2005; Stinchcombe, 1965). These studies range widely in their results dealing with organizational age and propose not only liabilities of newness but also liabilities of adolescence and old age. By evaluating the relationship of a hospital's age with its financial wellbeing it may be possible to identify age related liabilities that exist within this sample of rural Alabama hospitals.

### Hospital Size

Hospital size (i.e., number of staffed beds) has been used as both an independent predictor variable and a control variable of interest in several studies attempting to understand the factors associated with hospital distress and failure (Gifford et al., 1988; Nyhan et al., 2001; Ramamonjiarivelo et al., 2014; Succi et al., 1997). Researchers associated with studies involving hospital size argue that

smaller hospitals should be more susceptible to financial distress than larger ones due to economies of scale.

Succi, Lee, and Alexander (1996) argued that larger hospitals are less susceptible to short term fluctuations because of their size and associated resources. Because of additional purchasing power (i.e., economies of scale), larger hospitals are often able to secure supplier discounts and better able to acquire skilled employees by offering higher salaries and better benefits (Nyhan et al., 2001). This improved buying power also better enables larger hospitals to offer more technological innovations, thus attracting more admitting physicians and patients (Succi et al., 1997). If a hospital's smaller size and subsequent weaker purchasing power makes it less capable of adapting to change, then this vulnerability would be exacerbated by an environment that has shifted from stable to turbulent (Lee et al., 1997; Succi et al., 1997).

#### County-level Population

A county's population has long been used as a proxy for determining the scope and size of a rural market environment as both a predictor variable and a control variable (Alexander, D'Aunno, & Succi, 1996; Henderson & Taylor, 2003; Kim & McCue, 2008; Succi et al., 1997; Lillie-Blanton et al., 1992; Williams et al., 1992). According to Henderson and Taylor (2003), a county's population is the most significant factor in determining its ability to support and maintain a hospital.

Hospitals located in counties with a larger population have a better defined market and are more resistant to the forces that could cause financial distress or failure (Lillie-Blanton et al., 1992). The precedent for using county population as an independent variable for the study of hospital success dates back to Williams et al. (1992). They argued that even though there is potential for a hospital to draw patients from its surrounding counties, most small rural hospitals are more likely to draw the majority of patients only from their own county.

#### Average County Per-Capita Income

A county's average per-capita income is often used in conjunction with population density as a variable of interest when studying the characteristics of an organization's market. Average per-capita income of a county's residents has served as a proxy for the munificence of a hospital's local environment in several hospital-related studies (Kim & McCue, 2008; McCue & Diana, 2007; Ramomonjarivelo et al., 2014; Semritc, 2009; Succi et al., 1997). These studies unanimously posited that counties with a larger per-capita income should have hospitals more financially stable than those counties with a lower per-capita income. For example, McCue and Diana (2007) best summarized the argument associated with the use of this variable for the study of rural hospitals with their insistence that communities with a high per-capita income are expected to contribute to a positive cash flow position for its hospital.

#### Age of County's Population

Population age has figured prominently in several studies attempting to link hospital success or failure to environmental variables (Kim & McCue, 2008; Lillie-Blanton et al., 1992; Mayer et al., 1987). These researchers all used the percentage of county residents who were aged 65 or older to determine if there was a significant association between residents' age of 65 or older and a hospital's financial success. The authors concluded that a high percentage of patients aged 65 or older in a hospital's immediate market was statistically significant as an indicator of increased

demand for hospital services and a higher payment for services through Medicare. This study expands upon their concept by using the median age of the hospital's county population (ADPH, 2010, 2011, 2012, 2013, 2014).

Rural counties in Alabama tend to have, on average, older residents than urban counties, and many of them have a high percentage of residents over 65. By using median age for the population's age, it was the intention of this study to ascertain if the subtle differences associated with this overall measurement of population age had a significant association with not only residents that were 65 or older, but also with the county's entire population.

### Number of Physicians

Another measure that could potentially shed light on a rural environment's ability to support a hospital is the number of physicians residing within its community. Several studies have examined the effects of physician presence in the success of U.S. hospitals. This study extends the works of Ramamonjiarivelo et al. (2014), Almwajeh (2004), McCue et al. (2007), and Fennell (1980). These researchers all posited that the ratio of physicians to their surrounding population is a useful measure of the environmental munificence of trained caregivers and that the number of available physicians directly affected the range of services that hospitals were able to offer patients (Fennell, 1980; McCue et al., 2007). This ratio represented two possibilities in this study: (1) physicians must seek out employment in areas providing sufficient population to take advantage of their services, and (2) a labor shortage for those hospitals located in smaller counties.

## **Method**

### Data

This study was based on longitudinal panel data assembled from multiple sources (See Listing of Study Variables, Source, and Description: Table 1). The Alabama Hospital Association was the primary source for the listing of all current Alabama rural, acute-care hospitals (ALHA, 2015) with these data being verified using both the Center for Medicare/Medicaid Services (CMS) file (CMS, 2015) and Area Resource Files (AHRF) (2014). Hospitals that were not short-term, acute care, or non-federal hospitals were removed from the list; leaving a total of 53 hospitals for the study. Annual data (2010-2014) were collected for each of these 53 designated hospitals, creating a preliminary sample of 265 hospital-year observations. After removing incomplete observations, 246 hospital-year observations remained.

For these hospitals, financial data were acquired from the American Hospital Directory Database (AHD, 2016) and verified using the CMS Cost Reports Database (CMS) (2015), which provided both balance sheet and income statement data for the five years of 2010 through 2014. Financial indicators were then used to construct an organization's Z"-Score (Figure 1 details the process for the construction of hospital Z"-Scores). The coefficients (weighting) used in the calculations followed the works of Langabeer (2008) and Al-Sulaiti and Almwajeh (2007) who used a service industry version of the Z" model to study hospitals in their research.

The dependent, binary variable "Low-Z"-Score" was constructed by choosing Z"-Scores that were equal to or below a value of 1.1 as suggested by Ramamonjiarivelo et al. (2014), Hayes et al. (2010), and Keating et al. (2005).

The organizational characteristics used for this study builds on the works of Gifford et al. (1988), Nyhan et al. (2001), and Succi et al. (1997) for explaining the reasons for hospital closures in the U.S. Data for these variables were obtained from the AHRF (2014), the Regional Economic Analysis Project (REAP) (2016), the Alabama Hospital Association (ALAHA) online database (2015), CMS-PUF files for 2010-2015, and Manta (2016). The independent variables included (1) hospital ownership, (2) hospital age, and (3) hospital size.

The environment factors used in this study expands upon work by both Lillie-Blanton et al. (1992) and Williams et al. (1992) in which they posited that community factors play a major role in the success or failure of a hospital (for both rural and urban hospitals). The data for this study were obtained for each hospital's county by using the Area Health Resource File (AHRF 2014), the University of Alabama's Center for Business and Economic Research (CBER, 2015), the Regional Economic Analysis Project (REAP) (2016), and ADPH (2015).

County wide data were used as a proxy for hospitals' competitive environment because only three of these counties were host to more than one hospital. Due to the small size and relatively general nature of their offerings, it is unlikely they would draw many patients from the surrounding counties (Lillie-Blanton et al., 1992; Succi et al., 1997). These independent variables were drawn from county wide census data and consisted of: (1) county population density, (2) county average per-capita income, (3) median age of county population, and (4) physicians per 10,000 of a county's population (See Table 1 for a breakdown of all data, format, and source).

**Table 1 - Listing of Variables, Source, and Description**

CONSTRUCT	TYPE	SOURCE	DESCRIPTION
Hospital Z"-Score	Continuous	American Hospital Directory (AHD), CMS Cost Reports	Constructed from Balance Sheet and Income Statements. A weighted compilation of financial indicators for Liquidity, Profitability, Efficiency , and Productivity
Low-Z"-Score	Binary	Calculated Z"-Score (see above)	Constructed variable. Value of "1" is hospital's Z"-score is </+ to 1.1,, else value is "0"
Hospital Ownership	Nominal	American Hospital Assoc (AHA), Alabama Hospital Assoc (ALAHA)	1- For Profit Corporation, 2- Not For Profit
Hospital Age	Continuous	AHD, Alabama Department of Public Health (ADPH), Manta	Age of the hospital. Calculated as the number of years elapsed since the founding of the organization
Hospital Age Squared	Continuous	Age (See Above)	Definition of Age as Quadratic Variable
Hospital Bed Size	Continuous	American Hospital Resource File (AHRF), ALAHA	Number of licensed and staffed acute care beds in facility.
County Population	Continuous	AHRF, Census	Documented county population for the year in question.
County Average Per-Capita Earnings	Continuous	AHRF, Census	Average per-capita earnings for individual county residents for the year this data was collected.
County Physicians	Continuous	AHRF	Number of MDs located in and licensed within county per 10,000 residents
County Median Age	Continuous	ADPH	The median age of the county's population

Analysis

All variables in this study were subjected to univariate analysis. The categorical variables (low Z-Score and ownership) were evaluated for frequency and percentages by category. The remaining independent (continuous) variables utilized means, medians, and modes (See Descriptive Statistics – Table 2 and Table 3).

**Table 2 - Descriptive Statistics for Categorical Variables**

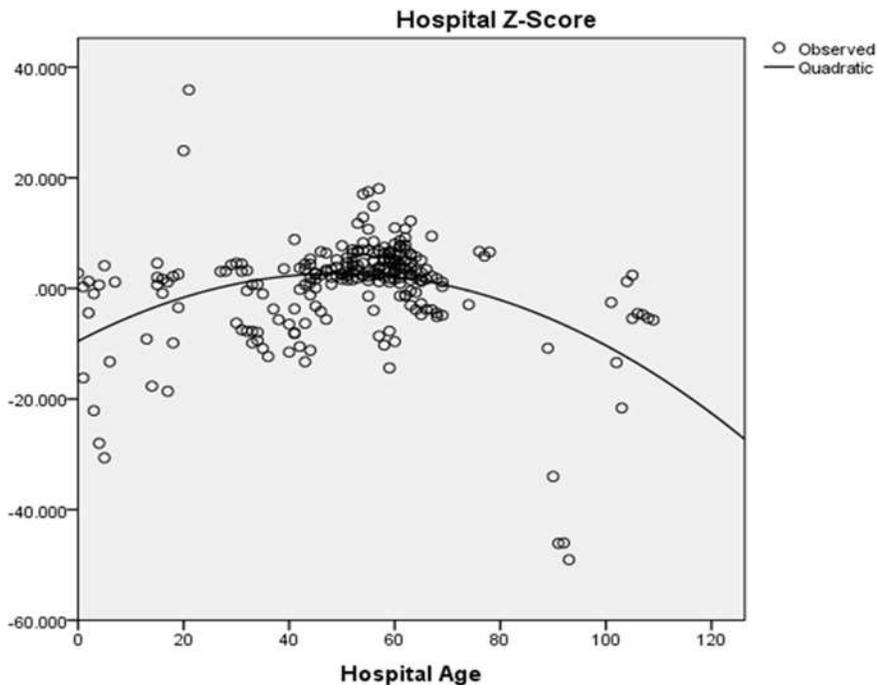
Categorical Variable Information			N	Percent
Dependent Variable	Low Z-Score	0	160	65.0%
		1	86	35.0%
Factor	ForProfit	Total	246	100.0%
		1	69	28.0%
		0	177	72.0%
		Total	246	100.0%

**Table 3 - Descriptive Statistics for Continuous Variables**

		N	Minimum	Maximum	Mean	Std. Deviation
Covariate	Hospital Age	246	0	109	51.56	21.039
	AgeSq	246	0	11881	3098.97	2256.910
	Hospital Bedsize	246	15	236	75.90	44.420
	County Pop	246	8553	200111	44320.41	43143.391
	Avg Percap Income	246	23037	39040	30755.41	3260.675
	PopAge	246	31.1	45.2	40.226	2.3308
	MD/Pop	246	1.7044	20.5222	7.452224	4.3472512

Because hospital age is frequently viewed as a non-linear variable, it was subjected to curve estimation testing to determine if it was a linear or non-linear (quadratic) variable (See Non-Linear Test for Hospital Age – Figure 3). Based on the findings of this test, the variable “AgeSquared” was included in the model to represent the quadratic curve associated with the variable “Age”. Binary logistic regression was then performed on the improved model’s panel data using the SPSS GENLIN function to insure proper accounting for the repeated measures and standard errors that are associated with panel data.

**Figure 3 - Non-Linear Test for Hospital Age**



**Findings**

By examining the logistic regression of the panel data model, we found that for-profit ownership, age, and age-squared were significantly associated with the dependent variable Low Z”-Score at the  $p \leq .05$  level (Table 4 – Parameter Estimates). For-profit hospitals had 2.499 times greater odds of being associated with financial distress (low Z”-Score) than not-for-profit hospitals ( $p = .004$ ).

Hospital age had a negative association with financial distress with an odds ratio of .905,  $p < .001$ . Age-squared was also found to be significant with an odds ratio of 1.001,  $p < .001$ . When the quadratic age curve was evaluated for this effect it showed that the risk of hospitals in this sample being in financial distress declined as they grew older until they reached 58 years of age, after which their risk began to increase. There was a significant association between ownership and hospitals that were posited to be in financial distress, with for-profit ownership having a significantly higher odds ratio of being in distress when compared with not-for profit hospitals. There was also a significant relationship between a hospital's age and financial distress (Low Z'-Score).

**Table 4**  
**Parameter Estimates**

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	6.213	3.2266	-.111	12.537	3.708	1	.054	499.177	.895	278464.350
[ForProfit=1]	.957	.3570	.258	1.657	7.194	1	.007	2.605	1.294	5.244
[ForProfit=0]	0 <sup>a</sup>							1		
HospitalAge	-.107	.0226	-.151	-.063	22.324	1	.000	.899	.860	.939
AgeSq	.001	.0002	.000	.001	16.361	1	.000	1.001	1.000	1.001
HospitalBedsizes	.001	.0040	-.007	.009	.033	1	.855	1.001	.993	1.009
CountyPop	-1.914E-06	6.3356E-06	-1.433E-05	1.050E-05	.091	1	.763	1.000	1.000	1.000
AvgPerCapIncome	2.701E-06	6.2270E-05	.000	.000	.002	1	.965	1.000	1.000	1.000
MedianAge	-.118	.0638	-.243	.007	3.415	1	.065	.889	.784	1.007
MDSPer10000	.025	.0664	-.105	.155	.141	1	.707	1.025	.900	1.168
(Scale)	1 <sup>b</sup>									

Dependent Variable: Low Z-Score

Model: (Intercept), ForProfit, HospitalAge, AgeSq, HospitalBedsizes, CountyPop, AvgPerCapIncome, MedianAge, MDSPer10000

- a. Set to zero because this parameter is redundant.
- b. Fixed at the displayed value.

Existing literature (Hannan, 1998; Singh et al., 1986; Singh et al., 1990; Stinchcombe, 1965) suggests that there should be an increased association with the risk of failure for both young hospitals and older hospitals; this is similar to findings in other industries. That assumption also holds true in this study. Based on the findings of the quadratic curve estimation for age and the logistic regression analysis, there was support for both the “liability of newness” and “liability of old age” arguments with regard to Alabama’s rural hospitals. The remaining independent variables were not found to be significant at the 95% level, with only population median age approaching the cutoff level  $p \leq .05$  (See Table 4 –Parameter Estimates).

## Discussion

A majority of Alabama’s rural hospitals are experiencing some level of financial concern. For the fiscal year 2014, 17 of the 53 rural hospitals in our sample (32%) had a calculated low Altman’s Z”-Score placing them in the “financial distress” category, and 14 of the hospitals (26%) had a score considered to be in the area of “concern.” Based on these findings, more than 58% of rural hospitals in this sample are in danger of financial failure leading to possible closure.

Hospital ownership was found to be a significant predictor of financial distress ( $p \leq .05$ ) in this study’s sample. Among the ownership types evaluated, for-profit rural hospitals had 2.499 times greater odds of being in distress than not-for profit hospitals. There are several possible reasons for this difference (i.e., taxes, higher costs, less public support) (Gifford et al., 1988; Succi et al., 1997). Fourteen of Alabama’s currently operating rural hospitals (28%) are for-profit and seven of these hospitals produced an Altman Z”-Score indicating financial distress for fiscal year 2014. The high percentage of financial distress for for-profit hospitals agrees with prior research. (Mayer et al., 1987). Stockholders (i.e., owners) are often less tolerant of low or negative returns on their investments than either county governments or non-profit organizations (Hayford, Nelson, & Diorio, 2016; Mayer et al., 1987).

Hospital age, as a non-linear (quadratic) variable, was also found to be a significant predictor of financial distress ( $p \leq .05$ ). A curve analysis of hospital age demonstrated that hospitals are likely to have financial distress when they are new (liability of newness) with the indicators for financial distress declining until approximately age 58 (See Figure 3 – Non-Linear Test for Hospital Age).

At about this age (58) the trend reverses and the indicators for financial distress increase for every year afterward. This quadratic age curve suggests that Alabama’s rural hospitals have a life cycle extending from 0 to 110 years with a well-defined introduction, growth, maturity and decline as defined by Cox (1967) and Hofer (1975).

The only environment variable that approached significance in this study was the median age of county residents. It approached significance at the 95% level with a  $p = .065$ . Even though it was

judged to be insignificant in this study, it shows promise for future study because age-related variables are usually assessed as a quadratic or non-linear variable. When median age was subjected to quadratic testing in this study it still was not significant at the .05 percentile level. It is possible, however, that this variable could be significant when evaluated within a larger sample.

As with all studies, this research has limitations. First, it had a small sample size with five repeated measures for 53 hospitals. Second, the localized, intra-state nature of the study makes it potentially non-generalizable across the entire U.S. hospital industry. It is, however, useful in that it provides a large enough sample of similar organizations to test several of the tenets proposed by organizational ecology and other health care researchers.

## **Conclusion**

This study identified and tested a number of organizational and environmental variables used previously to investigate organizations' financial performance. These variables were evaluated as to their significance and association with the financial wellbeing of Alabama's rural hospitals. By identifying two variables that were significantly associated with financial distress, (ownership and hospital age), this study showed that there is sufficient support to recommend that these factors be considered by healthcare managers and financial professionals working in this sector.

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