Rural Library Opportunity Zones:
Mapping Rural Library Employment Opportunities Using Quantum GIS

Brady Lund
Emporia State University

Abstract

This paper uses Quantum Geographic Information System (QGIS) to locate library employment opportunities in Rural Opportunity Zones (ROZ): counties in the state of Kansas that offer student loan repayment and income tax waivers for five years for qualified individuals. Counties are displayed on a QGIS map that includes school district lines, hospitals, public libraries, and population densities. The counties in ROZ are compared using three measures: how many libraries are in the county; the standard of living in the county; and leisure activities that are near or in the county. The rural library opportunities are compared to urban library opportunities in Kansas, to illustrate how comparable the opportunities are at rural and urban libraries, with regard to average annual wages for employees, library use statistics, and collection size. The researcher concluded that many excellent job opportunities exist for library professionals and paraprofessionals in ROZ. The researcher also concluded that QGIS is a helpful and easy-to-use tool for comparing data in a geographical display.

Article Type: Research paper

Introduction

The political climate in United States has been divisive in the last decade, with one instigator being the educational and economic divide between urban and rural communities. In the information age, rural communities feel left behind. Industrial-age jobs are being outsourced to developing countries, and the individuals who held these jobs are left without the education and training they need to adapt to the evolving economy. Left without the time, money, and travel resources to attend a college, these individuals have one place to turn for technical education and job training: libraries. Rural public libraries are the center of their communities. Yet, rural libraries struggle to find qualified librarians to employ (BLS, 2016). Rural libraries tend to pay less than libraries in large cities, and the size and endowment for these libraries is less than that of the big towns, leaving qualified individuals believing that there is no benefit to working at a rural library. The following research illustrates how this lack of benefits is misperceived. Using Quantum Geographic Information System Software, a map is presented that relates library opportunities – in public and school libraries – to rural opportunity zones, which pay off student loans for individuals who relocate to rural communities. Individual counties are identified that meet both criteria. These counties are then compared by number and quality of library opportunities, standard of living measures, and recreation opportunities, using statistical analysis software.
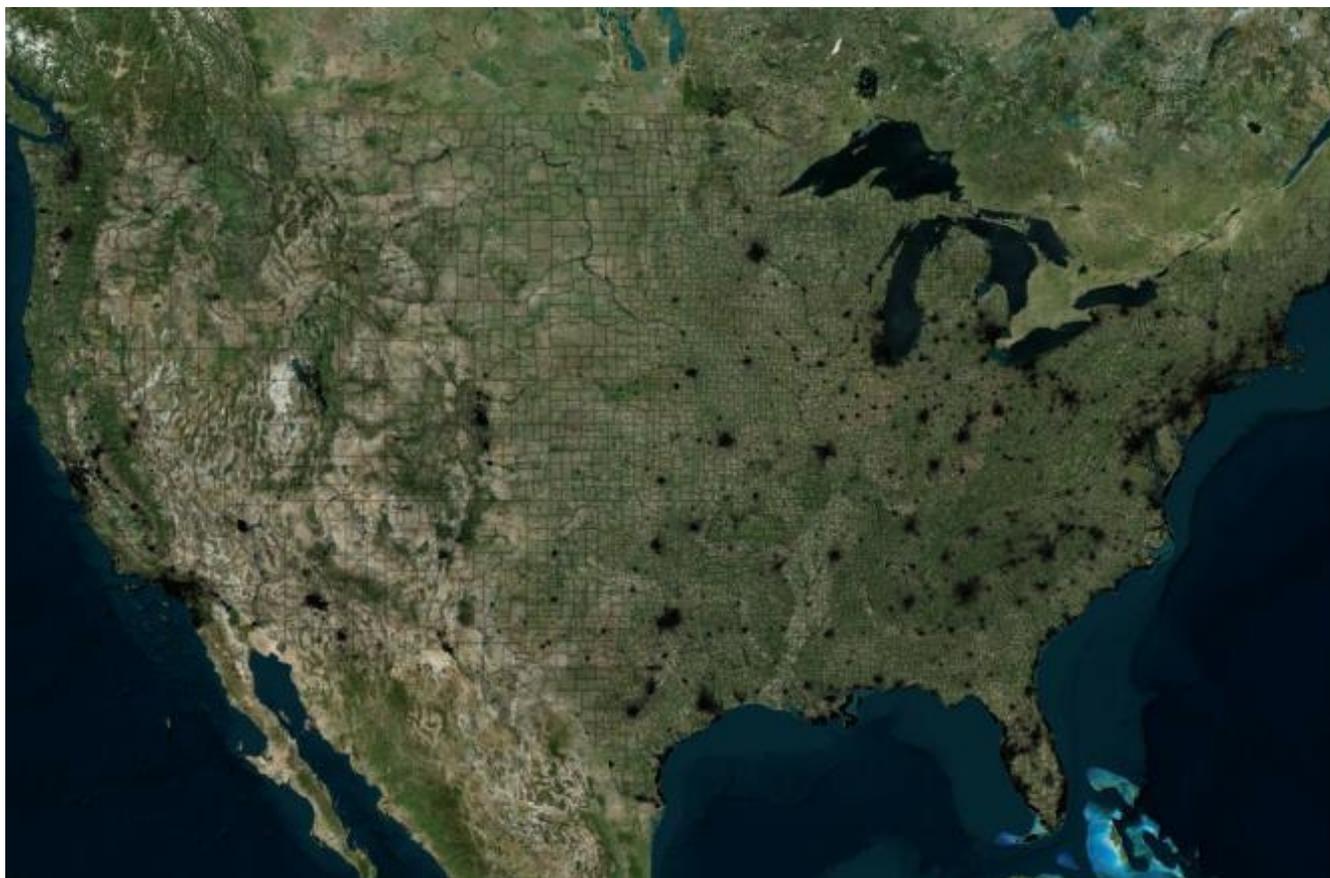
Figure 1: A QGIS Map that displays county lines (in gray) and population densities (black). Map created by Brady Lund 2017 using data from nhgis.org (nhgis, 2014).

Introduction to QGIS and ROZ

QGIS

Quantum Geographic Information System (QGIS) is an open-source software available for free on the web. Designed for geographers for use in georesource locating and flight mapping, the software has been downloaded millions of times for professional, educational, and personal use (Wilson, 1997). QGIS takes the traditional interactive map to the next level. Users can select from an array of template maps, including Google, Bing, and MapQuest variants, and then add layers of information by downloading packets of data from State and Federal data catalogs. The maps can be manipulated to highlight certain parts of data, and layers can overlap to compare sets of data. Elements on the map are interactive, allowing the user to click on them and see a complete data entry. QGIS can be used to make large sets of geographic data easier to digest; for example, populations of

US cities are more easily conceptualized as a map with darkened areas representing population density than as spreadsheets with thousands of entries (as seen in Figure 1 above). QGIS will allow the reader to conceptualize library opportunities in Rural Opportunity Zones, without having to parse through a table of 300+ libraries.

Rural Opportunity Zones

Since 1950, the average population of rural communities has fallen by 60-80%, and recent censuses indicate that this trend will not stop any time soon (Carey Institute, 2008). The political climate of the 1990's and 2000's only furthered the divide between rural and urban communities, as businesses had incentives to relocate near large cities or out of the country. Federal laws were passed that eased the burden on the urban lower and middle class, but failed to revive rural communities (Gimpel & Karnes, 2006). There are now calls on all sides of the political

spectrum to find innovative new ways to bring economic opportunity and population growth to rural towns.

Rural Opportunity Zones were originally designated in 2011 as a response to the decline in rural populations by Kansas Governor Sam Brownback and the Kansas Legislature (Kansas Department of Commerce, 2014). Lawmakers believed that, by offering incentives for middle-class, educated individuals and families to move to rural areas of Kansas, this could reinvigorate these communities and bring new businesses, both small and large. With 50% of businesses and factories in small towns sitting dormant, and 60% of rural residents under- or unemployed, there was a lot of potential for growth if the state could just get businesses into these communities (Carey Institute, 2008). 50 counties were originally selected to launch the program, with 27 more added as of 2017 (Office of the Governor of the State of Kansas, 2011). The current map of Rural Opportunity Zones is shown in figure 2 below.

According to the Department of Commerce for the State of Kansas, Rural Opportunity Zones (ROZ) are authorized to offer two financial incentives to new residents: 1. "Kansas income tax waivers for up to five years" and 2. "Student loan repayments up to $15,000 (Kansas Department of Commerce, 2014)." In order to receive these benefits, incoming residents must meet criteria, namely an established residency in a ROZ county and a residency outside the state of Kansas for the five years prior. Kansas's Rural Opportunity Zones program is unique in its design, but many states have considered similar programs including Pennsylvania, Georgia, Colorado, Nebraska, Oklahoma, West Virginia, Iowa, and Wisconsin (Kansas Department of Revenue, 2016).

Definition of Terms

In this paper, some terms will be used that may have ambiguous definitions. For the sake of clarity, these terms deserve a brief elaboration.

Standard of Living

The term "Standard of Living" can be used broadly to refer to any statistic that measures the "minimum necessities, comforts, or luxuries held essential to maintaining a person (Standard of living, 2012)." For the purpose of this paper, standard of living refers to three specific measures: comparable access to non-critical access hospitals to that of urban communities;
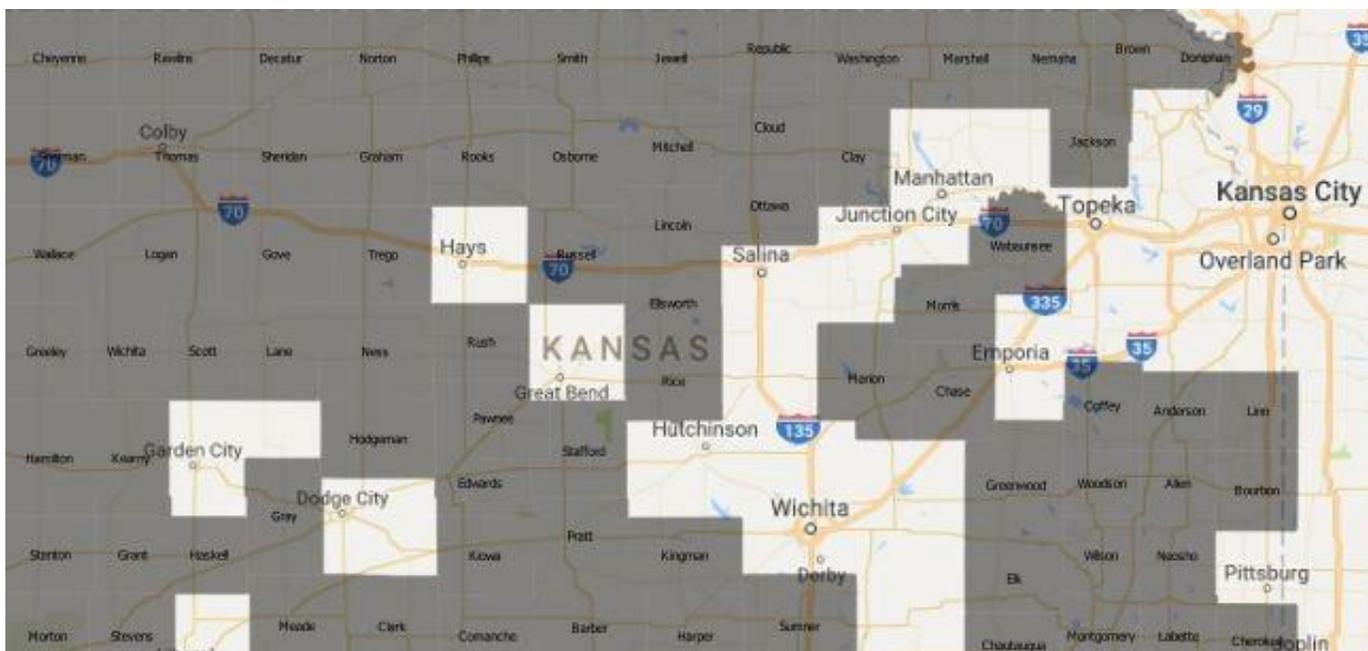

Figure 2: Map of all 77 Rural Opportunity Zones, including all major cities in Kansas. As you can see, the counties in which these cities reside are not included in a Rural Opportunity Zone.

the average per-capita income of individuals in the community; and the percentage of the community under the poverty line. These three measures were selected based off the wide-availability of these data in GIS databases. If a rural community has similar numbers to urban communities, then it will be considered to have a "fair" or "good" standard of living (Wilson, 1997).

Non-Critical Access Hospital

Critical Access Hospitals are common in the rural United States. They must have "no more than 25 beds," lack "long-term care services," and "be located more than a 35-mile drive from any hospital (Centers for Medicare and Medicaid Services, 2016)." Because critical access hospitals do not provide the same quality and breadth of services as an urban hospital would, they will not be considered sufficient to match an urban standard of living. Only hospitals that provide the same array of services as a larger, urban hospital will satisfy this requirement (Wilson, 1997).

Leisure Activities

While leisure activities can be defined as any activity that is done "free from work or duties" and "without compulsion (leisure, 2012)", the term is used in this paper to refer to those activities that A) are unique to a certain community, and B) are likely to attract visitors out of pleasure rather than out of necessity. This was done to eliminate leisure activities that are shared by all communities, and put a focus on what makes each community unique. An example of a leisure activity, using this definition, is going to a waterpark, nature trail, museum, having a state-of-the-art internet infrastructure, or original architecture. An example of an activity not included in this definition is shopping at a supermarket, or watching T.V.

Local Funding Sources

Sources of funding that come from "local property taxes, either through a specific mill levy, an appropriation from general funds" or a "special tax" are considered local funding sources (Montana State Library, 2011).

Generally, local funding sources comprise the majority of funding for public libraries, however the amount of financial support can vary from city to city. This figure is used to illustrate the strong local support for libraries that exists in rural Kansas.

Literature Review

Quantum GIS and Geographic Information Systems in general have been used – albeit rarely – in some compelling research in Library and Information Science and related fields. In 2011, Sung Jae Park at Florida State University published a dissertation entitled "The Accessibility of Public Libraries to Users: A GIS Study." A GIS software called ArcMap was used as part of the quantitative data analysis in the paper. The researcher displayed the daily travel activities of 409 individuals who visited public libraries to conceptualize patterns in their behavior. From this data, the researcher identified four library access patterns: "single-destination, en route, base camp, and trip-chaining trips (Park, 2011)." The researcher concluded that 80% of library trips were a part of multi-destination trips, and were most likely to be coupled with shopping for groceries or at the mall, or eating at a restaurant. The researcher also concluded that travel time, rather than travel distance, is the greater constraint to accessibility; as patrons can find a way to work a library visit into a trip, but are less willing to exhaust a lot of time in the process. This paper was one of few pure LIS research documents to feature GIS as a method for data analysis. It supports the legitimacy of GIS in LIS research, by introducing the field of LIS to GIS and by using qualitative interviews to support conclusions from the data. The researcher's focus on the number and type of trips, rather than the number of unique users, as a way to show that smaller libraries may still get a higher use-rate than larger libraries, informed the present paper's approach.

A great introduction to GIS and its use outside the field of geography is "GIS-Based Studies in the Humanities and Social Sciences," a compendium edited by Atsuyuki Okabe (2006). One article in this collection that informed the present study is "Urban Employment Areas:

Defining Japanese Metropolitan Areas and Constructing the Statistical Database for Them (Kanemoto & Kurima)." The researchers used QGIS in this study to propose political boundaries for municipalities based on population density and job opportunities. They rated the municipalities based on a number of factors, including: population size, employees-to-residents ratio, the number of commuters, income, and corporate capital. From their data, they were able to support new definitions for urban areas as Metropolitan Employment Areas (i.e. larger urban areas) and Micropolitan Employment Areas (smaller urban areas), which has since been used by the Japanese Government, individuals, and industry to inform research and decision-making. While this study primarily focuses on Japan, it takes care to mention the United States and how this data can be used to inform research in the States. The present study incorporates the theory of informed decision-making using data from Geographic Information Systems to propose the suitability of library job opportunities in Rural Opportunity Zones. It also takes inspiration from Kanemoto and Kurima's municipality ratings when defining opportunities in the Zones.

The precedent of using QGIS to document opportunities for rural development is informed by Cano, Garzón, & Sánchez-Soto's 2013 article, "Historic preservation, GIS, & rural development: The case of Almería province, Spain." In this article, the researchers use a GIS software to identify historic rural buildings that have been abandoned, and encourage individuals to restore them by bringing new ideas for business and housing. Their reasoning behind this project is that the reuse of rural buildings will save the individual energy, money, and materials, will create jobs and stimulate the rural economy, and will improve the quality of the community and its sense of culture (Cano, Garzón, & Sánchez-Soto, 2013). The present study hypothesizes that similar benefits will be attained from the employment of highly-qualified individuals in libraries in Rural Opportunity Zones. Cano, Garzón, & Sánchez-Soto's research included the identification of locations on a map, the collection and storage of data about those locations, and the display of rural

building locations and their data in a GIS file. A similar approach was taken in the present study: Rural Opportunity Zones were located; data about library opportunities, hospitals, and leisure activities were collected; and the results were displayed in a GIS file.

GIS lends itself to the use of case studies as a part of research. In "Urban form and life-cycle energy consumption: Case studies at the city scale," the authors use QGIS to model energy consumption in a ten-mile radius around the city of Austin, Texas. From this data, the authors identified trends in energy consumption based on the demographics of a particular neighborhood (Nichols & Kockelman, 2015). They then selected certain neighborhoods that exemplified a trend, and explored these areas in greater detail. This was done to expand on generalized numbers with real examples. Using case studies proved to be an effective model for working with GIS data, as the researchers gathered more information about their communities than they otherwise would have, such as the identification of factors that might contribute to greater energy consumption. This also contributed to the reader having a better conception of the data in what influence it has on the stakeholders in the communities.

Methodology

This project is designed to locate opportunities for library employment within Rural Opportunity Zones. In order to accomplish this goal, the QGIS system was used in conjunction with data acquired from the Kansas data catalog. Four data sets were selected for examination: Rural Opportunity Zones in the State of Kansas, a collection of counties that appear in a user-selected color on the map (Kansas Department of Commerce, 2015); School Districts of Kansas, divisions whose outlines appear as dark lines on the map (Kansas Adjutant General, 2015); Public Libraries of Kansas, that appear as large circles on a QGIS map; and, Hospitals and Medical Centers in the State of Kansas, that also appear as circles on the map. For the sake of clarity, Rural Opportunity Zones were made pink, public
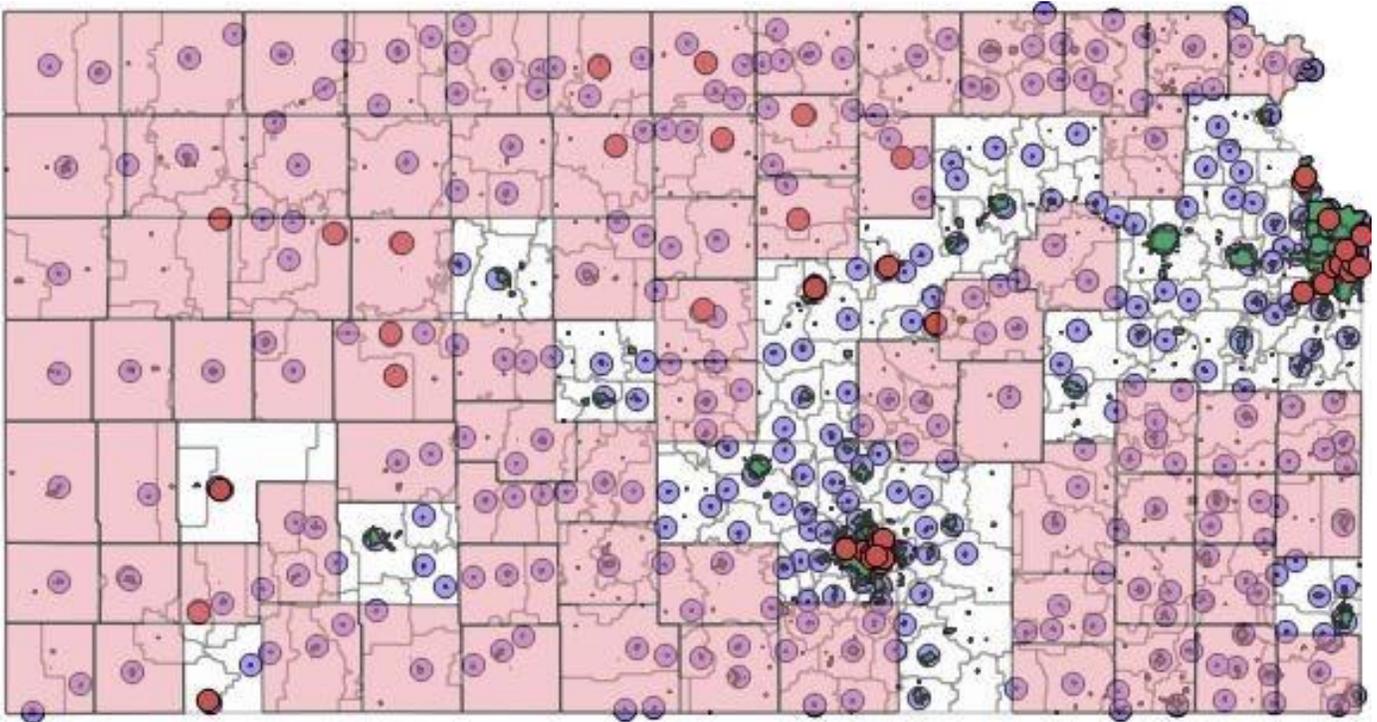
Figure 3: Static version of map of Kansas created with QGIS by Brady Lund 2017. Red dots represent hospitals, blue dots represent public libraries, dividing lines represent school district boundaries, and pink shaded areas represent Rural Opportunity Zones. Green areas represent population centers.

libraries were made purple, and hospitals red. To compare population density across the state of Kansas, a layer was added which adds a small green dot per 100 citizens. Large cities like Wichita, Topeka, and the Kansas City /Lawrence/Overland Park metro areas are distinguishable by the size of their collection of dots; whereas the areas within Rural Opportunity Zones have few collections large enough to be visible. The final map is shown in Figure 3 above.

Once the map was compiled, it allowed the researcher to interact with the individual counties and see the Rural Opportunity Zone status, number of school districts, public libraries and

hospitals of each. This data was then transferred to SPSS statistics software for analysis. In addition to identifying those counties with a high number of libraries, the software allowed the researcher to investigate the relationship between rural libraries and use rate, and median income of the town in which the libraries are located.

Results

77 counties were identified as Rural Opportunity Zones. The statistics for these counties are shown in figure 4 above. The counties had an average of three public libraries and two school libraries. The median income for library staff at

Descriptive Statistics of ROZ Counties						
	N	Total	Minimum	Maximum	Mean	Std. Deviation
# of Hospitals in County	77	15	.00	2.00	.1948	.43039
# of School Districts in County	77	**177**	1.00	6.00	2.2987	1.02681
# of Public Libraries in County	77	**228**	1.00	7.00	2.9610	1.52558
Valid N	77	**405 Total Library Employers in Rural Opportunity Zones**				

Figure 4: Average and total numbers of Hospitals, Public Libraries and School Districts in Rural Opportunity Zone counties.

public libraries in Rural Opportunity Zones was $38,000; the median income for library staff at school libraries was $46,000 (Bureau of Labor Statistics, 2015). These average wages are comparable to average starting wages in Kansas's urban libraries. Nearly all public libraries in Rural Opportunity Zones received 80% or more of their funding from local sources -which is consistent with larger public libraries in the state of Kansas, such as Wichita and Topeka - even though the user population in Rural Opportunity Zones was often under 1000 (IMLS, 2014). Whereas Wichita had a population of 350,000 and visits of 1,000,000, Jay Johnson Public library in Quinter, KS (described more below) had 11,000 visits for a population of only 900 (Kansas Adjutant General, 2015). While the population and collection size of rural libraries is much smaller, the number of visits per capita is triple that of urban libraries. This shows that rural communities continue to value their libraries, perhaps more so than urban populations.

Several Rural Opportunity Zone counties have at least eight unique library employment opportunities. These are displayed in Figure 5. Those Rural Opportunity Zone counties that have at least one hospital are displayed in Figure 6. While some counties are further along than others, this data shows that Kansas counties have begun to grow and improve their standard of living, and would be suitable for early-career librarians to help that growth.
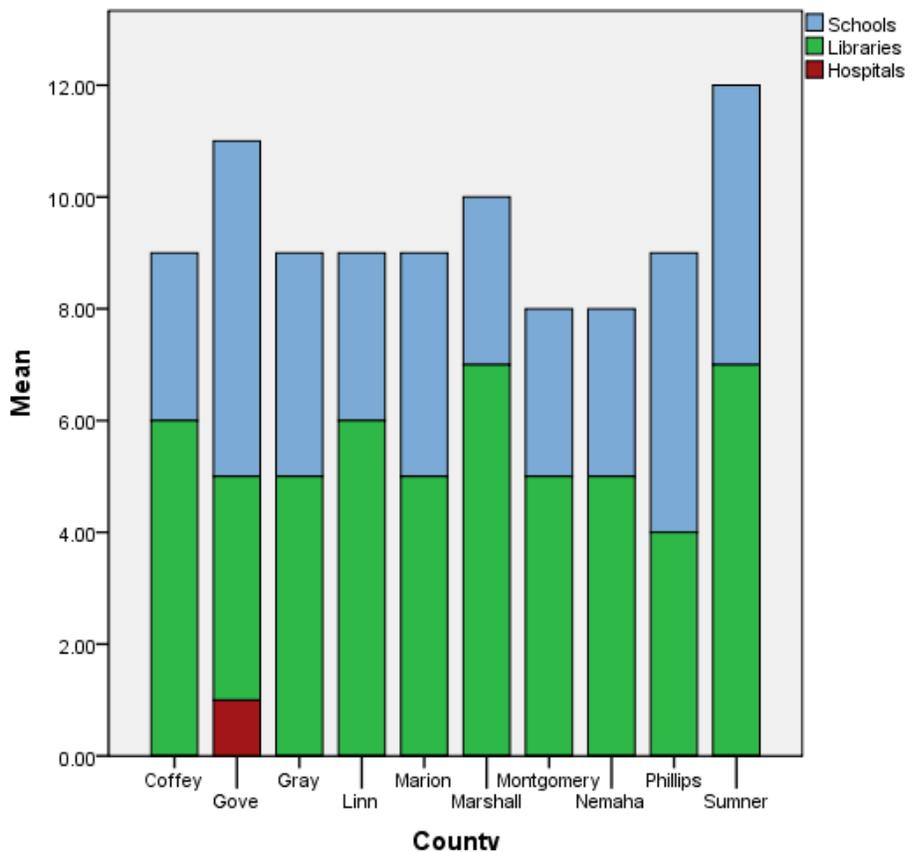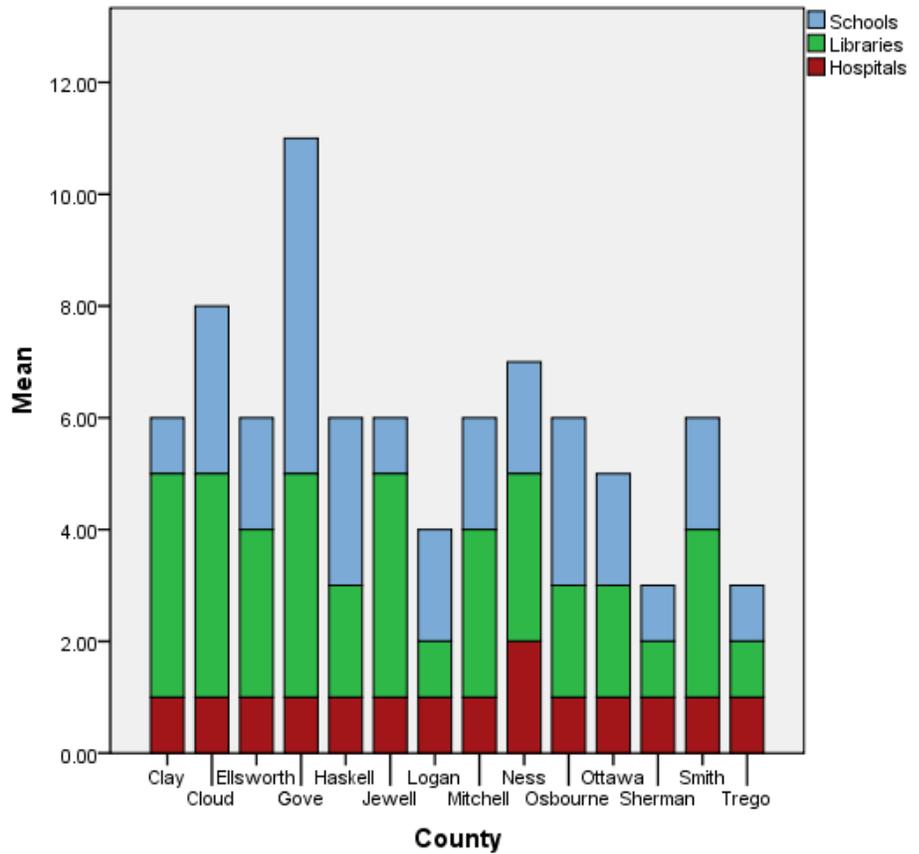
Figures 5 & 6: Number of School Districts, Public Libraries, and Hospitals in each Rural Opportunity Zone County (4: minimum 1 hospital; 5: minimum 8 library opportunities) Brady Lund 2017

The standard of living in Rural Opportunity Zone counties vary based on geographic region. Nine counties in Rural Opportunity Zones had at least one non-critical access care hospital (with Ness County having two). Access to advanced medical care is a complication for counties in southeastern, southcentral, and far western Kansas. Northcentral and southwestern Kansas, however, have multiple hospitals, most of which are located on highways for quick access. Scott, Ness, and Greeley, located in western Kansas, are three of only four counties in the state that had a per capita income higher than the national average (US Census Bureau, 2016). Conversely, Pawnee and Seward counties, in south central Kansas, had a per capita income under $18,000. Lost Springs, Kansas, located in Marion County, has an average income of $7,000 with an poverty rate over 20%, one of the worst in the country (United States Census Bureau, 2016). Because quality of life measures vary so greatly from region to region, it warrants further research when an individual is considering a library job in a Rural Opportunity Zone.

Leisure activities in rural Kansas are vast, stemming from the rich history of the area. From being a part of the Western Interior Seaway millions of years ago, to more recently being home to nomadic indigenous tribes such as the Osage, Kanza, and Wichita, the entire state is covered with museums sharing their stories and artifacts. Natural rock formations cover the state, from the sloping Flint Hills of the east, to the pillars and mushroom rock formations of the west. There are 25 lakes spread across the state, with plenty of access for water sports, hunting, and fishing. Most of the state is also within a few hours' drive of a major metropolitan center, such as Wichita, El Dorado, Hays, Salina, or Denver, that offers dining, shopping, and entertainment. While Russell County has the most leisure activities with 13, including the clearest lake in Kansas, wealth of museums, a 20-minute drive to Hays, and location along Interstate 70, no county in a Rural Opportunity Zone has less than six unique leisure opportunities.

While these statistics illustrate that there are good job opportunities for librarians in rural libraries, it is difficult to conceptualize how rural libraries serve their communities, and what kinds of leisure activities and quality of life amenities these communities have, without looking at a few examples. The following brief case studies are valuable examples of the kind of opportunities rural libraries offer to early-professional librarians, including the fact that these rural libraries are valued and frequented by their residents and that there are numerous opportunities for leisure and a good infrastructure for standard of living.

Case Studies

Gove County

Four of the counties in Rural Opportunity Zones had at least 10 library opportunities; of these counties, only one had a non-critical access hospital, Gove County. Gove is located in northwest Kansas, with a total population of 2,700 residents. The county boasts four public libraries. The average collection size of these four libraries is 12,583, with an annual circulation of 20,562 (Kansas Adjutant General, 2015). According to the Institute of Museum and Library Services (IMLS), the largest of these libraries, Jay Johnson Public Library in Quinter, Kansas had a total revenue of $102,000 and total expenditures of $67,188 (IMLS, 2014). Nearly $60,000 of that amount was spent on salaries for three employees (one full- and two part-time); $6,000 was spent on collections; and $1,500 for other expenses.

Jay Johnson library has a collection of approximately 17,000 print, audio, and video materials. It logged 11,223 visits with a total circulation of 15,478, a program attendance of 1,294, and 2,500 computer uses on 6 computers, in a city with a population of less than one thousand (Kansas Adjutant General, 2015). These figures demonstrate how vital the library is to the community, with the number of visits being 11x greater than the population, and the circulation 15x greater.

Jay Johnson library is well-funded by the city and residents, with ¾ of its revenue coming from local sources. The county has six school districts. The average annual salary for school librarians in this county is $48,000, and the districts serve an average of 150 students – much less than an urban school in the state (Bureau of Labor Statistics, 2015). Gove's standard of living measure is benefited by Gove County Medical Center, which offers short- and long-term care. Gove's poverty rate is 10%, below the national average (US Census Bureau, 2014). Based on the wages for librarians in Gove, as well as access to medical care and a below average poverty rate, Gove has a "good" standard of living.

Gove also has numerous outlets for leisure. It is a hotbed for fossils and natural structures left behind from the Western Interior Seaway in the Cretaceous Period and nomadic Native Americans 65 million years later (Kansas Sampler Foundation, 2013). It also boasts a number of hiking/biking trails, and is less than an hour from the larger city of Hays, Kansas. Hays is home to Fort Hays State University, a moderately-sized state college with enrollment over 10,000 (and houses a federal depository library), and has a number of museums, shopping centers, and recreation outlets.

From annual pay, to benefits, to lifestyle and culture, Gove county serves as a great example of central Kansas rural library opportunity. The opportunities at libraries like Jay Johnson might just be perfect to propel an early-career librarian into a successful leadership role.

Marion County

Marion County has the most combined employment opportunities with 12, including four public libraries and eight school districts within its borders. The population of this county has declined 50% in the last fifty years, epitomizing the increasing urbanization of the last half-century. Its largest city is Marion, with a population of 1900. Its city library has total revenues of $98,500, and expenditures of $88,500 (IMLS, 2014). Staff salaries and benefits account for $62,000 of the expenditures for two

employees. Expenditures for collections is $14,000 per year. In 2014, the library had 32,000 materials. It logged 41,000 visits, a program attendance of 4,000, and 2,800 computer uses on eight computers.

Nearly 90% of Marion city library's funding comes from local sources, showing a strong support in the community for the library. While the county has no non-critical access hospitals of its own, there are five hospitals within an hour's drive of its limits. Its poverty level is a touch over half that of the nation (8%), and while the per capita income is only $16,000, the median family income is nearly $50,000 (US Census Bureau, 2014). Marion County, therefore, has a "fair-to-good" standard of living.

For leisure, Marion County has a rich history, including the Peabody Historical Library Museum, one of the earliest free libraries in the west built in 1875 and repurposed into a museum after a new Carnegie library was built in 1914 (Kanas Sampler Foundation, 2013). Marion is located less than one hour from four major population centers: Salina, Newton, Emporia, and Wichita. These four cities have a combined population of one-half million and boast four malls, five major event centers, two state colleges, and several large employers including the headquarters for Koch Industries. Marion County exemplifies the opportunities of rural central Kansas. These counties are close to city life, while being just far enough away to reap the benefits of rural opportunity zones and offer administrative opportunities to early-career librarians.

Sherman County

Just on the Kansas side of the Kansas-Colorado border is the county of Sherman. Sherman is not the most populous county in Rural Opportunity Zones, nor does it have the most library opportunities; however, Sherman does have one of the largest and most conveniently located towns, Goodland. Goodland Public library is large for a city of 4,500, with total revenues of $237,000. It employs four library staff, with total expenditures on salaries and benefits equaling $140,000 (IMLS, 2014). The library has

collection expenditures of $40,000 per year for a collection of 42,000 materials. In 2014, it logged 58,750 visits, a program attendance of 6,200, and a whopping 32,000 computer uses on 18 computers. These statistics rival that of many small urban libraries (IMLS, 2014).

Like Marion city in the previous section, 90% of the funding for Goodland Public Library is from local sources, and the impressive stats for the library demonstrate that the investment is put to good use. Goodland has one hospital within its city limits that offers both short and long-term care. Sherman County's poverty levels are on par with the national average, but with fewer households in poverty than the national average (US Census Bureau, 2014). Sherman County's standard of living is "fair."

It is the access to leisure activities near Sherman that makes it an impressive county. Goodland is only 20 minutes from the Colorado border and three hours from Denver and Colorado Springs, thus a manageable drive from skiing, hiking, canoeing, among other great outdoor activities. The city itself is home to a small technical college and one of three 24*32 foot reproductions of Van Gogh Paintings around the world, giving it a unique, artistic footprint. Interstate Highway 70 also runs past the town: a four-lane highway that stretches from Utah to Baltimore, and passes through several major metropolitan centers. All this makes Sherman perhaps the best located of all the counties in a Rural Opportunity Zone.

Sherman county highlights the benefits of living in a border county in the state of Kansas. Kansas has 27 border counties that are within a three-hour driving distance of one of five major U.S. metropolitan centers: Denver, Oklahoma City, St. Louis, Kansas City, Omaha (Kansas Department of Revenue, 2016). 21 of these counties are a part of the Rural Opportunity Zones program.

Conclusions

Rural libraries are the centerpiece of their communities. They are a place for individuals to educate and inform themselves, and a place for community and culture. However, finding staff willing to leave the urban environment and work at a rural library is challenging. The State of Kansas's Rural Opportunity Zones program attempts to encourage relocation from urban to rural areas by offering student loan repayment and income tax waivers for five years. Using the Quantum GIS software, the researcher related these zones to opportunities at public and school libraries. Counties that had an optimal combination of opportunities and a high standard of living were discussed in detail. The researcher concluded that rural library employment in Rural Opportunity Zones is an excellent opportunity for paraprofessionals and early professional librarians, based on high enthusiasm for rural libraries, comparable starting wages to urban libraries, and the benefits of student loan payment assistance and income tax waivers.

Quantum GIS proved to be a useful and straightforward software to use for this assessment. The data from GIS websites provide a trove of information about the economic, social, and political characteristics of geographic regions. These data allowed the researcher to identify Rural Opportunity Zones, and locate libraries and hospitals within the zones, without having to compile and search through large spreadsheets. The visual data presented on the map provides additional comparative data regarding geographic location of Rural Opportunity Zones and library resources at rural versus urban libraries. Quantum GIS deserves further exploration by library professionals as a tool for geospatial analysis.

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QGIS is a free geographic location system available online at http://qgis.org/en/site/

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