# UNDERSTANDING SELECTED HEALTH OUTCOMES BETWEEN KANSAS COUNTIES: DOES WHERE A COUNTY FALLS ON A RURAL URBAN CLASSIFICATION CONTINUUM MATTER?

by

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# Abstract

Purpose: The objective of this study was to compare characteristics of urban and rural counties in Kansas in order to identify and seek explanations for differences in health factors and population health outcomes.

Methods: Select data from the County Health Rankings and Roadmaps program were examined within or using the context of the USDA, Economic Research Service 2013 Rural-Urban Continuum Code (RUC) classification scheme. A comparison of all 19 urban counties vs. all 86 rural counties was conducted, followed by a comparison of counties as they were classified on the rural-urban continuum.

Findings: More evidence of health disparities was observed when using the rural-urban continuum comparison than by the strict urban vs. rural comparison. Health determinants, behaviors, and outcomes, were generally more unfavorable in rural counties, but this was mostly captured through the RUC comparison. On average, RUC 4 and RUC 5 communities (both rural) were most disadvantaged when compared to counties that fell somewhere else on the continuum. Overall, there were higher rates of injury death, preventable hospital stays, and premature death in rural areas.

Conclusions: The favorable and unfavorable health factors and health outcomes did not present only in urban areas nor only in rural areas nor did they present only in one RUC. These findings showed that there is a complexity to health disparities that cannot be easily captured or addressed without careful attention to the nature of the specific communities in which they are found.

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# Chapter 1 - Overview

## Introduction

There are many factors that shape health. Our concept of health has evolved from one that thought of it only in its negative, the absence of disease, to a perspective that has broadened both the definition and the determinants. One manifestation of this transition is the understanding that not all people are afforded the same opportunities to attain good health. Health disparities, the differences in health outcomes experienced by groups of people, are vast and are documented among races, genders, socioeconomic statuses, education levels and more (Adler, 2013; Braveman, Egerter & Williams, 2011). While multiple examinations of health disparities have occurred, the subject is so complex that many questions remain. Many health disparities are documented as well within rural populations, however they are generally less researched or understood (Zeng, et al., 2015). Understanding health disparities in the rural context is an endeavor that is made arduous by the evolving nature of the built and physical environment in rural areas, the changing demographics of rural residents, and interrelating dynamics of rural health behaviors and the rural environment (Burton, Lichter, Baker & Eason, 2013). Moreover, the data used to inform this topic are not always reflective of the realities unique to the rural environment in that they are often taken from urban settings and then applied to rural context with little regard for differences (Burton, et al., 2013; Hill, You & Zoellner, 2014; Morton, 2003).

The significance of this study, then, was to provide more depth to the existing knowledge regarding rural health disparities in Kansas. Based on previous investigations and current literature, this study assumed that health disparities do exist among rural populations in Kansas much as they do to varying degree among rural populations across the nation. The objective of

this study was to determine how health determinants, health behaviors, and ultimately, health outcomes differ between urban and rural areas generally, and more specifically, how they differ based on degree of rurality.

Two studies in particular generally shaped the direction of this investigation. Nayer and colleagues conducted a cross-sectional study in which they compared available data from all frontier counties with nonfrontier counties in the United States (frontier criteria being less than 7 people per square mile). They found evidence of some better health outcomes among frontier county residents than other levels of rurality and urban populations, yet evidence of some greater health risk behavior as well (Nayer, Yu & Apenteng, 2013). James conducted analyses of the rural mortality penalty as it manifests along the rural-urban continuum and his results revealed that not all rural places produce equal health disparities (James, 2014). The mortality penalty had long been associated with urban areas in the United States due to the presence of contagious diseases, poor infrastructure (sewage and garbage disposal), and bad water quality in densely populated areas resulting in higher mortality rates (Cosby et. al, 2008). As public health efforts and improved infrastructure have largely eliminated these problems in the developed world, a rural mortality penalty has emerged (Cosby et al., 2008). Along the rural-urban continuum (discussed later), James found different factors were predictive of mortality within the varying levels of rurality and some presented distinctly healthier than others (James, 2014). Further, evidence suggests that the most rural and the most urban places share some of the same health concerns and that suburban areas often fare the best (Eberhardt & Pamuk, 2004). These findings suggest that an investigation of rural health disparities should not treat rural and urban areas as completely homogeneous within themselves nor as strict dichotomies from each other.

## Expected Results

The hypotheses for this study were:

Hypothesis 1: There will be differences in population health outcomes that will differentially favor Kansas urban counties. The population health outcomes to be measured are: adult obesity, alcohol-impaired driving deaths, injury death rate, preventable hospital stays, and premature death. It is proposed the following factors will be influential in those outcomes.

1a. It is expected that living in a compromised socioeconomic position will act as a barrier for individuals being able to achieve healthy outcomes. Measures of socioeconomic position include: percentage of food insecurity, percentage of children eligible for free lunch, percentage of children in poverty, percentage of children in single-parent households, the social associations rate, educational attainment, percentage of unemployed, percentage of income inequality present, percentages of the population without health insurance and the violent crime rate. It is expected that a larger percentage of the rural population will be living under these more compromised circumstances.

1b. It is expected that there will be more limitations in the built environment in the rural counties as compared to urban ones, and these will act as barriers for individuals living in rural Kansas counties being able to achieve a healthier status. Measures of the built environment include: severe housing problems, access to exercise opportunities, the food environment index, and limited access to healthy food.

1c. It is expected that there will be less access to health care providers in the Kansas rural counties, and these will compound the already more vulnerable health status for those living in Kansas rural counties. Measures of health care access are: ratios of primary care physicians and dentists, and rates of preventable hospital stays.

Hypothesis 2: It is expected that significant population health outcomes differences between rural and urban areas may not be as discrete as others have expected. That is, there may be differences along a continuum of ruralness to urbanness that are not easily captured when categorizing areas as either urban or rural. Therefore, it is hypothesized that the results will indicate varying health disparities depending on where a Kansas county falls on the rural-urban continuum. Findings of this nature would remain consistent with the significant amount of literature, presented earlier, that observes health inequalities in rural America, but that not all rural areas are created equal and not all urban counties are healthy.

## Background

Health, as defined by the World Health Organization, is a state of complete physical, mental, and social wellbeing, rather than the mere absence of disease (World Health Organization [WHO], 1948). The WHO formally recognized this definition in 1948 and in many ways laid the foundation for the discourse on health disparities to evolve the way it has. As the concept of what comprises health became more expansive, so too did our understanding of the determinants of health. Understanding that health involves more than disease, it follows that there are nonmedical influences upon health outcomes. This evolution has produced an expansive dialogue in which two basic approaches to health can be identified: a medical approach and a population health approach (Knibb-Lamouhe, 2012).

The standard medical approach is concerned primarily with disease progression and its treatment of the individual (Knibb-Lamouhe, 2012). The medical model will be addressed in

more detail later. Here it is sufficient to state that it has produced many impressive medical achievements yet the health outcomes it yields overall are lacking. The costs associated with these medical developments and treatments are significant (Knibb-Lamouhe, 2012). The latter is very apparent when examining the health care expenditures of the United States. In the pursuit of health, the United States devotes almost 18% of its Gross Domestic Product (Kottke, 2013) to health expenditures. This equates to roughly $8,500 per capita in health care spending (Kottke, 2013). These numbers exceed all other countries' health care expenditures and might suggest that the United States population enjoys the best health outcomes. Health outcomes in the United States are among the worst in the developed world, however. This deficit in quality and length of life experienced by the American people undoubtedly has an array of contributing factors that many would suggest cannot be fully addressed solely by a biomedical approach to health (Kaplan, 2014).

The population health approach suggests models of improving health outcomes that acknowledge there are nonmedical factors that influence health (Hartley, 2004; Knibb-Lamouhe, 2012). The nonmedical factors influencing health are often categorized as the social determinants of health or the conditions in the social, physical, and economic environment in which people are born, live, work and age (Braveman et al., 2010; Healthy People 2020 [HP2020], 2010). One of the groundwork pieces regarding the social determinants of health was a report released by The World Health Organization in 2003, entitled, "The Determinants of Health: The Solid Facts," and its content outlined some specific determinants influencing health (Wilkinson & Marmot, 2003). They include: stress, early life, social exclusion, work, unemployment, social support, addiction, food, and transport (Wilkinson & Marmot, 2003). More broadly speaking Braveman

and colleagues (2010) use the term as a way to encompass all things involving "health-related knowledge, attitudes, beliefs, or behaviors" that shape health outcomes.

As the word implies, individuals are unique and develop in different social and physical environments under the umbrella of varying policies. The courses of action or policies that one community adopts might vary significantly from the courses of action another community selects. These decisions are often made at levels far removed from the individual yet have tremendous implications upon an individual's life. Attempts to explain this reality have been made by use of a river metaphor and the idea is that events that transpire upstream eventually trickle downstream. There are a few ways this river metaphor can be applied to health outcomes. One example involves contaminated drinking water that originates upstream because of improper disposal of chemicals resulting in run off to the river. These chemicals contaminate the drinking water greatly harming the people downstream. This could be addressed by instructing the people to drink bottled water or by forcing the factory to comply with proper disposal techniques. While drinking bottled water is an obvious solution, it is one that would likely result in health disparities because not all people would have the same resources with which to purchase the bottled water. Forcing the factory into compliance would eventually resolve the issue downstream for all people regardless of affluence (Braveman et al., 2011).

Another way this metaphor is explained involves the example of a few fishermen observing a person floating downstream struggling to get out of the water. The fishermen help this person only to witness another person in the same predicament. They then help that person and the scenario continues to unfold throughout the day. Tired, they realize that it would make more sense to go upstream and determine why people keep falling into the water. Upstream they observe there is a cliff without a barrier that is creating favorable conditions for people to fall

directly into the water. They then go to community leaders and suggest a barrier is built. The idea is that instead of expending all energy saving people downstream the best use of energy would be creating a preventive barrier upstream. In these examples the concepts seem rather obvious and simple, in reality the causal pathways between up and downstream determinants can be long, interrelating, and complicated (Braveman et al., 2011). In the complicated weave of causal pathways between up and downstream determinants the downstream impacts upon health are often most apparent, which provides some explanation for the vast majority of health research and interventions centering on the individual level (Braveman et al., 2011; Brownson, Seiler, Eyler, 2010). The population health approach generally seeks to address the upstream causes of a given outcome, whereas the medical model generally focuses upon treating whatever condition results downstream (Brownson et al, 2010).

Research and interventions centered upon individual health outcomes have their place. However, knowledge of the larger picture necessitates addressing health determinants outside the narrow scope of the individual. The reality is individuals are dealt circumstances that can be either conducive to healthy living or, conversely, can serve as real hindrances to attaining good health. Some people systematically experience greater obstacles to health based on their status, which often result in differences in health outcomes, labeled health disparities (Truman et al., 2011). Health disparities, are brought about by both inequality and inequity, where inequity involves an unjust and avoidable inequality (Truman et al., 2011). From the increased dialogue on the social determinants of health a general framework has emerged that suggests that social conditions are fundamental contributing factors to health disparities (Burton et al., 2013). That is, health attainment, in many ways, is a byproduct of exposure to social conditions, where

unequal social conditions lead to unequal health outcomes (Burton, et al., 2013) and the ability to respond appropriately to ameliorate the impact of those poor health outcomes.

The establishment of a positive association between social conditions and inequalities in things like money, power, and knowledge is compounded by the equally established concept of a social gradient (Burton et al., 2013; Link, Phelen, Miech & Westin, 2008). Data indicate that stepwise incremental gradient patterns present themselves among varying race and ethnicity groups (Adler, 2013; Braveman et al., 2011). In other words, improvements in social advantage differentially affect races and genders. The totality and implications of these concepts create a subject that is neither simple nor succinct to examine nor address.

Many health organizations seeking to do just that suggest models for examining health outcomes that consider factors including the physical environment, social and economic factors, health behaviors, and access to care (Booske et. al, 2010). The methods of some of these models will be discussed later but the categories listed are so widely accepted that they will be the ones examined in this study. First, a brief look at literature will reveal evidence for some of the ways these categories can influence health and specifically interrelate in the rural context. Later, the data analyses will investigate the way these factors may influence the actual health disparities observed in rural Kansas.

Ninety-five percent of the land area of the United States is classified as rural, with about 19 percent of the population or 59.5 million people living in a rural area, according to the 2010 Census. The U.S. Census Bureau defines rural as a population of less than 2,500 and this small population is often distributed throughout large expanses of land. Meanwhile, they classify urban as a concentration of 50,000 people or more and an urban cluster as 2,500 to 50,000 people; far more people fall into these categories (249,253, 271 to be exact), according to the 2010 Census.

Population size and density are just a couple of observable differences between rural and urban population.

Environments are shaped by natural factors, like air and water quality, but also by many human inputs, like farming and industry practices and even the buildings placed on the land (Merchant, Coussens & Gilbert, 2006). The human inputs and built environments of a rural area can be significantly different than those of an urban area. Not only are there differences between the two but also the rural environment itself is evolving, in part due to the dwindling presence of small towns and the resulting consolidation of essential facilities like schools, grocery stores, and health care facilities (Merchant et al., 2006). Sparsely populated areas foster environments that often lack some of the amenities found in more urban areas due to less population demand. One byproduct is the built environment of a rural area can itself become a barrier to creating or maintaining health.

There are several ways in which the built environment of a rural area can hinder good health. While the word rural often conjures up images of wide open spaces and the great outdoors, the reality is a rural area may often lack infrastructure conducive to physical activity like safe walking trails, maintained parks, or recreation centers that are common in more populated areas (Hill, et al., 2014). Likewise, there are many factors within the rural physical environment, often related to agricultural, forestry, or mining practices, which can hinder health by negatively changing air and water quality (Merchant et al., 2006). It is also suggested that physical conditions of the environment may produce feelings of isolation (Hartley, 2004).

The word rural may, for many, be synonymous with images of farm life and one may then suspect that good nutrition is not only feasible, but that fresh food options abound. What is known, however, is that the food environments of rural areas often do anything but foster good

nutrition. In fact, rural studies indicate that nearly three quarters of rural food distribution sites are convenience stores with few choices in general, and poor choices for fresh produce in particular (Hartley, Anderson, Fox & Lenardson, 2011). The farming usually takes place on an industrial level and the food the farmer grows is not the family's primary food source (Merchant et al., 2006). The food environment index combines two measures of food access: 1) the percentage of the population that is low-income and has low access to a grocery store, and 2) the percentage of the population that does not have access to a reliable source of food during the past year (also known as food insecurity). Food insecurity is thought to impact nearly 15% of the rural population and food environments in rural areas are more likely to score poorly than those in urban areas (Burton et al., 2013). The rating measures of the food environment account for the interrelated nature of determinants of health in that it is not just the presence of grocery stores, but the means to purchase from them, too, that contribute to food choices and their eventual health impacts.

Just as the built environment of rural America is evolving, so are the characteristics of the people who reside there and the reality is that an increasing number of residents struggle with that environment. In their work exploring changes that have occurred in rural America, Burton and colleagues describe the "new rural," as featuring "rural ghettos" where "high concentrations of poverty, social isolation, marginal labor force attachment, social organization and racial stigma abound" (Burton et al., 2013, p. 1134). This new makeup of the rural environment is the product of an array of complicated events. Small towns are declining, thanks, in large part, to young people moving to more urban areas in pursuit of greater work and school opportunities (Burton et al., 2013). The departure of youth from rural areas drives up the average age of the rural population, and the increased age likely influences the health outcomes being recorded. The

departure of youth is likely the source of another "interrelated pathway" in that the young people often leave in search of meaningful employment opportunities, yet their departure creates less demand for amenities and accommodations that could, in turn, produce demand for reasonable wage positions (Burton et al., 2013).

Several rural areas are experiencing an influx of Hispanic laborers; Midwestern rural counties have experienced an influx of Hispanic workers due to the meat packing industry's demand for cheap labor, for example (Burton et al., 2013; Nayer et al., 2013). Their presence is challenging many characteristics of the traditional rural environment. The children within the immigrant families could eventually challenge the consistent trend that the age of the population tends to increase as the level of urbanization decreases (Meit et al., 2014). Hispanics now comprise the majority of the school-aged population in some rural areas, for example (Burton et al., 2013). This is reflective of a larger demographic trend where minorities are becoming the majority population regardless of age group. Specific to the area of this study, U.S. Census information indicate that there are four counties in Kansas that are now majority-minority counties, they are: Finney, Seward, Ford (all rural), and Wyandotte (urban). Grant County is very close to approaching majority-minority status as well (see Table 1-1).

**Table 1-1: Kansas Majority-Minority Counties, 2013**

| County | RUC | % African American | % Asian | % Native Hawaiian/ Other Pacific Islander | % Hispanic | % Non-Hispanic white |
|---|---|---|---|---|---|---|
| Finney | 5 | 2.4 | 4.0 | 0.1 | 47.9 | 44.3 |
| Ford | 5 | 2.5 | 1.7 | 0.3 | 52.0 | 42.2 |
| Seward | 5 | 3.3 | 2.9 | 0.2 | 58.4 | 33.7 |
| Wyandotte | 1 | 24.0 | 3.4 | 0.2 | 27.1 | 42.7 |
| Grant | 7 | 0.4 | 0.5 | 0.0 | 46.6 | 51.4 |

*Note*: Census Population Estimates, 2013

Overall, rural communities have undergone what scholar Wesley James (2014) refers to as a "macro-level restructuring" due to "immigration and suburbanization resulting in diverse economic opportunities, populations, and changing demographic characteristic structures" (p. 11). The traditional trend that rural populations lack racial and ethnic diversity is being challenged by the reality that social, racial, and ethnic boundaries have blurred within rural areas (James, 2014). This large shift in demographics introduces new obstacles for these rural areas that often lack resources to address existing difficulties in the first place. This can exacerbate health disparities in these rural areas and can pose real concerns for the immigrants and other ethnic minorities, especially considering rural minorities, regardless of income level, are highly segregated from the white population (Burton et al., 2013). It is noteworthy that immigrant families are more likely than native-born families to have both parents present and this could serve as a protector against some health disparities (Hernandez, 2004). For example, greater educational attainment is associated with better health outcomes and two-parent homes are associated with greater educational success for both the children and the parents (Hernandez, 2004).

In order to understand how rurality impacts health outcomes, consideration must be given to a variety of factors. The physical and built components of the rural environment influence health outcomes. Likewise, the characteristics of the rural residents influence their health outcomes. What is not as easily apparent are the interrelating dynamics of the rural residents' health behaviors and the said environment. Upon investigation, what will surface is evidence of both potentially predisposing characteristics of rural residents and environmental limitations that can promote the presence of health disparities in the rural population (Nayar, et al., 2013).

The specific health behaviors of rural populations, as those of all populations, are implicated in the formation and nature of health disparities. Any comparison of rural and urban health outcomes necessitates mentioning that central counties of large metropolitan areas are often composed of ethnically-diverse and economically-disadvantaged populations and health outcomes in these highly urban areas can be riddled by health disparities too (Eberhardt et al., 2001; Meit et al., 2014). Health disparities related to levels of urbanization manifest differently throughout the nation. Central counties of large metropolitan areas generally perform the worst overall in the Northeast and Midwest, and nonmetropolitan counties generally perform the worst overall in the South and West (Meit et al., 2014). Suburban residents, those living in the fringe counties of these large metropolitan areas, generally have the best health outcomes regardless of region (Meit et al., 2014). Levels of urbanization are classified and defined differently by different organizations. The classifications mentioned here and the one this study will use are the rural-urban continuum codes first established in the 1970s (James, 2014).

The Urban and Rural Health Chartbook released in 2001 by the U.S. Department of Health and Human Services as a part of its report on the health of the nation established various health disparities in America related to levels of urbanization. Quite evident in the chartbook is the presence of health disparities in rural populations. The nonmetropolitan areas ranked poorly on health indicators such as health behaviors, mortality, and morbidity, in total ranking poorly on 21 of the 23 health indicators measured (Hartley, 2004). The Urban and Rural Health Chartbook from 2001, though considerably dated, is worth mentioning because it provides a baseline when considering whether rural health disparities are improving or worsening.

This, and other rural studies, indicates that rural populations are in many ways a health disparate population. There are visible differences in rates of disease incidence, prevalence,

morbidity, mortality or survival that is significantly disadvantaged from other populations' health (Zeng et al., 2015). The 2014 Update of the Rural-Urban Chartbook, published by the Rural Health Reform Policy Research Center, indicates that many rural health disparities persist and several health behaviors are contributing factors. The findings are documented according to how they manifest regionally. Some of the specific rural health behaviors displayed in the Midwest (the area of concern for this study) will be mentioned here. Smoking cigarettes, consuming alcohol in excess, and physical inactivity have numerous implications on health. Similar cigarette smoking trends were recorded among adolescents and adults living in nonmetropolitan communities with both groups being more likely to smoke than those in urban areas. Men and women living in nonmetropolitan areas were more likely to report consuming five or more alcoholic drinks in one day in the last year than those living in central counties of large metropolitan areas. Further, physical inactivity during leisure time was most common among men and women who reside in the most rural counties. Also of note, the suicide rates increased as the level of rurality increased. Overall, the 2001 Chartbook revealed patterns of rural populations engaging in risky health behaviors (Hartley, 2004). Unfortunately, the 2014 update points to a similar pattern in that nonmetropolitan counties nationwide have the highest death rates for children and young adults as well as unintentional and motor vehicle traffic-related injuries (Meit et al., 2014). A sampling of these findings is provided here and can be compared to the 2001 findings (see Table 2-1 and Table 2-2).

## Table 1-2: Selected health outcome characteristics by region, U.S., 2001

| Region and urbanization | %Cigarette smoking | %Leisure time physical Inactivity | %Obesity | Death rates all causes ages 1-24 | Death rates all causes ages 25-64 | Death rates for all unintentional injuries | Death rates for all motor vehicle traffic-related injuries |
|---|---|---|---|---|---|---|---|
| All Regions | 24.2 | 38.1 | 19.6 | 43.3 | 386 | 36.1 | 15.8 |
| Metropolitian counties | | | | | | | |
| Large central | 22.6 | 40.7 | 19.1 | 44.5 | 419.6 | 31.2 | 11.5 |
| Large fringe | 21.6 | 30.9 | 17.7 | 35.4 | 319.1 | 29.1 | 12.5 |
| Small | 25.4 | 38.1 | 19.8 | 41.7 | 384.9 | 36.5 | 16.1 |
| | | | | | | | |
| Nonmetropolitan counties | 27.3 | 42.2 | 21.6 | 52.3 | 411.9 | 49.7 | 25.1 |
| With a city ≥ 10,000 | 26.1 | 38.1 | 20.5 | 46.2 | 399.8 | 44.6 | 21.4 |
| Without a city ≥ 10,000 | 28.5 | 46.3 | 22.7 | 58.5 | 421.5 | 54.1 | 28.3 |
| | | | | | | | |
| Midwest | | | | | | | |
| Metropolitian counties | | | | | | | |
| Large central | 27.6 | 37.2 | 21.9 | 48.7 | 445.7 | 31.6 | 10.6 |
| Large fringe | 23.9 | 28.4 | 18.5 | 35.4 | 309.6 | 29.3 | 12.9 |
| Small metro | 26.5 | 36.6 | 19.8 | 37 | 347.4 | 32.2 | 13.3 |
| | | | | | | | |
| Nonmetropolitan counties | 26.1 | 36.8 | 22.8 | 47.4 | 352.3 | 43.9 | 22 |
| With a city ≥ 10,000 | * | * | * | 41.1 | 350.2 | 38.9 | 18.5 |
| Without a city ≥ 10,000 | * | * | * | 54.5 | 354.2 | 48.2 | 25.1 |

*Note*: Compiled from Health, United States, 2001 Urban and Rural Chartbook. All ages > 18, rates per 100,000

## Table 1-3: Selected health outcome characteristics by region, U.S., 2004

| Region and urbanization | %Cigarette smoking | %Leisure time physical Inactivity | %Obesity | Death rates all causes ages 1-24 | Death rates all causes ages 25-64 | Death rates for all unintentional injuries | Death rates for all motor vehicle traffic-related injuries |
|---|---|---|---|---|---|---|---|
| All Regions | 19.2 | 32.2 | 30 | 43.3 | 334 | 38.2 | 11.4 |
| Metropolitian counties | | | | | | | |
| Large central | 15.8 | 32.3 | 27.4 | 44.5 | 329.8 | 32.1 | 7.9 |
| Large fringe | 17.8 | 29.5 | 29 | 35.4 | 282.5 | 33.1 | 9.3 |
| Small metro | 20 | 30.9 | 30.6 | 41.7 | 346.5 | 40.8 | 12.1 |
| | | | | | | | |
| Nonmetropolitan counties | 27 | 38.8 | 35.7 | 52.3 | 399.4 | 48.9 | 17.2 |
| With a city ≥ 10,000 | 27.1 | 37.2 | 34.9 | 46.2 | 390.1 | 58.9 | 23.3 |
| Without a city ≥ 10,000 | 27 | 41 | 36.9 | 58.5 | 414.1 | 52.7 | 19.5 |
| | | | | | | | |
| Midwest | | | | | | | |
| Metropolitian counties | | | | | | | |
| Large central | 19.9 | 37.2 | 30.8 | 48.7 | 385.4 | 34.3 | 7.2 |
| Large fringe | 20.4 | 28.4 | 29.6 | 35.4 | 280.5 | 34 | 8.6 |
| Small metro | 22.1 | 36.6 | 31.3 | 37 | 328.4 | 38.1 | 10 |
| | | | | | | | |
| Nonmetropolitan counties | 25.5 | 36.8 | 34.1 | 47.4 | 341.4 | 42.9 | 13.9 |
| Micropolitan | * | * | * | 41.1 | 339.1 | 50.3 | 19.8 |
| Non-core | * | * | * | 54.5 | 345 | 45.8 | 16.2 |

*Note*: Compiled from The 2014 Update of the Rural-Urban Chartbook. All ages > 18, rates per 100,000

The Kansas Health Gap Report generated by the County Health Rankings & Roadmaps program indicates that there are many differences in health determinants, health behaviors, and ultimately health outcomes between counties in the state. The focus of the report is not on health disparities as they relate to specific levels of urbanization, however they do provide the percentage of deaths in excess for each county (where sufficient data permits).

There are different classification schemes used to describe levels of urbanization. The classification scheme used in this study was the Rural-Urban Continuum Codes (RUC) developed by United States Department of Agriculture's Economic Research Service to the data furnished by County Health Rankings & Roadmaps program. RUC codes are applied to all United States Counties and are based on population size and proximity to a metro county; there are 9 codes, 3 metro codes and 6 nonmetro codes (James, 2014) (see Table 3-1). Of the seven counties in Kansas with deaths in excess ranging from 32 to 40 percent all but one are rural (Catlin, Givens & Willems Can Dijk, 2015). Those counties are Geary (RUC 4), Cherokee (RUC 6), Allen, Labette (RUC 7), Kearny, Woodson (RUC 9) and Wyandotte (RUC 1) (Catlin et al., 2015). Wyandotte County proves to be an outlier for many rural and urban comparisons and one contributing factor may be that it has become a majority-minority county.

The health behaviors, risk factors, and subsequent health outcomes of rural populations must be viewed in context. The increased prevalence of chronic illness in rural populations cannot be attributed to a singular determinant, for example (James, 2014). Rather, multiple determinants of rural health have been identified. A small sampling includes lifestyle and behavior, poverty, income inequality, age-structure of the population, access to care, and unique cultural characteristics (James, 2014). Indeed, data reveal rural populations are not homogeneous on many characteristics, varying not only to more densely populated areas but amongst

themselves as well. There are many predisposing characteristics that impact a person's health seeking behavior including age and gender, socioeconomic factors like employment and education, and even English proficiency (Nayar et al., 2013). A rural resident may adopt a poor health behavior largely in response to his or her environment because said behavior is the cultural norm for example, or perhaps because he or she lacks social or family support, or perhaps because the environment hinders a more healthful choice.

The influence of environment upon individuals is certainly not unique to rural environments. The differing, and often poorer, health behaviors exhibited in rural areas may stem from the reality that while certain conditions are improving for urban areas, they are declining for rural areas. For example, rural poverty rates are rising while urban poverty rates are declining (National Advisory Committee on Rural Health and Human Services [NACRHHS], 2014). In their January 2014 Policy Brief, the NACRHHS spoke to the magnitude of poverty in rural areas and point to the profound association between poverty and poor health outcomes (NACRHHS, 2014). Specific health outcomes that this committee found especially noteworthy include, "adults living in poverty are about twice as likely to suffer from depression, live with two or more chronic health conditions, and experience reduced access to medical care, dental care, and prescription drugs" (NACRHHS, 2014, p. 2). These finding are especially problematic for rural areas because the poverty rate among the rural population is greater than the nation's overall poverty rate at 17.7% and 14.5% respectively (Burton et al., 2013). That is, poverty by itself already puts rural populations at higher risk for poor health outcomes.

There is a positive correlation between poverty and obesity, so not surprisingly there is a consistent increase in obesity rates and obesity-related conditions in rural populations throughout the nation (Hill, You & Zoellner, 2014). The phenomenon of obesity is, of course, not unique to

the rural environment; neither are the health complications obesity can lead to. However, even amongst like-income families, obesity rates are greater in those families that reside in rural areas as compared to those that reside in more urban areas (Hartley et al., 2011). These findings call to mind the aforementioned social gradient and further point to the complexity of health disparities within the rural community that cannot be attributed to a single source, like poverty.

An increased poverty rate in rural areas does not bode well for the health of the adult population, and the implications for children are no less troublesome. As of 2010, 22 percent of children in general and nearly 50 percent of children in a female-headed home were living in poverty conditions in rural areas (NACRHHS, 2014). Children that grow up in poverty face a variety of adverse health outcomes and research has consistently found an inverse association between income and mortality and morbidity (Adler & Rehkopf, 2008; Fuller-Rowell, Evans, Ong, 2012; Matthews & Gallo, 2011). In the face of stress, the body attempts to maintain equilibrium and when chronic stress exists, as is often the case amid impoverished conditions, the wear and tear on the body can lead to physiological deregulation and this can lead to diseases, many that do not manifest until later in life (Fuller-Rowell et al., 2012). There is a growing recognition of the influence of childhood experiences on adult health outcomes. The first major investigation into childhood exposures and health risk behaviors and disease in adulthood was the Adverse Childhood Experiences Study (ACE). This study largely focused on various abuse exposures and overall dysfunction in the household and found a graded relationship between the amount of exposures and every one of the health risk behaviors and diseases examined (Felitti et al., 1998).

As many of the rural poor live in deep poverty, defined as less than one half of the official poverty threshold, the toll poverty takes on health outcomes among rural residents, adult

or child alike, is significant (Burton et al., 2013). For reference the U.S. Department of Health & Human Services 2016 poverty guideline for a family of four is $24,300. This figure is reflective of the current poverty measures that are widely agreed to be flawed in two primary ways; that is the dollar amounts are based on outdated assumptions about family expenditures and at the same time, they do not accurately count family resources including public assistance transfers (Cauthen & Fass, 2008). The methods for determining poverty levels have not been updated since the 1960s (except to adjust for inflation) and are problematic because it is estimated that families across the nation actually need an income at least twice the official poverty level just to meet the most basic needs (Cauthen & Fass, 2008).

The many interrelated determinants of health, like those briefly presented above, all create circumstances that begin to explain the presence of health disparities in rural populations. Until these various determinants of health can be addressed, the health care system is burdened with responding to their impacts on health. The older population and the documented health risk behaviors in rural areas are contributing factors to the clear need for health care providers, facilities, and services in rural communities. However, the smaller and often spread out population within rural areas creates less demand for services. This, coupled with fewer resources with which to attract medical facilities and providers, can create a scarcity of needed health care services in rural communities. This paradox has long been at the center of the rural health disparities dialogue. Often the number of providers and facilities are determined or driven by population.

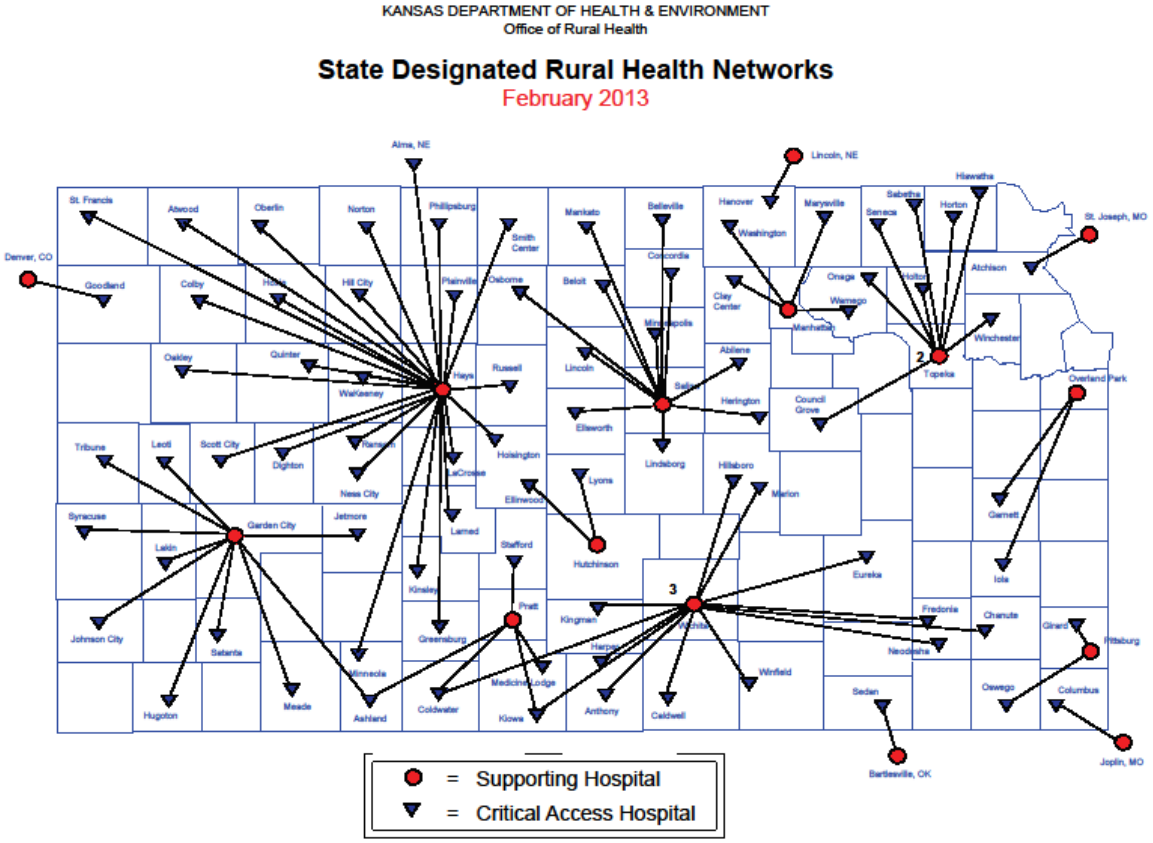
Medical and population health models develop essentially two approaches to addressing rural health disparities. The main concern that has persisted from the medical model perspective involves the accessibility of medical providers and facilities in rural environments. The

differences for rural and urban populations with regard to health care provider ratios and distance to health care providers can be stark. Some view this as a primary contributor to rural health disparities. However, population health approaches, while concerned with access to care, place less emphasis on clinical care as having a significant role in the development of health outcomes. The population health approach considers medical care as necessary but not sufficient to address factors faced by rural populations that affect health outcomes negatively.

Access to care involves the timely use of potential and appropriate health services to achieve the best health outcomes. One of the potential limitations of the rural environment is a lack of adequate health care providers and facilities which hinders the residents' access to care. The medical model approach is primarily centered on the preservation of equitable access, by use of federal and state policies, to ensure that residents of rural communities have essential health care services that are generally a staple in urban communities (Hartley, 2004). Rural health policy concerning equitable access largely developed in response to many hospital closures in the 1980s and early 1990s (Critical Access Hospitals [CAH], 2013). The Balanced Budget Act of 1997 created Critical Access Hospitals [CAH] and the Medicare Rural Hospital Flexibility Program (CAH, 2013). Both were aimed at improving access to care in rural communities by ensuring preventive and emergency services remained available and that needed funding was available to sustain these services (CAH, 2013). Hospitals must meet certain criteria like being located at least 35 miles from another hospital (certain exceptions may apply) and must provide 24/7 emergency care; when a facility meets this and other criteria and are designated a CAH they receive an enhanced Medicare reimbursement: a cost-based reimbursement from Medicare plus 1% reimbursement (CAH, 2013). Given the large proportion of Medicare recipients residing in rural communities, rural hospitals are particularly sensitive to this source of funding. This

enhanced reimbursement arrangement therefore makes it more likely that these facilities can remain open in rural areas. There are eighty-four Critical Access Hospitals in Kansas (see Figure 1-1). These policies mostly focus on ensuring the retention of hospital facilities in rural areas. However, growth in non-hospital services was also a response to rural hospital closures and it is an effort that has grown to include many other health care services like mental health services, dental care, and pharmaceutical services within rural areas (Burrows, Suh & Hamann, 2012).

**Figure 1-1: Map of Critical Access Hospitals in Kansas**




*Note*: Taken from http://www.krhop.net/cahs_networks.php

Despite efforts such as these to address barriers to care, rural environments often have fewer physicians, specialists, nurses, and other workers in health care occupations (Burrows et al., 2012). It is easy to recruit providers into resource rich environments. However, as noted, the population of a rural environment is inherently small, often dispersed, and can be burdened by unstable and inadequate economic infrastructure. This limits the presence of local hospital and other health care facilities (Burrows et al., 2012). The rural communities generally have less financial resources available to entice medical professionals to locate and remain in their communities. This is compounded by the reality that rural physicians, by and large, work longer hours and see more patients than urban physicians (Burrows et al., 2012). The difficulty rural communities have in attracting health care workers to their locations often results in the residents assuming a burden of excessive travel time and cost for basic health care (Burrows et al., 2012). The consequence of this burden or the degree to which it is felt likely varies based on an individual's health status. People contending with chronic diseases, for example, will likely experience greater adverse effects of a travel burden due to the continual and special nature of their health care needs.

Within Kansas, a state comprised predominately of rural counties, there has long been attention on the shortage of primary care physicians within the rural counties. Based on population density criteria, eighty-nine counties in Kansas were determined to be some degree of rural (frontier, rural, or densely rural) and of those counties, fifty-three met the criteria to receive the Governor-Designated Medically Underserved Area criteria based on 2012 physician survey data (Primary Care Health Professional Underserved Areas Report [PCHPUAR], 2014) (see Table 1-4). In Kansas, the Governor-Designated Medically Underserved Area designation is

reserved for areas with a provider-to-population ratio that is at or below 1 physician per 2,695 people (that is equivalent to less than 37.1 physicians per 100,000 people) and frontier areas with fewer than two primary care providers available ([PCHPUAR], 2014). This designation is used to establish or permit continued operation of Rural Health Clinics, which were established in 1977 by Congress in an attempt to increase access to health care services in rural areas ([PCHPUAR], 2014). Rural Health Clinics must use mid-level practitioners at least half of the time, in turn, the health care professionals receive payment incentives to practice in that area ([PCHPUAR], 2014). Additionally, there is a federal Health Professional Shortage Areas designation and ninety-two of the 105 Kansas counties meet this more complex criteria ([PCHPUAR], 2014).

**Table 1-4: Governor-Designated Medically Underserved Areas in Kansas, 2014**

| County | RUC | County | RUC | County | RUC | County | RUC |
|---|---|---|---|---|---|---|---|
| Anderson | 7 | Graham | 9 | Lincoln | 9 | Rice | 7 |
| Barber | 9 | Grant | 7 | Linn | 1 | Rush | 9 |
| Chase | 9 | Gray | 9 | Logan | 9 | Sheridan | 9 |
| Chautauqua | 8 | Greeley | 9 | Marion | 6 | Stafford | 9 |
| Cherokee | 6 | Greenwood | 6 | Meade | 9 | Stevens | 7 |
| Cloud | 7 | Hamilton | 9 | Miami | 1 | Thomas | 7 |
| Comanche | 9 | Haskell | 9 | Morton | 9 | Trego | 9 |
| Decatur | 9 | Hodgeman | 9 | Ness | 9 | Wabaunsee | 3 |
| Doniphan | 3 | Jefferson | 3 | Osage | 3 | Wallace | 9 |
| Edwards | 9 | Jewell | 9 | Ottawa | 9 | Washington | 9 |
| Elk | 8 | Kingman | 2 | Pawnee | 7 | Woodson | 9 |
| Ellsworth | 7 | Kiowa | 9 | Philips | 7 | | |
| Franklin | 6 | Lane | 9 | Rawlins | 9 | | |
| Geary | 4 | Leavenworth | 1 | Republic | 9 | | |

*Note*: Compiled from the Primary Care Health Professional Underserved Areas Report Kansas 2014

While preservation of adequate health care services remains an important part of rural health policy, there has been a shift in concentrated efforts to include a population health approach that considers all determinants of mortality (James, 2014). The many changes in rural America have brought about increased understanding regarding how social and economic processes, resources, constraints, and other circumstances impact health outcomes (James, 2014). Healthy People 2020 indicates that access to care impacts one's overall physical, social, and mental health status, and in turn one's quality of life and life expectancy, suggesting that the burden of access to care extends beyond economic and travel factors (HP2020, 2010). Perceptions about the quality of the health care an individual receives can influence likely use of the services and this is just one factor pointing to great complexity of access to care.

Due to the complex nature of access to care, a broadened perspective has emerged supported, in part, by findings that demonstrate that access to care for rural residents has more nuances than can be explained strictly by use of physician-to-resident ratios (Stensland, Akamigbo, Glass & Zabinski, 2013). In their work investigating the amount of health care services Medicare beneficiaries use in rural and urban areas, Stensland and colleagues determined that after adjusting for health status there was no significant differences between the amounts of health care received nor satisfaction with access to care among rural and urban Medicare recipients (Stensland, 2013). They also found that some of the policies aimed at preserving access to care in rural areas have become so relaxed that at least 306 hospitals receiving critical access payments were located within fifteen miles from another hospital (the criteria is set at 35 miles) (Stensland, 2013). The implications of this relaxed policy is significant because Medicare pays rural providers three billion dollars more each year (through critical

access payments and other means) than providers in urban areas (Stensland, 2013) A case can be made these funds could be used more efficiently if they were more specifically targeted to rural providers that are truly more isolated (Stensland, 2013).

While certainly the population health approach considers medical care as necessary and supports efforts to ensure access to health care services, these efforts are not viewed as especially effective in improving health outcomes. The previously mentioned RWJ approach, which uses a population health model paradigm, attributes access to care fitting into the broader topic of clinical care, and assigns it as having about a 20 percent influence on health outcomes. That same model gives much more emphasis to health behaviors and social and economic factors as influencers of health, 30 and 40 percent respectively, and frames the growing approach of addressing the rural culture when seeking to improve rural health outcomes. The underlying principle is that there are factors, many addressed above, within the rural environment that promote a culture that contributes to poor health choices and that the greatest potential to improve health outcomes is by addressing the culture, rather than improving access to care alone.

While this information generally, and in some instances specifically, applies to Kansas, greater understanding of the actual differences in health determinants and health behaviors that lead to health disparities for Kansas is needed. Given that health disparities manifest differently in relation to population characteristics and often region of the country, the aim of this study is to provide further insight into the actual differences in health determinants, health behaviors, and eventual health outcomes specifically as they relate to the rural-urban continuum in Kansas.

# Chapter 2 - Theoretical Framework

## Introduction

When a given phenomenon occurs, assumptions and generalizations about it tend to follow, hypotheses are formed and theories are born. The organization of these concepts helps to enhance understanding and provide a framework for examining the given topic. When investigating the subject of rural health disparities, it is necessary to view the matter through a specific theoretical framework. This chapter will briefly present prominent theories and models relevant to health outcomes and will clearly state the theoretical framework through which this study will view its results..

## Biomedical Model

The biomedical model, also referred to as the disease model, is an approach to health that emphasizes the biological causes of disease and has been the dominant model for decades (Deacon, 2013). This standard medical approach is concerned primarily with disease progression and its treatment (Knibb-Lamouhe, 2012). The biological cause of a disease is the primary focus, so the aim of the research becomes to discover the precise treatment of the biological dysfunction (Deacon, 2013). Understanding the mechanisms of disease and the processes of the human body are paramount within this approach and have resulted in many medical achievements with enormous potential to improve health (Knibb-Lamouhe, 2012 & Deacon, 2013). Yet, there are limitations to the medical approach, which scholar James Knibb-Lamouche suggests are threefold: medical advancements are often applied in a piecemeal manner fixing symptoms rather than treating the whole individual; strict reliance on the scientific method restricts to only aspects of an individual that can be measured, observed, or reproduced, thus

overlooking minds or emotions; and there is a significant cost associated with medical developments and treatment (Knibb-Lamouhe, 2012). Psychiatrist George Engel (1977) warned of the potential limitations of the biomedical model much earlier when he noted "it leaves no room within its framework for the social, psychological, and behavioral dimensions of illness" (p. 130). It also by default suggests the cure lies within the individual rather than within the context in which the individual acquires the disease.

As noted, theories are responses to phenomena, and patterns of disease and death have evolved over time making the development of alternate approaches to health natural. The briefest look at the history of disease will reveal a shift from infectious disease to chronic disease as the dominant source of disease and death. The control, prevention, and treatment of many infectious diseases points to the strength of the biomedical model, while the great emergence of chronic disease points to its limitations. Many chronic diseases, like heart disease or stroke, are often related to the health behaviors people adopt. A person's health behaviors cannot necessarily be explained using the biomedical model alone, therefore other models have been developed in an attempt to address this limitation.

### Biopsychosocial model

One of the most prominent challenges to the biomedical model was the biopsychosocial model that psychiatrist George Engel proposed in 1977. In his paper, "The Need for a New Medical Model: A Challenge for Biomedicine," he did more than simply identify the limitations of the biomedical model. Rather, he formed his own model that fundamentally assumed health and illness are consequences of the interplay of biological, psychological and social factors (Adler, 2009). Rejecting the notion that the biomedical model sufficiently explained the development of a given disease, Engel suggested that to understand the determinants of a disease

and arrive at rational treatment of it, a medical model must consider the patient, his or her social context, and the system devised by society to deal with the disease (Engel, 1977). In his challenge to the biomedical model, Engel developed many themes that related to the broadened definition of health that the World Health Organization adopted, one that viewed health not in terms of disease alone, but in terms of wellness (Preamble & Engel, 1977). The biopsychosocial model is able to offer explanation for why some patients feel "sick," while others view the same conditions as a "problem of living," because it places emphasis on the role of the patient beyond the biological factors at play (Engel, 1977). Many health behavior models followed that placed a similar emphasis upon the individual's choices as influential to health outcomes.

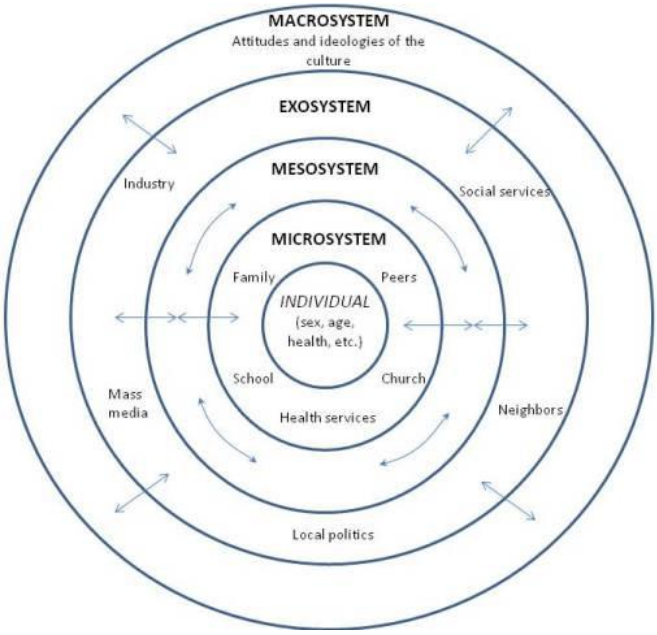
## Social Ecological Model

The biopsychosocial model, along with the many conceptual models about human behavior that followed, served to broaden the examination of health outcomes beyond the scope of biology alone. As noted, the biopsychosocial model acknowledged the influence of society on an individual's behavior. In the realm of health promotion, however, person-focused approaches largely dominated (Stokols, 1995). Gradually a transition to environmental-based and community-oriented health promotion has increased as the types of research and health promotion strategies adopted indicates (Stokols, 1995). The very introduction of the term health-promotion, which describes strategies aimed at disease prevention, speaks to the greater deviation from the biomedical model as a whole (Stokols, 1995). This increased acceptance of an ecological orientation is rooted in the foundation that developmental psychologist Uri Bronfenbrenner conceptualized in the 1970s.

In his paper, "The Ecology of Human Development, Experiments by Nature and Design" Bronfenbrenner outlined what he called a "new theoretical perspective for research in human

development" that suggested the ecological environment is akin to a set of Russian nesting dolls (p. 3). With concentration on the implications for child development, Bronfenbrenner outlined subsystems within the entire ecological system that interrelate and shape development (Bronfenbrenner, 1979). The microsystem is the closest layer to an individual and involves the surroundings like family and neighborhood (Bronfenbrenner, 1979). The mesosystem involves the connection between two or more systems in which the individual lives; for example, the influence of a family on their child's performance and behavior at school (Bronfenbrenner, 1986). The exosystem encompasses the larger social systems that the individual does not directly function in, but shape development nonetheless, because of the influence it may have on the individual's microsystem (Bronfenbrenner, 1979). He suggested three primary exosystems are especially likely to affect an individual in a modern, industrialized society (Bronfenbrenner, 1986). They are parents' workplace, parents' social networks, and community influences on family functioning (Bronfenbrenner, 1986). The macrosystem, he suggested, involves the cultural values, customs, and laws within the society of the individual as well (Bronfenbrenner, 1979). The chronosystem involves the importance of the timing of a given event on development, like the age a child is when his or her parents' divorce (Bronfenbrenner, 1989). The key distinction that Bronfenbrenner made regarding his theoretical conception was that the environment extended beyond the behavior of individuals to encompass functional systems both within and between settings and that a "principle of interconnectedness" or complex nesting of the subsystems is all at play with human development (Bronfenbrenner, 1979) (see Figure 2-1).

**Figure 2-1: Illustration of Bronfenbrenner's Ecological Framework**




*Note*: Taken from https://en.wikipedia.org/wiki/Social_ecological_model

While Uri Bronfenbrenner was a developmental psychologist and conceptualized this framework with child development largely in mind, many useful adaptations framed with the idea that there are interrelations between person and environment have been made. Social ecology is viewed as the set of theoretical principles explaining the interrelations among varying personal and environmental factors influencing human health (Stokols, 1995). Indeed as the concept of disease prevention took hold, various entities have suggested models for understanding the determinants of health and many of them are rooted in this theoretical framework. Golden and colleagues noted that those determinants of health outside an individual's control have been described in varying ways including the upstream determinants, social determinants, fundamental causes, structural factors, upper or outer levels of the social ecological model, and the wider levels of the health impact pyramid (Golden et al., 2015). So many have drawn from the social ecological framework because it provides an explanation for how social context can influence levels of policy, organization, and community and how they all interrelate to spur opportunities for, or alternatively create barriers for, healthy living (Langille & Rodgers, 2010). It is through the lenses of the social ecological framework that a view of the many determinants of health and there interrelatedness comes more easily into focus and these determinants are not limited to individual choices, health services, or health policies specifically (Puska, 2007). Health in All Policies [HiAP] emerged in the 21st century in Finland in recognition that many factors influence health and therefore the policies that shape those broader factors also influence health determinants (Puska, 2007).

## Theoretical framework for this study

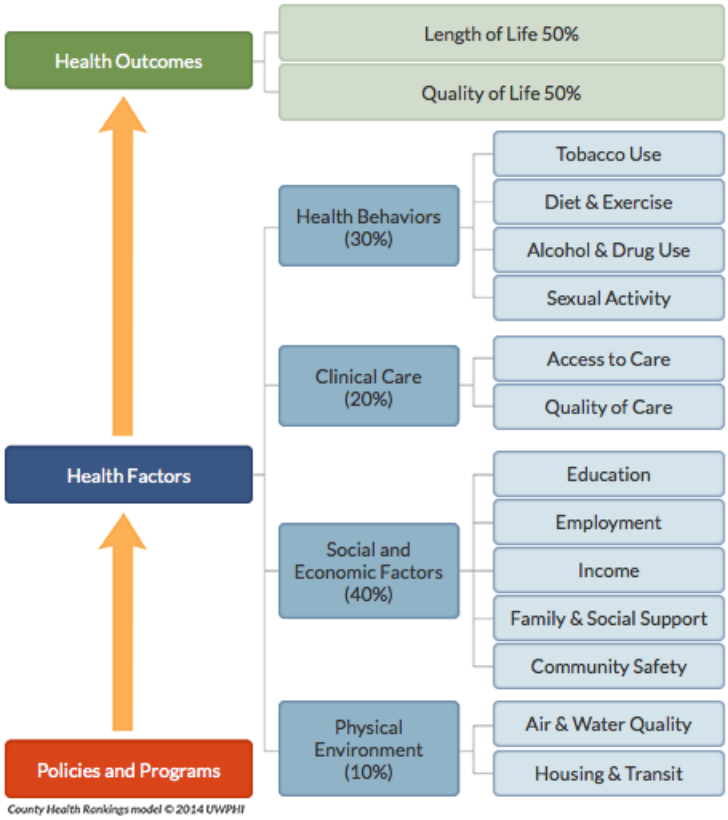
A premise of this study, and a concept mentioned previously, is that there are nonmedical factors that influence health. These are often categorized as the social determinants of health or the conditions in the social, physical, and economic environment in which people are born, live, work and age (Braveman et al., 2010; HP2020, 2010). The framework for this study drew on existing ecological models to give consideration to the dynamic relationships among individuals, groups, and their environment that may shape rural health disparities.

The premise of the County Health Rankings project, the source of the data for this study, is a population health model. The rankings include data on health outcomes, which are measured equally by length and quality of life, and health factors (Booske et al, 2010). Adapting from previously established models, the project identifies and assigns weight to four major categories of factors impacting health. They are social and economic factors (40%), health behaviors (30%), clinical care (20%), and the physical environment (10%). The County Health Rankings project identifies a model developed in 2002 by McGinnis and colleagues as their initial model for consideration (Booske et. al, 2010). McGinnis and colleagues' model suggested these health factors and weights: genetic predispositions 30%, social circumstance 15%, environmental exposures 5%, behavioral patterns 40%, and shortfalls in medical care 10%" (as cited in Booske et al., 2010, p. 4). In acknowledgement that genetic factors are (presently) non-modifiable and non-measurable, the County Health Rankings removed genetic factors and revised the weights of the remaining health factors, resulting in social circumstance 21%, environmental exposure 7%, behavioral patterns 57%, and medical care 14% (Booske et. al, 2010). The categories and weights were then revised further for reasons including: the estimates represented contributions to early death and not to other health outcomes and they did not reflect interrelationships

between the health factors (Booske et. al, 2010). Attempts at analysis of these health factors and weights is complicated by matters like knowing whether the measures of determinants precede outcome measures, establishing adequate time lag between determinants and outcomes, and because ecological data cannot establish causation (Booske et. al, 2010). These are only some of the reasons that many models assign different weight to determinants and health factors.

Exact weights aside, these four categories (social and economic factors, health behaviors, clinical care, environmental factors) are widely accepted as factors influencing health outcomes and are included, in some way, on the many prominent health rankings that examine measures of mortality and morbidity (Booske et. al, 2010). The County Health Rankings identify many sub-categories within these greater health factors (see Figure 2-2). The model for this study identifies many of those sub-categories as key variables for considering rural health disparities.

**Figure 2-2: County Health Rankings Approach**

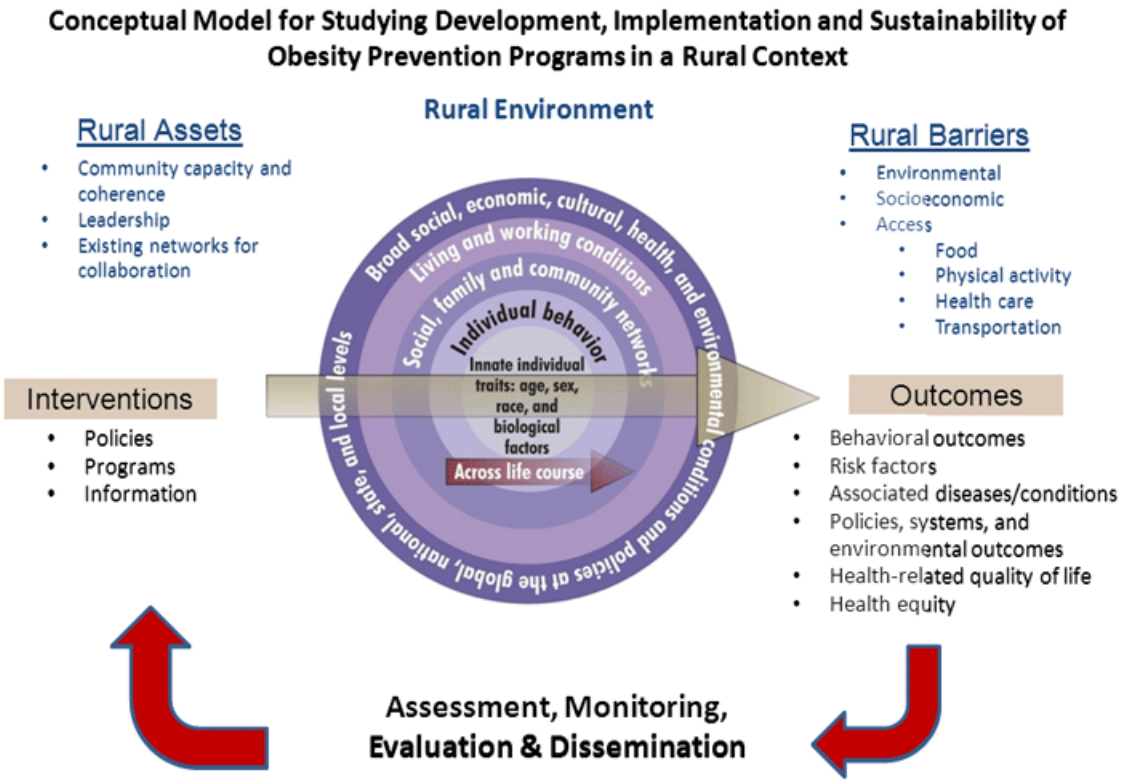



*Note*: Taken from http://www.countyhealthrankings.org/our-approach

Further, The Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020 for the U.S. Department of Health and Human Services developed a conceptual model for studying obesity prevention in a rural context (see Figure 2-3). This conceptual model is highly relevant to rural health disparities and it, along with the County Health Rankings model, is modified to form a conceptual model for this study. The model for this study relays the idea that health disparities in rural populations are shaped by health behaviors, but that those behaviors are in large part the product of environmental factors (see Figure 2-4).

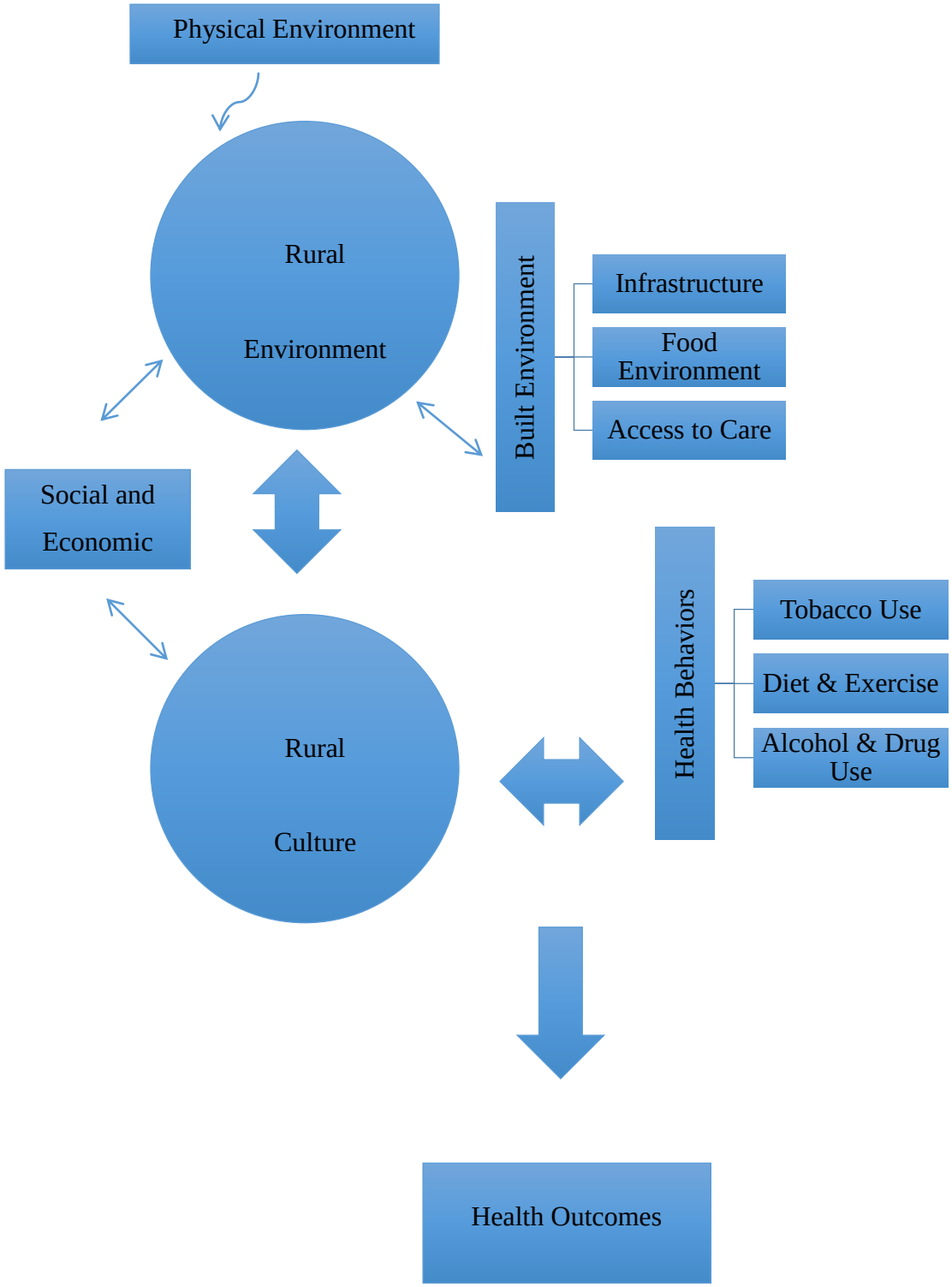
A point of distinction is in the variable access to care. It reflects the availability of health care providers in the environment versus the actual built facilities. The presence of health care facilities is conducive to improved access to care in that health care providers generally practice in some type of built facility. However, built health care facilities are not necessary indicative of the presence of health care providers so a distinction between access to care and the built environment is made in this model though they are clearly interrelated on some level. Moreover, the model reveals that there are many interrelated factors that shape the environment and promote a rural culture that is prone to health behaviors that may lead to health disparities differently than those same health behaviors in different level of urbanization.

**Figure 2-3: Social-ecological model of obesity prevention in a rural context**




*Note*: Taken from https://www.ruralhealthinfo.org/community-health/obesity/3/environmental-factors

**Figure 2-4: Conceptual Model for this Study**



# Chapter 3 - Methodology

## Introduction

The objective of this study was to understand what factors influence the health of residents of rural as compared to urban counties in Kansas, and to determine if there are specific differences related to being rural. Based on previous mentioned studies, which indicate that health disparities manifest differently along the rural-urban continuum, this study considered the ways health disparities present in varying levels of rurality. This study investigated both numerical data and the circumstances unique to these rural areas to create a more comprehensive picture of rural health disparities in Kansas overall. The objective was to identify specific health disparities, likely determinants, and consider how they may differ along the rural-urban continuum in Kansas.

This analysis compared all 105 counties in Kansas, 19 urban and 86 rural utilizing select data furnished by County Health Rankings & Roadmaps program and applying the Rural-Urban Continuum Codes to the counties. The expectation was that results would show that 1) demographic factors and health system factors impact population health outcomes; 2) there would be differences between urban and rural areas; and 3) some of these differences would only be apparent when viewed in the context of a rural-urban continuum.

## Rural and Urban Definition

When it comes to classifying what constitutes a rural or urban population there is no shortage of definitions. This was made evident even in the brief background section of this study in which many different classifications were mentioned as information was presented. While a universal definition would prove useful, various organizations and policy-makers utilize different criteria to classify rural populations (Coburn et. al., 2007). What can result is the same group of

people being labeled rural by one organization and urban by another; the implications for measuring and comparing outcomes of this population become complicated (Coburn et. al., 2007). The United States Census Bureau provides the strict statistical measures of urbanization that are based solely on population density. The U.S. Census Bureau classifies all territory, population, and housing units located outside of urbanized areas and urban clusters as rural, where urban areas are considered populations of 50,000 or greater and urban clusters include populations between 2,500 and 50,000. While small population size is a common characteristic of a rural area, there are other factors to consider when classifying an area rural or urban. The Office of Management and Budget utilizes a regional-economic concept to form metropolitan-nonmetropolitan classification that takes a more comprehensive approach to defining levels of urbanization than strictly relying on population density. Briefly stated, the additional considerations involve not only the density of population; they also indicate how economically tied an area is to a densely populated core in terms of labor-force commuting. The United States Department of Agriculture, Economic Research Service developed a Rural-Urban Continuum Code scheme in 1970 to address the very concept of factors other than population density impacting whether an area should be considered rural or urban. RUC codes are applied to all United States counties and are based on population size and proximity to a metro county; there are 9 codes: 3 metro codes and 6 nonmetro codes (James, 2014). This was the rural classification scheme used for this study (see Table 3-1).

**Table 3-1: Rural- Urban Continuum Codes**

| 2013 Rural-Urban Continuum Codes | |
|---|---|
| **Code** | **Description** |
| **Metro counties:** | |
| 1 | Counties in metro areas of 1 million population or more |
| 2 | Counties in metro areas of 250,000 to 1 million population |
| 3 | Counties in metro areas of fewer than 250,000 population |
| **Nonmetro counties:** | |
| 4 | Urban population of 20,000 or more, adjacent to a metro area |
| 5 | Urban population of 20,000 or more, not adjacent to a metro area |
| 6 | Urban population of 2,500 to 19,999, adjacent to a metro area |
| 7 | Urban population of 2,500 to 19,999, not adjacent to a metro area |
| 8 | Completely rural or less than 2,500 urban population, adjacent to a metro area |
| 9 | Completely rural or less than 2,500 urban population, not adjacent to a metro area |

*Note*: Taken from http://www.ers.usda.gov/data-products/rural-urban-continuum-codes/documentation.aspx#referencedate

## Data Collection

Data from the County Health Rankings & Roadmaps program, a collaborative effort between the RWJ foundation and the University of Wisconsin Population Health Institute, were used. The County Health Rankings data are compiled using county-level measures from many national and state data sources and are made available for public use. These sources, along with the measures and limitations, are thoroughly detailed at their website (www.countyhealthrankings.org). The data used represent a range of years, 2006 to 2013.

The County Health Rankings & Roadmaps program ranks counties according to health outcomes, specifically length and quality of life, by considering factors including health behaviors, clinical care considerations, social and economic factors, and the physical environment. The RWJ project assigns the county health rankings by comparing counties within each state, rather than comparing counties from one state to another state. Details of the county rankings are provided for descriptive purposes, however this study did not consider the rankings as a variable in the analyses. The specific variables selected for this study, their description, and source are detailed below (Table 3-2). There were some variables of interest precluded from the study due to missing data in excess of 15 percent. These were the age-adjusted percentages of adults reporting fair or poor health, the mental health provider ratio, percentage of high school graduates, and percentage of adults that reported binge or heavy drinking.

## Table 3-2: Detailed Study Measures, Sources, and Years

| Measure | Description | Source | Year(s) |
|---|---|---|---|
| Demographics | Vary | Census Population Estimates | 2013 |
| Severe housing problems | Percentage of households with at least 1 of 4 housing problems: overcrowding, high housing costs, or lack of kitchen or plumbing facilities | Comprehensive Housing Affordability Strategy (CHAS) data | 2007-2011 |
| Violent crime | Number of reported violent crime offenses per 100,000 population | Uniform Crime Reporting - FBI | 2010-2012 |
| Access to exercise opportunities | Percentage of population with adequate access to locations for physical activity | Business Analyst, Delorme map data, ESRI, & US Census Tigerline Files | 2010 & 2013 |
| Primary care physicians | Ratio of population to primary care physicians | Area Health Resource File/American Medical Association | 2012 |
| Dentists | Ratio of population to dentists | Area Health Resource File/National Provider Identification file | 2013 |
| Food environment index | Index of factors that contribute to a healthy food environment, 0 (worst) to 10 (best) | USDA Food Environment Atlas, Map the Meal Gap | 2012 |
| Limited access to healthy foods | Measure of food environment index | USDA Food Environment Atlas | 2010 |
| Food insecurity | Measure of food environment index | Map the Meal Gap | 2012 |
| Children eligible for free lunch | Income at or below $29,995 for a family of four in 2012-2013 | National Center for Education Statistics | 2012 |
| Children in poverty | Percentage of children under age 18 in poverty | Small Area Income and Poverty Estimates | 2013 |
| Children in single-parent households | Percentage of children that live in a household headed by single parent | American Community Survey | 2009-2013 |
| Social associations | Number of membership associations per 10,000 population | County Business Patterns | 2012 |
| Some college | Percentage of adults ages 25-44 years with some post-secondary education | American Community Survey | 2009-2013 |
| Unemployment | Percentage of population ages 16 and older unemployed but seeking work | Bureau of Labor Statistics | 2013 |
| Income Ratio | Ratio of household income at the 80th percentile to income at the 20th percentile | American Community Survey | 2009-2013 |
| Uninsured | Percentage of population under age 65 without health insurance | Small Area Health Insurance Estimates | 2012 |
| Physical inactivity | Percentage of adults aged 20 and over reporting no leisure-time physical activity | CDC Diabetes Interactive Atlas | 2011 |
| Adult smoking | Percentage of adults who are current smokers | Behavioral Risk Factor Surveillance System | 2006-2012 |
| Adult obesity | Percentage of adults that report a BMI of 30 or more | CDC Diabetes Interactive Atlas | 2011 |
| Alcohol-impaired driving deaths | Percentage of driving deaths with alcohol involvement | Fatality Analysis Reporting System | 2009-2013 |
| Injury deaths | Number of deaths due to injury per 100,000 population | CDC WONDER mortality data | 2008-2012 |
| Preventable hospital stays | Number of hospital stays for ambulatory-care sensitive conditions per 1,000 Medicare enrollees | Dartmouth Atlas of Health Care | 2012 |
| Premature death | Years of potential life lost before age 75 per 100,000 population (age-adjusted) | National Center for Health Statistics - Mortality files | 2010-2012 |

*Note*: Compiled from http://www.countyhealthrankings.org/ranking-methods/data-sources-and-measures

## Methods and Analysis

Referring to the model proposed, this study examined difference between rural and urban areas through a variety of statistical methods on a range of interrelated factors. The analyses conducted were a Pearson correlation coefficient test, t-test comparisons, Analysis of Variance (ANOVA), and stepwise regression procedure to produce multiple regression models. The level of significance of 0.05 was used for all statistical tests, except the stepwise regression procedure, which was set at 0.15 level of significance.

Factors relating to the environment that were examined included: severe housing problems, access to exercise opportunities, primary care physician rate, dentist rate, the food environment index, and limited access to healthy food. The social and economic factors examined were: food insecurity, children eligible for free lunch, children in poverty, children in single-parent households, social associations, educational attainment as reflected by percentage of the population with some college attendance, unemployment, income inequality, violent crime, and percentages of the population without health insurance. The health behaviors of adult smoking and physical inactivity were examined. The health outcomes of adult obesity, alcohol-impaired driving deaths, injury deaths, preventable hospital stays, and overall premature death were examined.

Descriptive statistics were used to begin to describe the basic features of the data set used in this study. The data were first summarized into a data table showing the mean, standard deviation, and range of each variable of interest by RUC (see Tables 4-1 through 4-5). A Pearson correlation coefficient was performed to measure the strength of linear associations between the variables mentioned above (see Tables 4-6). The strengths of associations were determined using

the following indicators: .50 to .70 were considered moderate correlations and .70 or higher were considered strong correlations when the $p \leq 0.05$.

A comparison of urban and rural areas was completed by grouping RUC counties 1-3 to form an urban group and grouping RUC counties 4-9 to form a rural group and analyzing for each variable through use of simple linear regression ($y = \beta_0 + \beta_1 x + \epsilon$). Then, more specific comparisons of urban and rural areas were made based on what RUC a county was labeled. An Analysis of variance (ANOVA) was performed for each variable to determine differences between RUCs 1-9. When differences were present, a t-test was conducted to compare those counties that were significantly different, determined by a $p \leq .05$. ANOVA tests were also performed for each variable to determine the differences among only the rural RUCs 4-9, determined by a $p \leq 05$. When differences were present, a t-test was conducted to compare those that were significantly different.

Using standard stepwise regression, multiple regression models were created for each of the five health outcomes. Stepwise regression is a semi-automatic procedure that adds the most significant variables while also removing the least significant variables to form a model. The candidate predictors were both added and removed through the process based on alpha-to-enter significance level and alpha-to-remove significance level that were set at .15. All variables of interest in study, including demographics, were considered candidate predictors. All data were analyzed using Minitab 17.

# Chapter 4 - Results

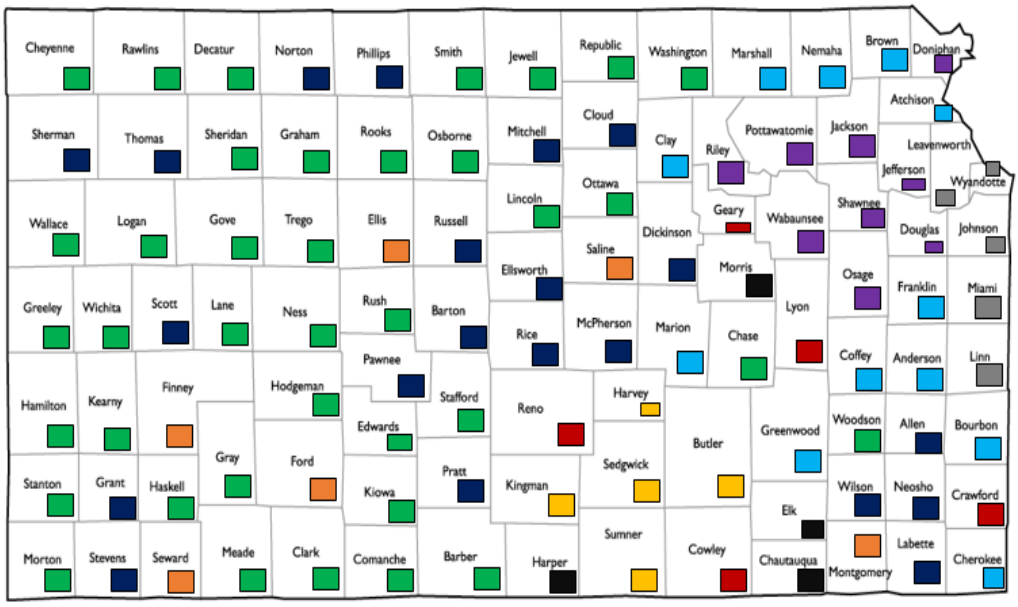
## Introduction

Many of the results confirmed the hypotheses for this study. The first hypothesis was there would be differences in population health outcomes that will differentially favor Kansas urban counties. There were differences between urban and rural areas in the rates of injury death, preventable hospital stays, and premature death, with each occurring at a higher rate in rural areas. It was hypothesized that these differences in health outcomes would be based on several factors. Not all predicted differences were supported by the findings, especially when comparing urban areas (RUCs 1-3) with rural areas (RUCs 4-9). However, when counties were grouped into their respective RUCs, more evidence supporting the predicted differences surfaced. This confirmed that the second hypothesis was true.

To begin, all counties labeled 1 through 3 are considered to some degree, urban. All counties labeled 4-9 are considered to some degree, rural (see Figure 4-1). The means of each variable for each RUC indicates that there were differences in many of the health determinants, health behaviors, and health outcomes among the counties in Kansas (see Tables 4-1 through 4-5). Based on averages, RUC 1 counties had the highest percentage of children living in a single-parent home (31.4%), the highest percentage of unemployment (6.6%), and the highest percentage of income inequality (4.2). RUC 3 had the highest percentage of adults age 25-44 with some post-secondary education (69.4%). RUC 4 had the highest percentage of severe housing problems (14.8%), the highest dentist rate (62.8), the highest percentage of people with food insecurity (15.6%), and the highest percentage of adult obesity (34.3%). RUC 5 had the

highest violent crime rate (395), the highest percentage of children eligible for free lunch (50.3%), and the highest percentage or people with access to exercise opportunities (79%). RUC 6 had the highest primary care provider rate (63.1). RUC 8 had the lowest Food Environment Index score of 6.3 (where 0 is worst and 10 is best) and it follows that they had the highest percentage of people with limited access to healthy food (18.5%). RUC 8 also had the highest percentage of children living in poverty (24.8%), the highest percentage of adult smokers (20.1%), the highest percentage of people without health insurance (18.6%) and the highest percentage of physically inactive people during leisure-time (29.3%), the highest percentage of alcohol-impaired driving deaths (52.4%), the highest rate of injury deaths (106.6), the highest preventable hospital stays rate (101.6), and the highest rate of premature death (9003 Years of Potential Life Lost Rate). RUC 9 had the highest social association rate (34.4). These differences indicate that all health determinants, health behaviors, and health outcome are not solely favorable or solely unfavorable in urban and rural counties.

**Figure 4-1: Map of Kanas Counties with 2013 USDA, ERS RUC Codes**




Metro counties:

RUC 1 Counties in metro areas of 1 million population or more

RUC 2 Counties in metro areas of 250,000 to 1 million population

RUC 3 Counties in metro areas of fewer than 250,000 population

Nonmetro counties:

RUC 4 Urban population of 20,000 or more, adjacent to a metro area

RUC 5 Urban population of 20,000 or more, not adjacent to a metro area

RUC 6 Urban population of 2,500 to 19,999, adjacent to a metro area

RUC 7 Urban population of 2,500 to 19,999, not adjacent to a metro area

RUC 8 Completely rural or less than 2,500 urban population, adjacent to a metro area

RUC 9 Completely rural or less than 2,500 urban population, not adjacent to a metro area

**Table 4-1: Descriptive Statistics of Demographic Characteristics in Kansas Counties, 2013**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| DEMOGRAPHICS: | | | | | | | | | |
| %<br>< 18 | 25.609 | 25.151 | 23.468 | 24.675 | 27.232 | 23.809 | 23.648 | 21.026 | 23.259 |
| *SD* | 1.785 | 1.457 | 3.607 | 3.597 | 4.448 | 1.512 | 3.221 | 1.8665 | 3.223 |
| Range | 24-28% | 23-27% | 18-30% | 22- 31% | 22- 32% | 21-26% | 18-32% | 20- 24% | 19-29% |
| % 65 and over | 14.118 | 16.303 | 14.664 | 13.924 | 12.506 | 19.394 | 18.249 | 24.435 | 21.326 |
| *SD* | 3.702 | 3.357 | 3.683 | 4.092 | 3.705 | 2.460 | 2.710 | 2.493 | 4.120 |
| Range | 11-20% | 12-21% | 8- 18% | 7- 18% | 9- 18% | 15- 23% | 13- 23% | 22- 27% | 12- 28% |
| %<br>African American | 8.006 | 2.761 | 2.853 | 5.433 | 2.973 | 1.303 | 1.529 | 0.436 | 0.621 |
| *SD* | 9.597 | 3.522 | 2.842 | 6.566 | 1.525 | 1.386 | 1.478 | 0.267 | 0.644 |
| Range | .7-24% | .3-9% | .5-8% | 2-17% | .9-6% | .4-5% | .3-5% | .1-.6% | .2- 4% |
| % American Indian/ Alaskan Native | 0.822 | 1.040 | 2.040 | 1.382 | 1.535 | 1.769 | 0.967 | 2.073 | 0.825 |
| *SD* | 0.340 | 0.268 | 2.461 | 0.608 | 1.068 | 2.570 | 0.539 | 1.903 | 0.539 |
| Range | .4-1% | .7-1% | .7-8% | .8-2% | .4-4% | .5-9% | .3-5% | .6-5% | .1-2% |
| %<br>Asian | 1.998 | 1.401 | 1.384 | 1.995 | 2.161 | 0.439 | 0.584 | 0.275 | 0.496 |
| *SD* | 1.894 | 1.622 | 1.718 | 1.190 | 1.203 | 0.129 | 0.205 | 0.102 | 0.398 |
| Range | .3-5% | .4-4% | .2-4% | .5-4% | .7-4% | .3-.8% | .3-1% | .2-.4% | .1-2% |
| % Native Hawaiian/ Other Pacific Islander | 0.108 | 0.057 | 0.080 | 0.294 | 0.156 | 0.055 | 0.071 | 0.088 | 0.048 |
| *SD* | 0.086 | 0.037 | 0.083 | 0.298 | 0.095 | 0.068 | 0.059 | 0.090 | 0.074 |
| Range | 0-.1% | 0-.1% | 0-.3% | .1-.8% | .1-.3% | 0-.3% | 0-.2% | 0-.2% | 0-.3% |
| %<br>Hispanic | 9.285 | 7.438 | 5.038 | 11.772 | 30.076 | 2.660 | 9.426 | 4.176 | 9.550 |
| *SD* | 10.192 | 4.709 | 3.021 | 5.967 | 25.162 | 0.772 | 11.120 | 1.535 | 9.959 |
| Range | 2-27% | 3-14% | 2-12% | 5-21% | 5-58% | 2-4% | 2-47% | 3-6% | 2-38% |

**Table 4-1: Descriptive Statistics of Demographic Characteristics in Kansas Counties, 2013, Continued**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| DEMOGRAPHICS: | | | | | | | | | |
| % Non-Hispanic White | 78.130 | 85.573 | 86.612 | 77.047 | 62.037 | 92.089 | 86.300 | 90.792 | 87.651 |
| *SD* | 20.948 | 9.850 | 7.379 | 11.893 | 24.582 | 3.540 | 10.569 | 2.537 | 10.131 |
| Range | 43-94% | 70-94% | 75-94% | 59-88% | 34-91% | 84-96% | 51-96% | 87-93% | 65-97% |
| % Female | 49.810 | 50.172 | 49.472 | 49.656 | 49.523 | 50.395 | 49.354 | 49.647 | 49.837 |
| *SD* | 1.804 | 0.480 | 1.294 | 1.398 | 1.058 | 0.410 | 2.292 | 1.187 | 0.851 |
| Range | 47-51% | 50-51% | 47-52% | 47-51% | 48-51% | 50-51% | 43-51% | 48-51% | 48-51% |

*Note*: Data from http://www.countyhealthrankings.org/rankings/data, Census Population Estimates, 2013

**Table 4-2: Descriptive Statistics of Environmental Characteristics in Kansas Counties**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| ENVIRONMENTAL FACTORS: | | | | | | | | | |
| % Severe Housing Problem | 13.657 | 11.259 | 13.039 | 14.841 | 14.695 | 10.241 | 9.938 | 9.908 | 8.209 |
| *SD* | 3.678 | 1.614 | 6.019 | 2.500 | 2.630 | 1.918 | 2.342 | 1.165 | 2.562 |
| Range | 11-20% | 10-14% | 8-24% | 12-18% | 11-18% | 7-13% | 5-16% | 10-11% | 4-14% |
| % Access to Exercise Opportunities | 74.154 | 62.475 | 57.498 | 72.516 | 78.927 | 51.913 | 64.250 | 43.180 | 52.092 |
| *SD* | 24.596 | 17.858 | 29.042 | 15.817 | 4.925 | 13.086 | 16.409 | 28.940 | 22.391 |
| Range | 35-98% | 42-81% | 27-93% | 54-96% | 72-85% | 27-72% | 2-81% | 0-63% | 1-92% |
| PCP Rate | 53.173 | 57.758 | 54.469 | 56.624 | 54.296 | 63.141 | 55.606 | 46.310 | 69.541 |
| *SD* | 36.223 | 31.830 | 25.805 | 11.518 | 17.207 | 29.614 | 21.529 | 19.126 | 43.437 |
| Range | 41-110 | 13-86 | 6-88 | 44-69 | 38-86 | 32-117 | 14-88 | 34-68 | 0-183 |
| Dentist Rate | 41.486 | 39.259 | 33.730 | 62.268 | 52.624 | 37.035 | 41.827 | 28.458 | 28.008 |
| *SD* | 21.199 | 16.004 | 20.450 | 29.305 | 16.478 | 16.789 | 10.138 | 28.960 | 24.350 |
| Range | 24-78 | 24-58 | 12-60 | 39-112 | 30-79 | 24-79 | 29-61 | 0-68 | 0-81 |
| Food Environment Index | 7.320 | 7.440 | 7.078 | 6.840 | 7.367 | 7.217 | 7.514 | 6.300 | 6.818 |
| *SD* | 1.132 | 0.416 | 1.124 | 0.727 | 0.450 | 0.531 | 0.811 | 2.269 | 1.437 |
| Range | 7.1-8.3 | 6.8-7.9 | 4.9-8.3 | 6.0-7.5 | 6.5-7.8 | 6.4-8.1 | 5.2-9.0 | 2.9-7.5 | 4.0-9.1 |
| % Limited Access to Healthy Food | 6.974 | 7.732 | 10.530 | 8.882 | 9.811 | 8.987 | 8.854 | 18.501 | 17.687 |
| *SD* | 4.852 | 1.558 | 7.875 | 4.689 | 7.198 | 4.480 | 5.509 | 20.901 | 13.669 |
| Range | 3-14% | 6-9% | 4-22% | 3-14% | 3-22% | 3-17% | 1-28% | 7-50% | 1-48% |

*Note*: Data from http://www.countyhealthrankings.org/rankings/data, multiple sources and years 2007-2013

**Table 4-3: Descriptive Statistics of SES Characteristics in Kansas Counties**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| SOCIAL AND ECONOMIC FACTORS: | | | | | | | | | |
| % Food Insecurity | 14.220 | 13.880 | 13.778 | 15.600 | 12.783 | 13.808 | 12.510 | 13.500 | 11.476 |
| *SD* | 3.004 | 1.207 | 2.712 | 1.592 | 2.282 | 1.370 | 1.905 | 0.804 | 1.406 |
| Range | 12-19% | 12-15% | 11-18% | 14-18% | 11-16% | 11-16% | 9-15% | 13-14% | 8-16% |
| % Children Eligible for Free Lunch | 34.456 | 35.721 | 30.538 | 45.941 | 50.340 | 38.870 | 39.144 | 43.743 | 34.983 |
| *SD* | 20.563 | 9.201 | 7.769 | 6.378 | 14.043 | 10.057 | 8.568 | 11.953 | 9.770 |
| Range | 19-69% | 14-22% | 19-45% | 37-54% | 28-65% | 23-53% | 25-54% | 26-51% | 20-56% |
| % Children in Poverty | 18.620 | 17.440 | 16.122 | 23.120 | 20.850 | 19.917 | 19.067 | 24.800 | 17.439 |
| *SD* | 12.156 | 3.094 | 3.075 | 1.708 | 4.421 | 5.690 | 5.380 | 5.697 | 3.339 |
| Range | 7-38% | 14-22% | 13-22% | 20-24% | 14-25% | 11-28% | 13-28% | 20-32% | 13-30% |
| % Children in Single-Parent Home | 31.385 | 26.596 | 25.460 | 30.197 | 30.590 | 29.124 | 27.450 | 27.115 | 21.514 |
| *SD* | 10.184 | 5.765 | 6.372 | 1.211 | 7.094 | 6.080 | 9.385 | 4.871 | 8.646 |
| Range | 22-49% | 22-34% | 16-37% | 28-31% | 24-38% | 20-38% | 2-40% | 20-31% | 3-35% |
| Social Associations Rate | 10.407 | 16.661 | 13.941 | 13.333 | 14.105 | 19.785 | 24.265 | 23.869 | 34.348 |
| *SD* | 2.233 | 5.334 | 3.657 | 3.641 | 4.473 | 5.750 | 5.259 | 8.436 | 11.142 |
| Range | 9-13 | 10-23 | 10-21 | 8-18 | 10-22 | 13-28 | 16-32 | 15-34 | 17-59 |
| % Some College | 66.514 | 64.762 | 69.388 | 64.137 | 53.085 | 61.398 | 60.924 | 60.679 | 63.051 |
| *SD* | 13.509 | 5.531 | 8.719 | 4.610 | 14.122 | 6.549 | 8.140 | 6.304 | 9.366 |
| Range | 47-84% | 62-73% | 56-58% | 58-69% | 37-75% | 52-77% | 46-79% | 52-67% | 39-79% |
| % Unemployed | 6.567 | 5.542 | 5.624 | 6.029 | 4.548 | 5.285 | 4.367 | 5.093 | 3.603 |
| *SD* | 1.439 | 0.791 | 0.760 | 0.838 | 1.377 | 1.172 | 1.467 | 1.132 | 0.784 |
| Range | 4.7-8.3 | 4.4-6.4 | 4.5-7.0 | 5.2-6.9 | 2.8-6.9 | 3.4-7.9 | 2.8-7.9 | 3.5-6.0 | 2.5-6.5 |

*Note*: Data from http://www.countyhealthrankings.org/rankings/data, multiple sources and years 2009-2013

**Table 4-3: Descriptive Statistics of SES Characteristics in Kansas Counties, Continued**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| SOCIAL AND ECONOMIC FACTORS: | | | | | | | | | |
| Income Ratio | 4.194 | 4.074 | 4.096 | 4.052 | 3.957 | 4.165 | 4.030 | 4.017 | 3.897 |
| *SD* | .279 | .341 | .683 | .613 | .643 | .318 | .586 | .448 | .518 |
| Range | 3.9-4.6 | 3.6-4.5 | 3.3-5.2 | 3.1-4.6 | 3.4-4.8 | 3.6-4.9 | 3.4-6.1 | 3.5-4.6 | 3.0-5.1 |
| % Uninsured | 13.580 | 13.399 | 13.508 | 16.382 | 18.214 | 13.746 | 14.858 | 18.599 | 16.918 |
| *SD* | 4.920 | 1.835 | 1.125 | 1.936 | 3.915 | 1.877 | 2.147 | 2.547 | 2.491 |
| Range | 10-21% | 11-16% | 12-15% | 15-19% | 13-23% | 11-17% | 12-19% | 16-22% | 14-23% |
| Violent Crime Rate | 328.689 | 324.854 | 267.159 | 383.033 | 394.892 | 201.806 | 253.006 | 141.527 | 166.863 |
| *SD* | 187.310 | 195.341 | 91.588 | 90.994 | 59.144 | 77.537 | 114.775 | 46.150 | 106.662 |
| Range | 165-592 | 155-648 | 198-455 | 266-499 | 334-504 | 112-330 | 34-508 | 88-169 | 0-581 |

*Note*: Data from http://www.countyhealthrankings.org/rankings/data, multiple sources and years 2009-2013

**Table 4-4: Descriptive Statistics of Health Risk Behaviors in Kansas Counties**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| HEALTH RISK BEHAVIORS: | | | | | | | | | |
| % Adult Smoking | 18.660 | 16.260 | 19.222 | 19.800 | 17.433 | 18.817 | 17.640 | 20.125 | 19.296 |
| *SD* | 5.221 | 4.136 | 4.011 | 3.739 | 4.284 | 3.666 | 3.382 | 6.409 | 5.630 |
| Range | 13-25% | 10-21% | 16-27% | 16-26% | 15-23% | 10-24% | 12-23% | 14-28% | 10-28% |
| % Physical Inactivity | 25.640 | 27.360 | 23.433 | 25.760 | 27.000 | 28.267 | 27.762 | 29.275 | 28.392 |
| *SD* | 5.536 | 3.211 | 4.202 | 2.910 | 2.960 | 2.780 | 2.356 | 2.572 | 2.197 |
| Range | 17-32% | 25-32% | 17-29% | 24-31% | 24-30% | 24-31% | 26-31% | 27-32% | 23-32% |

*Note*: Data from http://www.countyhealthrankings.org/rankings/data, multiple sources and years 2006-2012

**Table 4-5: Descriptive Statistics of Health Outcomes in Kansas Counties**

| *M*<br>*SD* | RUC 1 | RUC 2 | RUC 3 | RUC 4 | RUC 5 | RUC 6 | RUC 7 | RUC 8 | RUC 9 |
|---|---|---|---|---|---|---|---|---|---|
| HEALTH OUTCOMES: | | | | | | | | | |
| % Adult Obesity | 32.540 | 32.360 | 32.311 | 34.340 | 32.567 | 33.583 | 32.767 | 32.875 | 31.905 |
| *SD* | 5.956 | 2.652 | 4.480 | 2.149 | 1.666 | 2.667 | 1.792 | 1.377 | 1.708 |
| Range | 23-39% | 29-36% | 25-39% | 32-37% | 30-35% | 30-39% | 29-36% | 32-35% | 28-36% |
| % Alcohol-Impaired Driving Deaths | 31.584 | 28.793 | 25.767 | 33.968 | 39.645 | 37.442 | 29.807 | 52.381 | 41.005 |
| *SD* | 12.373 | 5.460 | 12.199 | 13.642 | 8.299 | 15.013 | 15.065 | 32.062 | 26.298 |
| Range | 14-44% | 23-35% | 8-50% | 19-50% | 31-52% | 6-67% | 0-56% | 33-100% | 0-100% |
| Injury Death Rate | 61.985 | 80.982 | 66.818 | 73.368 | 69.991 | 83.415 | 88.255 | 106.628 | 99.952 |
| *SD* | 17.368 | 14.888 | 22.522 | 8.212 | 9.420 | 12.837 | 17.055 | 20.570 | 27.189 |
| Range | 39-83 | 65-99 | 35-102 | 63-85 | 62-89 | 71-99 | 54-136 | 78-126 | 64-137 |
| Preventable Hospital Stays Rate | 63.696 | 51.940 | 51.202 | 63.764 | 66.320 | 70.849 | 78.443 | 101.648 | 93.590 |
| *SD* | 8.760 | 17.423 | 22.522 | 8.212 | 9.420 | 12.837 | 17.055 | 20.570 | 27.189 |
| Range | 51-72 | 38-81 | 34-77 | 51-94 | 45-78 | 71-99 | 49-153 | 78-124 | 31-186 |
| Years of Potential Life Lost Rate | 6832.684 | 7452.340 | 6374.194 | 8089.154 | 6914.828 | 8413.188 | 7944.536 | 9002.998 | 8303.461 |
| *SD* | 1921.403 | 983.265 | 1431.590 | 603.182 | 1088.190 | 2170.794 | 1793.626 | 769.634 | 2446.838 |
| Range | 4250-9644 | 6569-9034 | 4492-8661 | 7426-9014 | 5690-8699 | 5795-11244 | 4203-11840 | 7877-9513 | 4543-14698 |
| County Health Rankings | 40.800 | 45.400 | 28.222 | 67.400 | 45.167 | 57.083 | 54.524 | 62.000 | 52.353 |
| *SD* | 34.781 | 26.605 | 21.919 | 16.072 | 29.431 | 33.703 | 31.553 | 23.509 | 28.477 |
| Range | 2-94 | 18-82 | 1-56 | 46-83 | 11-88 | 9-99 | 4-97 | 40-95 | 5-101 |

*Note*: Data from http://www.countyhealthrankings.org/rankings/data, multiple sources and years 2008-2013

## Pearson Correlation Coefficient

The Pearson correlation coefficient results indicate that there were several variables in this study that were moderately correlated. There were also a few variables that were strongly correlated. The significant results ($p \leq 0.05$) are presented here (see Table 4-6).

There were statistically significant negative correlations between:

social associations and severe housing problems (r= -0.56, $p < 0.001$);

social associations and unemployment (r= -0.61, $p < 0.001$);

children eligible for free lunch and some college completion (r= -0.63, $p < 0.001$);

children eligible for free lunch and Non-Hispanic white (r= -0.60, $p < 0.001$);

Hispanic population and some college completion (r= -0.61, $p < 0.001$);

population 65 and over and violent crime (r= -0.52, $p < 0.001$);

population over 65 and the population less than 18 years (r= - 0.66, $p < 0.001$);

population 65 and older and severe housing problems (r= -0.57, $p < 0.001$);

Asian population and the population 65 years and over (r= - 0.64, $p < 0.001$);

Non-Hispanic white and population less than 18 years (r= -0.68, $p < 0.001$);

limited access to healthy food and food environment index (r= -0.92, $p < 0.001$).

There were statistically significant positive correlations between:

food insecurity and unemployment (r= 0.69, $p < 0.001$);

social associations and the 65 and over population (r= 0.60, $p < 0.001$);

unemployment and children in poverty (r= 0.53, $p < 0.001$);

children in poverty and food insecurity (r= 0.56, $p < 0.001$);

food insecurity and children in single-parent homes (r= 0.54, $p < 0.001$);

children in single-parent homes and children in poverty (r= 0.51, $p < 0.001$);

children eligible for free lunch and the uninsured (r= 0.65, $p < 0.001$);

children eligible for free lunch and the Hispanic population (r = 0.56, $p < 0.001$);

African American population and food insecurity (r= 0.56, $p < 0.001$);

African American population and violent crime (r= 0.59, $p < 0.001$);

severe housing problems and the Asian population (r=0.65, $p < 0.001$);

Asian population and access to exercise opportunities (r=0.50, $p < 0.001$);

Hispanic population and the population less than 18 years (r= 0.70, $p < 0.001$);

Non-Hispanic white and the population 65 years and over (r= 0.70, $p < 0.001$).

**Table 4-6: Pearson Correlation Coefficient Results**

| | *Severe Housing* | *Access to Exercise* | *Food Environment* |
|---|---|---|---|
| Social Association | -0.561<br>0.000 | | |
| Limited Access Food | | | -0.920<br>0.000 |
| Food Insecurity | 0.563<br>0.000 | | |
| % 65 and over | -0.566<br>0.000 | -0.483<br>0.000 | |
| % African American | 0.471<br>0.000 | 0.388<br>0.000 | |
| % Asian | 0.651<br>0.000 | 0.506<br>0.000 | |
| % Native Hawaiian | 0.409<br>0.000 | 0.375<br>0.000 | |
| % Hispanic | 0.287<br>0.003 | 0.383<br>0.000 | |
| % Non-Hispanic white | -0.462<br>0.000 | -0.479<br>0.000 | |

**Table 4-6: Pearson Correlation Coefficient Significant Results, Continued**

| | Dentist Rate | Some College | Unemployment | Income Ratio |
|---|---|---|---|---|
| Children in Poverty | | -0.353 | 0.528 | |
| | | 0.000 | 0.000 | |
| Children in Single-Parent Home | | | 0.461 | |
| | | | 0.000 | |
| Uninsured | | -0.627 | | |
| | | 0.000 | | |
| Social Association | | | -0.610 | |
| | | | 0.000 | |
| Violent Crime | | | 0.441 | |
| | | | 0.000 | |
| Children Eligible For free lunch | | -0.630 | | |
| | | 0.000 | | |
| Food Insecurity | | | 0.688 | 0.495 |
| | | | 0.000 | 0.000 |
| % < 18 | | -0.471 | | -0.334 |
| | | 0.000 | | 0.000 |
| % African American | 0.265 | | 0.465 | |
| | 0.007 | | 0.000 | |
| % Hispanic | | -0.606 | | |
| | | 0.000 | | |
| % Non-Hispanic white | | 0.547 | | |
| | | 0.000 | | |

**Table 4-6: Pearson Correlation Coefficient Significant Results, Continued**

| | Children in Poverty | Children in Single-Parent | Uninsured |
|---|---|---|---|
| Children in Single-Parent | 0.507<br>0.000 | | |
| Uninsured | 0.455<br>0.000 | | |
| Adult Smoking | 0.322<br>0.002 | | |
| Children Eligible For Free Lunch | 0.713<br>0.000 | 0.377<br>0.000 | 0.649<br>0.000 |
| Food Insecurity | 0.595<br>0.000 | 0.538<br>0.000 | |
| % Hispanic | | | 0.666<br>0.000 |
| % Non-Hispanic White | | | -0.591<br>0.000 |

**Table 4-6: Pearson Correlation Coefficient Significant Results, Continued**

| | Physical Inactivity | Social Associations | Violent Crime | Children eligible for free lunch |
|---|---|---|---|---|
| Violent Crime | | -0.436<br>0.000 | | |
| Children Eligible For free lunch | 0.329<br>0.001 | | 0.480<br>0.000 | |
| Food Insecurity | | -0.439<br>0.000 | 0.453<br>0.000 | |
| % 65 and over | 0.383<br>0.000 | 0.591<br>0.000 | -0.517<br>0.000 | |
| % African American | | -0.382<br>0.000 | 0.587<br>0.000 | |
| % Asian | -0.438<br>0.000 | -0.415<br>0.000 | 0.480<br>0.000 | |
| % Hispanic | | | | 0.561<br>0.000 |
| % Non-Hispanic White | | | -0.464<br>0.000 | -0.600<br>0.000 |

**Table 4-6: Pearson Correlation Coefficient Significant Results, Continued**

| | Limited Access To Healthy Food | Food Insecurity | % < 18 | % 65 over |
|---|---|---|---|---|
| % 65 and over | | | -0.662<br>0.000 | |
| % African American | | 0.560<br>0.000 | | -0.466<br>0.000 |
| % Asian | | 0.388<br>0.000 | | -0.641<br>0.000 |
| % Native Hawaiian | | | 0.393<br>0.000 | -0.520<br>0.000 |
| % Hispanic | | -0.324<br>0.001 | 0.695<br>0.000 | -0.574<br>0.000 |
| % Non-Hispanic White | | | -0.683<br>0.000 | 0.700<br>0.000 |

## Urban and Rural Comparison

The t-test results comparing urban (RUCs 1-3) with rural (RUCs 4-9) showed significant differences for some of the predictive variables and outcomes (see Table 4-8). Results for the significant differences between urban and rural areas follow. Of the 23 variables considered, 12 showed significant differences ($p < 0.05$) (see Table 4-7).

Of the environmental factors examined, severe housing problems was the only variable that showed significant differences between urban and rural counties. On average, the percentage of severe housing problems was 2.901 more in urban areas than rural areas ($p = 0.001$). Severe housing problems are defined by at least one of four housing problems: overcrowding, high housing costs, or lack of kitchen or plumbing facilities is present.

Of the social and economic factors examined, many showed significant differences between urban and rural counties. They were the violent crime rate, the percentage of people with food insecurity, the percentage of children eligible for free lunch, the social association rate, the percentage of adults with some college completion, the percentage of unemployed people, and percentage of uninsured people. Details of those significant differences follow.

On average, the violent crime rate was 74.2 higher in urban areas than in rural areas ($p = 0.025$). The violent crime rate is calculated by number of violent crimes/population * 100,000. On average, the percentage of people with food insecurity was 1.310 more in urban areas than in rural areas ($p = 0.012$). On average, the percentage of children eligible for free lunch was 5.46 more in urban areas than in rural areas ($p = 0.049$). On average, the social association rate was 13.01 less in urban areas than in rural areas ($p < 0.001$). The social association rate is calculated by number of associations/population * 10,000. On average, the percentage of adults age 25-44

with some post-secondary education was 5.62 higher in urban areas than in rural areas ($p = 0.015$). On average, the percentage of population ages 16+ unemployed and looking for work was 1.550 more in urban areas than in rural areas ($p < 0.001$). On average, the percentage of uninsured people was 2.611 less in urban areas than in rural areas ($p < 0.001$).

Of the health behaviors considered, physical inactivity during leisure time showed significant differences. On average the percentage of physically inactive people was 2.964 less in urban areas than rural areas ($p < 0.001$).

Of the health outcomes examined, the injury death rate, preventable hospital stays and premature death each showed significant differences. On average, the injury death rate was 21.20 less in urban areas than in rural areas ($p < 0.001$). The injury death rate was calculated by number of injury deaths/population * 100,000. On average, the rate of preventable hospital stays was 27.73 percent less in urban areas than in rural areas ($p < 0.001$). Preventable hospital stays are determined by discharges for ambulatory care sensitive conditions/Medicare enrollees * 1,000. Premature death is defined as deaths under the age of 75 and it is measured by Years of Potential Life Lost. On average, the Years of Potential Life Lost Rate (age-adjusted YPLL rate per 100,000) was 1352 less in urban areas than in rural areas ($p = 0.007$).

**Table 4-7: T-Test Results for Comparison of Urban and Rural**

**ENVIRONMENTAL FACTORS:**

Severe Housing Problems = 9.832 + 2.901 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 9.832 | 0.368 | 26.75 | 0.000 |
| Urban | 2.901 | 0.864 | 3.36 | 0.001 |

Access to Exercise = 57.68 + 5.51 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 57.68 | 2.33 | 24.80 | 0.000 |
| Urban | 5.51 | 5.47 | 1.01 | 0.316 |

PCP Rate = 61.91 - 6.92 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 61.91 | 3.61 | 17.13 | 0.000 |
| Urban | -6.92 | 8.17 | -0.85 | 0.399 |

Dentist Rate = 36.67 + 0.75 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 36.67 | 2.39 | 15.36 | 0.000 |
| Urban | 0.75 | 5.66 | 0.13 | 0.895 |

Food Environment Index = 7.059 + 0.178 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 7.059 | 0.125 | 56.64 | 0.000 |
| Urban | 0.178 | 0.293 | 0.61 | 0.546 |

Limited Access to Healthy Food = 13.2 - 4.44 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 13.29 | 1.15 | 11.57 | 0.000 |
| Urban | -4.44 | 2.70 | -1.64 | 0.104 |

**Table 4-8: T-Test Results for Comparison of Urban and Rural, Continued**

**SOCIAL AND ECONOMIC FACTORS:**

Food Insecurity = 12.479 + 1.310 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 12.479 | 0.218 | 57.31 | 0.000 |
| Urban | 1.310 | 0.512 | 2.56 | 0.012 |

Children Eligible for Free Lunch = 38.66 + 5.46 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 38.66 | 1.17 | 33.17 | 0.000 |
| Urban | -5.46 | 2.74 | -1.99 | 0.049 |

Children in Poverty = 19.093 - 1.97 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 19.093 | 0.544 | 35.09 | 0.000 |
| Urban | -1.97 | 1.28 | -1.54 | 0.127 |

Children in Single-Parent Homes = 25.424 + 1.89 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 25.424 | 0.912 | 27.88 | 0.000 |
| Urban | 1.89 | 2.14 | 0.88 | 0.379 |

Social Associations = 26.73 - 13.01 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 26.73 | 1.12 | 23.97 | 0.000 |
| Urban | -13.01 | 2.62 | -4.96 | 0.000 |

Some College = 61.559 + 5.62 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 61.559 | 0.971 | 63.40 | 0.000 |
| Urban | 5.62 | 2.28 | 2.46 | 0.015 |

**Table 4-9: T-Test Results for Comparison of Urban and Rural, Continued**

**SOCIAL AND ECONOMIC FACTORS:**

Unemployment = 4.301 + 1.550 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 4.301 | 0.136 | 31.61 | 0.000 |
| Urban | 1.550 | 0.320 | 4.85 | 0.000 |

Income Ratio = 3.9858 + 0.130 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 3.9858 | 0.0556 | 71.71 | 0.000 |
| Urban | 0.130 | 0.131 | 1.00 | 0.321 |

Uninsured = 16.110 - 2.611 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 16.110 | 0.295 | 54.69 | 0.000 |
| Urban | -2.611 | 0.692 | -3.77 | 0.000 |

Violent Crime = 224.4 + 74.2 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 224.4 | 14.3 | 15.73 | 0.000 |
| Urban | 74.2 | 32.6 | 2.28 | 0.025 |

**HEALTH BEHAVIORS:**

Adult Smoking = 18.664 - 0.37 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 18.664 | 0.532 | 35.09 | 0.000 |
| Urban | -0.37 | 1.15 | -0.32 | 0.749 |

Physical Inactivity = 28.012 - 2.964 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 28.012 | 0.314 | 89.15 | 0.000 |
| Urban | -2.964 | 0.739 | -4.01 | 0.000 |

**Table 4-10: T-Test Results for Comparison of Urban and Rural, Continued**

**HEALTH OUTCOMES:**

Adult Obesity = 32.583 - 0.198 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 32.583 | 0.274 | 118.90 | 0.000 |
| Urban | -0.198 | 0.644 | -0.31 | 0.759 |

Alcohol-Impaired Driving Deaths = 37.80 - 9.70 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 37.80 | 2.16 | 17.46 | 0.000 |
| Urban | -9.70 | 5.09 | -1.91 | 0.059 |

Injury Deaths = 90.47 - 21.20 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 90.47 | 2.52 | 35.97 | 0.000 |
| Urban | -21.20 | 5.65 | -3.75 | 0.000 |

Preventable Hospital Stays = 82.42 - 27.73 Urban

| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 82.42 | 3.15 | 26.20 | 0.000 |
| Urban | -27.73 | 7.11 | -3.90 | 0.000 |

Years of Potential Life Lost R. = 8130 - 1352 Urban

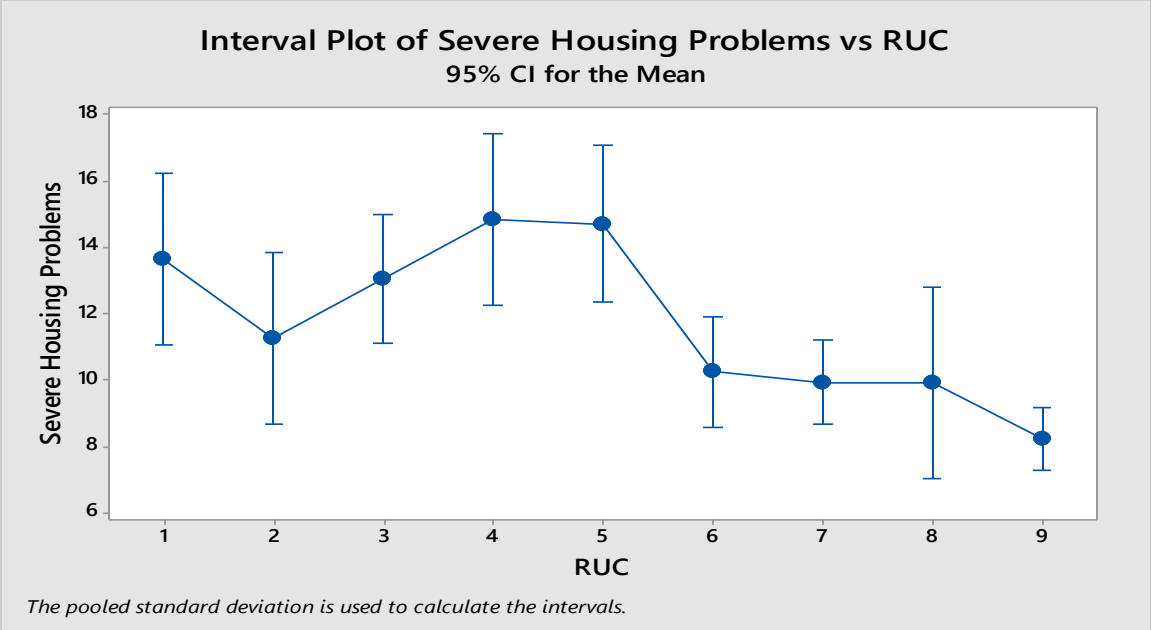
| Term | Coef | SE Coef | T-Value | P-Value |
|---|---|---|---|---|
| Constant | 8130 | 221 | 36.83 | 0.000 |
| Urban | -1352 | 488 | -2.77 | 0.007 |

## Comparison of RUCs 1-9

Analyses of variances (ANOVA) were conducted to determine the differences among the counties when grouped by RUC Codes. When there were differences in at least two of the RUCs a t-test was conducted to compare those that were statistically significantly different. There were statistical significant differences in 15 of the 23 variables considered. Those that were significantly different follow: severe housing problems, violent crime rate, access to exercise opportunities, dentist rate, limited access to healthy food, food insecurity, children eligible for free lunch, children in poverty, children in a single-parent home, social associations rate, unemployment, uninsured, physical inactivity, injury deaths, and preventable hospital stays. Those significant results follow.

The ANOVA showed that there were differences in the percentage of households with severe housing problems in at least two of the RUCs ($p < 0.001$). The t-test results showed that RUCs 1, 3, 4 and 5 were significantly different than RUC 9. RUCs 4 and 5 had the most severe housing problems of all RUCs (see Figure 4-2).

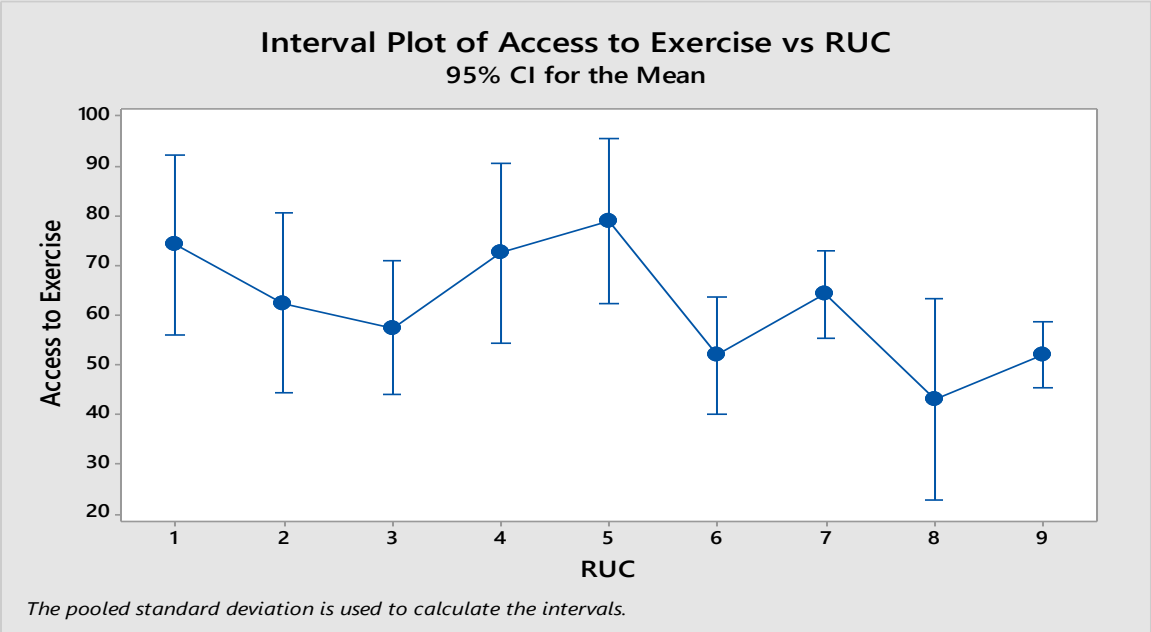
**Figure 4-2: ANOVA Percentage of People with Severe Housing Problems all Kansas Counties by RUC**




*Note*: Severe Housing Problems = 8.209 + 5.45 RUC_1 + 3.05 RUC_2 + 4.83 RUC_3 + 6.63 RUC_4 + 6.49 RUC_5 + 2.032 RUC_6 + 1.729 RUC_7 + 1.70 RUC_8

The ANOVA showed that that there were differences in the percentage of the population with access to exercise opportunities in at least two of the RUCs (p = 0.014). The t-test results showed that RUCs 1, 4, 5, and 7 were significantly different than RUC 9. They all have more percentage of the population with access to places for physical activity than RUC 9 (see Figure 4-3).

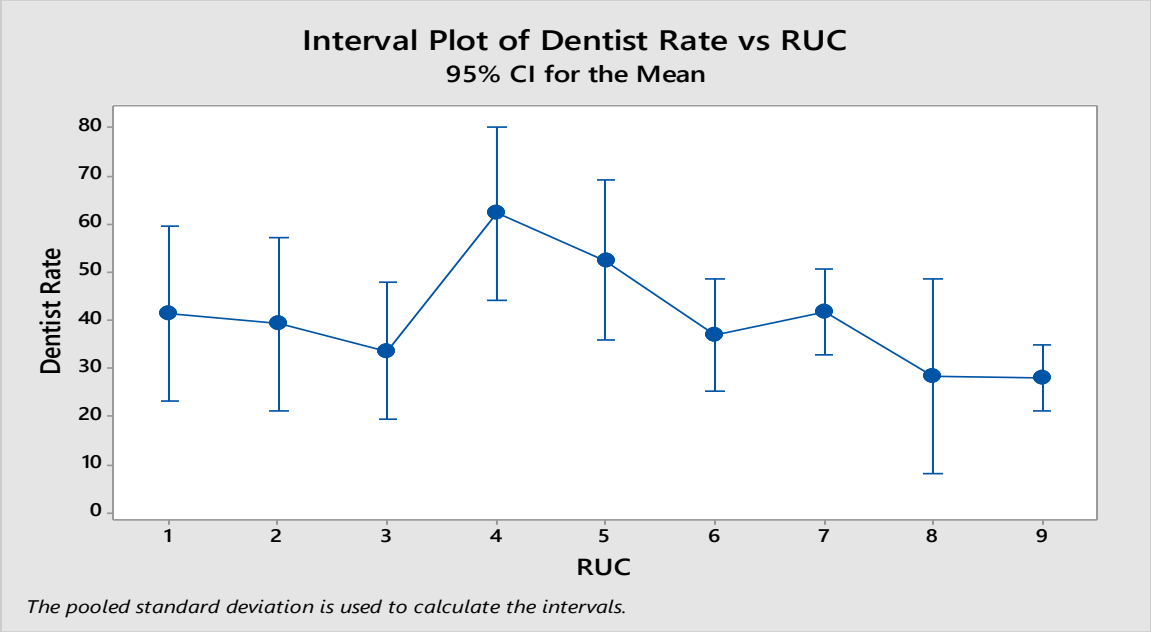
**Figure 4-3: ANOVA Percentage of People with Access to Exercise Opportunities all Kansas Counties by RUC**




*Note*: Access to Exercise Opportunities = 52.09 + 22.06 RUC_1 + 10.38 RUC_2 + 5.41 RUC_3 + 20.42 RUC_4 + 26.83 RUC_5 - 0.18 RUC_6 + 12.16 RUC_7 - 8.9 RUC_8

The ANOVA showed that there were differences in the dentist rate in at least two of the RUCs (p = 0.015). The t-test results showed that RUCs 4, 5 and 7 were significantly different that RUC 9. They each have a higher dentist rate than RUC 9 (see Figure 4-4).

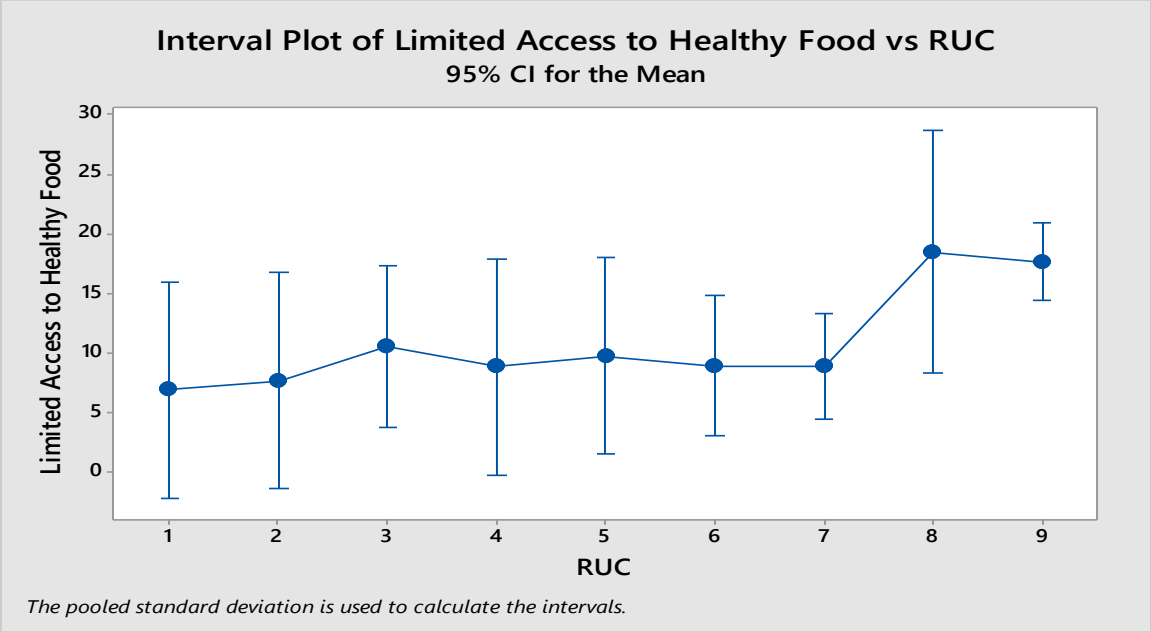
**Figure 4-4: ANOVA Dentist Rate all Kansas Counties by RUC**




*Note*: Dentist Rate = 28.01 + 13.48 RUC_1 + 11.25 RUC_2 + 5.72 RUC_3 + 34.26 RUC_4 + 24.62 RUC_5 + 9.03 RUC_6 + 13.82 RUC_7 + 0.5 RUC_8

The ANOVA showed there were differences in the percentage of people with limited access to healthy food in at least two of the RUCs (p = 0.021). The t-test results show that show that there were significant differences in all RUCs except RUC 4, 5, and 8 when compared to RUC 9. There are 10.71 percent less access to healthy food in RUC 1 than RUC 9 (see Figure 4-5).

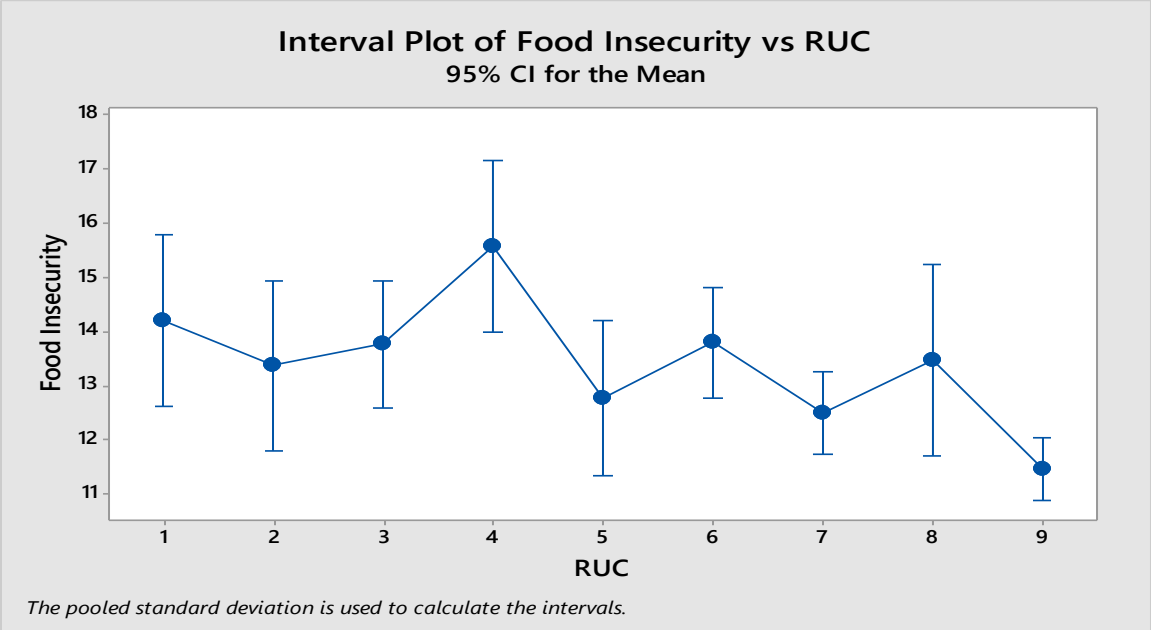
**Figure 4-5: ANOVA Percentage of People with Limited Access to Healthy Food all Kansas Counties by RUC**




*Note*: Limited Access to Healthy Food = 17.69 - 10.71 RUC_1 - 9.96 RUC_2 - 7.16 RUC_3 - 8.81 RUC_4 - 7.88 RUC_5 - 8.70 RUC_6 - 8.83 RUC_7 + 0.81 RUC_8

The ANOVA showed that there were differences in food insecurity in at least two of the RUCs ($p < 0.001$). The t-test showed that there were significant differences in all RUCs except RUC 5 when compared to RUC 9. There were 4.124 percent more with food insecurity in RUC 4 than RUC 9 (see Figure 4-6).

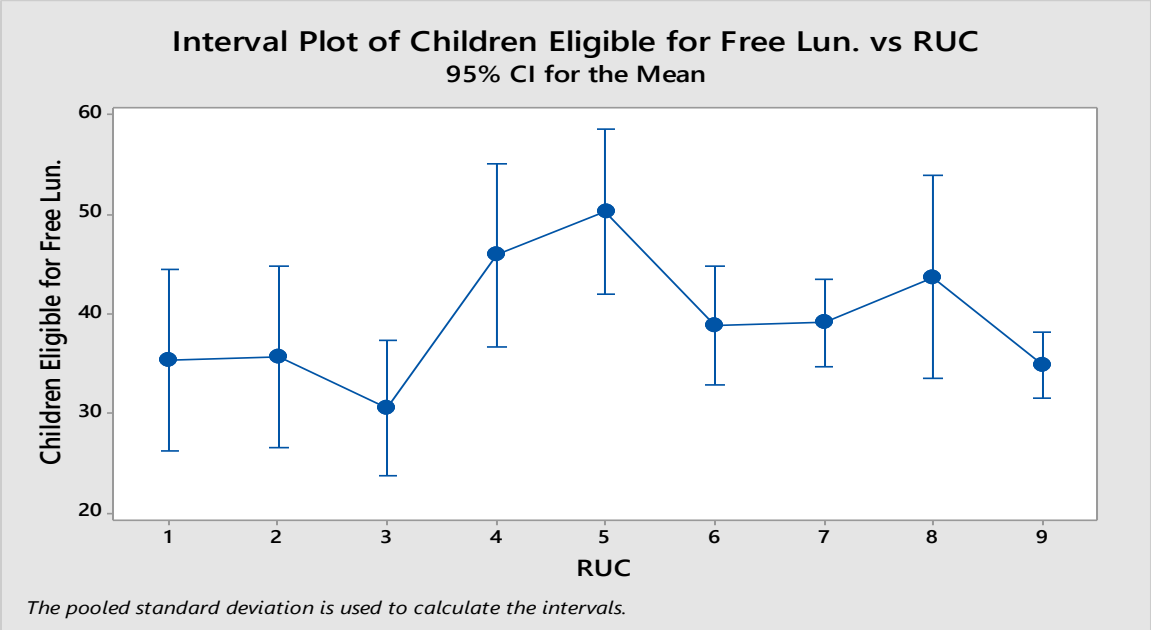
**Figure 4-6: ANOVA Percentage of People with Food Insecurity all Kansas Counties by RUC**




*Note:* Food Insecurity = 11.476 + 2.744 RUC_1 + 1.904 RUC_2 + 2.301 RUC_3 + 4.124 RUC_4 + 1.307 RUC_5 + 2.332 RUC_6 + 1.033 RUC_7 + 2.024 RUC_8

The ANOVA showed that there were differences in the percentage of children eligible for free lunch in at least two of the RUCs (p = 0.010). The t-test results showed that show that there were significant differences in RUCs 4 and 5 when compared to RUC 9. There were 15.36% more children eligible for free lunch in RUC 5 than RUC 9 (see Figure 4-7).

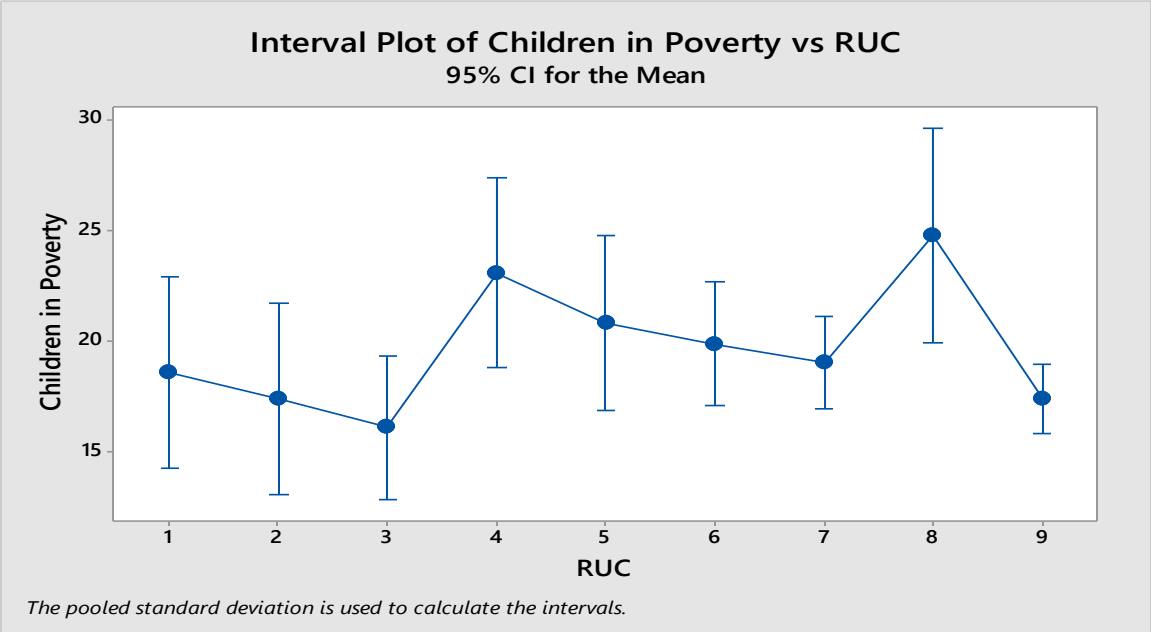
**Figure 4-7: ANOVA Percentage of Children Eligible for Free Lunch all Kansas Counties by RUC**




*Note*: Children Eligible for Free Lunch = 34.98 + 0.47 RUC_1 + 0.74 RUC_2 - 4.44 RUC_3 + 10.96 RUC_4 + 15.36 RUC_5 + 3.89 RUC_6 + 4.16 RUC_7 + 8.76 RUC_8

The ANOVA showed that that there were differences in the percentage of children in poverty in at least two of the RUCs (p = 0.030). The t-test showed that there were significant differences in RUCs 4 and 8 when compared to RUC 9. They had 5.68% and 7.36% more children in poverty than RUC 9 respectively (see Figure 4-8).

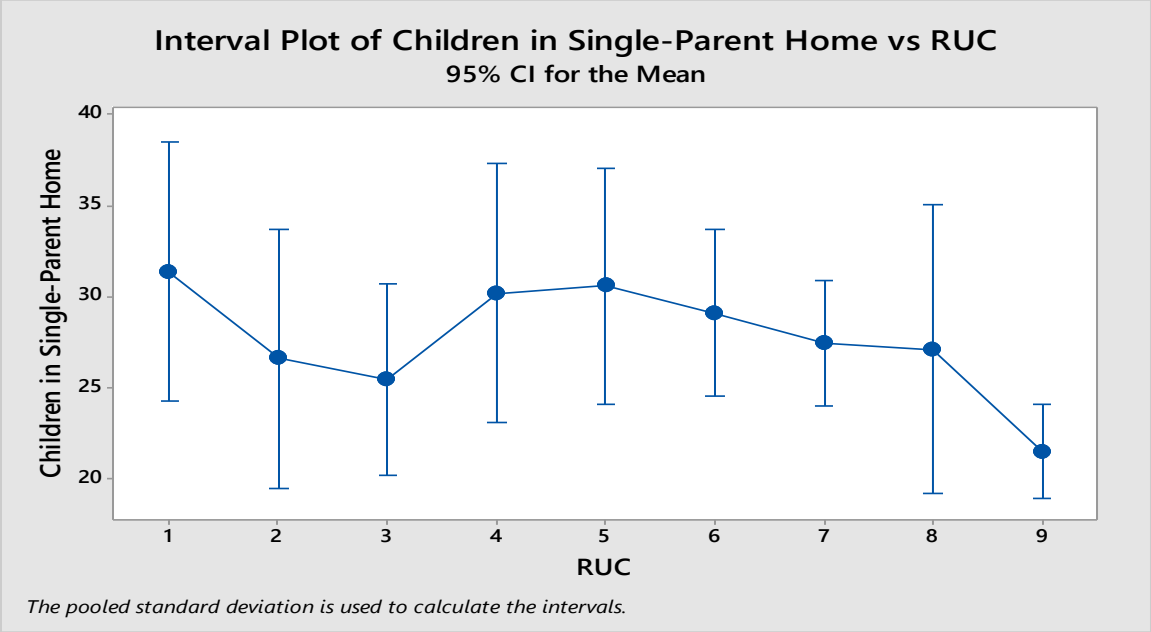
**Figure 4-8: ANOVA Percentage of Children in Poverty all Kansas Counties by RUC**




*Note*: Children in Poverty = 17.439 + 1.18 RUC_1 + 0.00 RUC_2 - 1.32 RUC_3 + 5.68 RUC_4 + 3.41 RUC_5 + 2.48 RUC_6 + 1.63 RUC_7 + 7.36 RUC_8

The ANOVA showed that there were differences in the percentage of children in a single-parent home in at least two of the RUCs (p = 0.016). The t-test results showed that there were significant differences in RUCs 1, 4, 5, 6, and 7 when compared to RUC 9. RUC 1 has 9.87% more children living in a single-parent home than RUC 9 (see Figure 4-9).

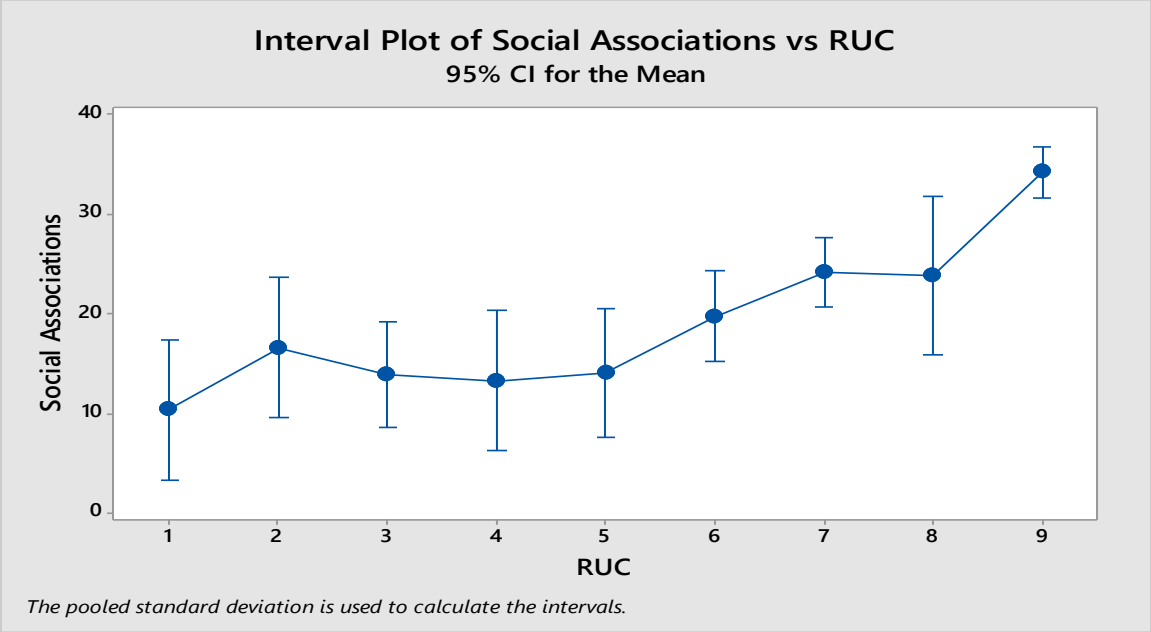
**Figure 4-9: ANOVA Percentage of Children in a Single-Parent Home all Kansas Counties by RUC**




*Note*: Children in Single-Parent Home = 21.51 + 9.87 RUC_1 + 5.08 RUC_2 + 3.95 RUC_3 + 8.68 RUC_4 + 9.08 RUC_5 + 7.61 RUC_6 + 5.94 RUC_7 + 5.60 RUC_8

The ANOVA showed that there were differences in the social association rate in at least two of the RUCs ($p < 0.001$). The t-test results showed that there were significant differences in all RUCs when compared to RUC 9 (see Figure 4-10).

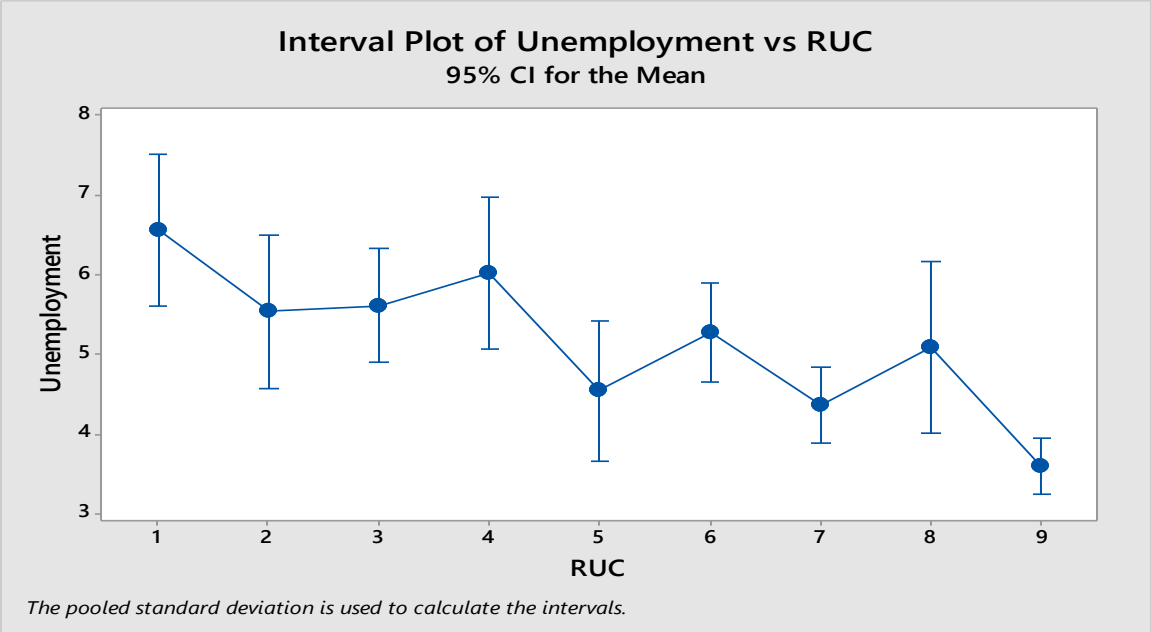
**Figure 4-10: ANOVA Social Association Rate all Kansas Counties by RUC**




*Note*: Social Associations = 34.35 - 23.94 RUC_1 - 17.69 RUC_2 - 20.41 RUC_3 -21.01 RUC_4 - 20.24 RUC_5 - 14.56 RUC_6 - 10.08 RUC_7 - 10.48 RUC_8

The ANOVA showed that there were differences in unemployment in at least two of the RUCs ($p < 0.001$). The t-test results showed that there were significant differences in all of the RUCs when compared to RUC 9. They all have more percentage of population ages 16+ unemployed and looking for work than RUC 9 with RUC 1 having the highest percentage of unemployment (see Figure 4-11).

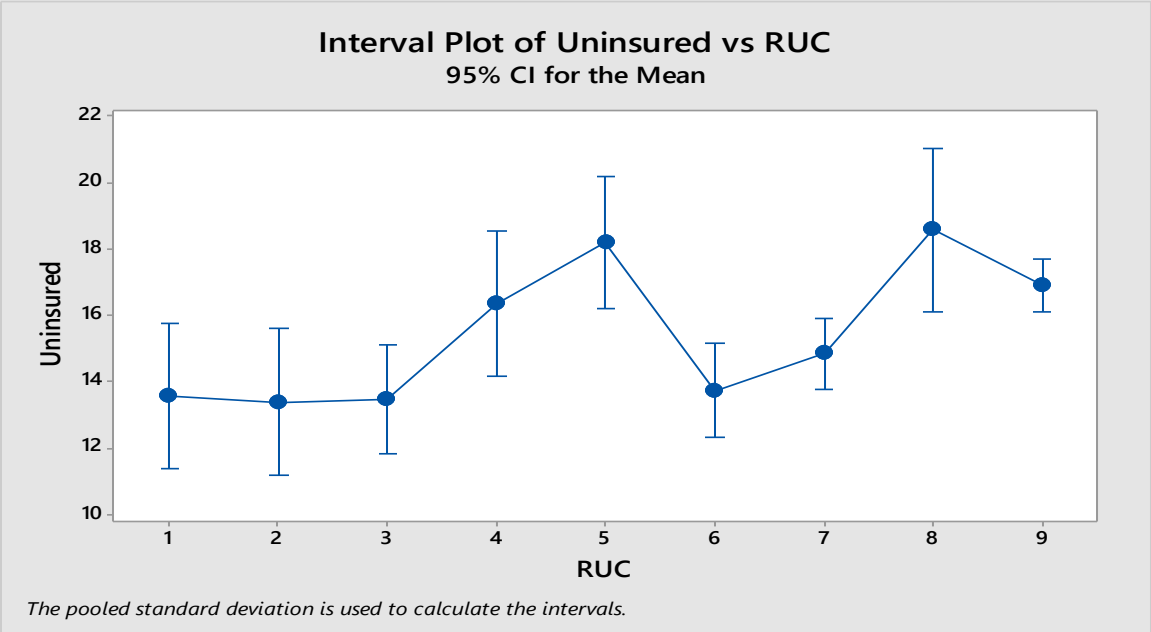
**Figure 4-11: ANOVA Percentage of Unemployed all Kansas Counties by RUC**




*Note:* Unemployment = 3.603 + 2.964 RUC_1 + 1.938 RUC_2 + 2.021 RUC_3 + 2.426 RUC_4 + 0.945 RUC_5 + 1.682 RUC_6 + 0.763 RUC_7 + 1.490 RUC_8

The ANOVA showed that there were differences in the percentage of uninsured in at least two of the RUCs ($p < 0.001$). The t-test results showed that there were significant differences in RUCs 1, 2, 3, 6, and 7 when compared to RUC 9. RUC 1 had 3.34 percent less people under age 65 without insurance than RUC 9 (see Figure 4-12).

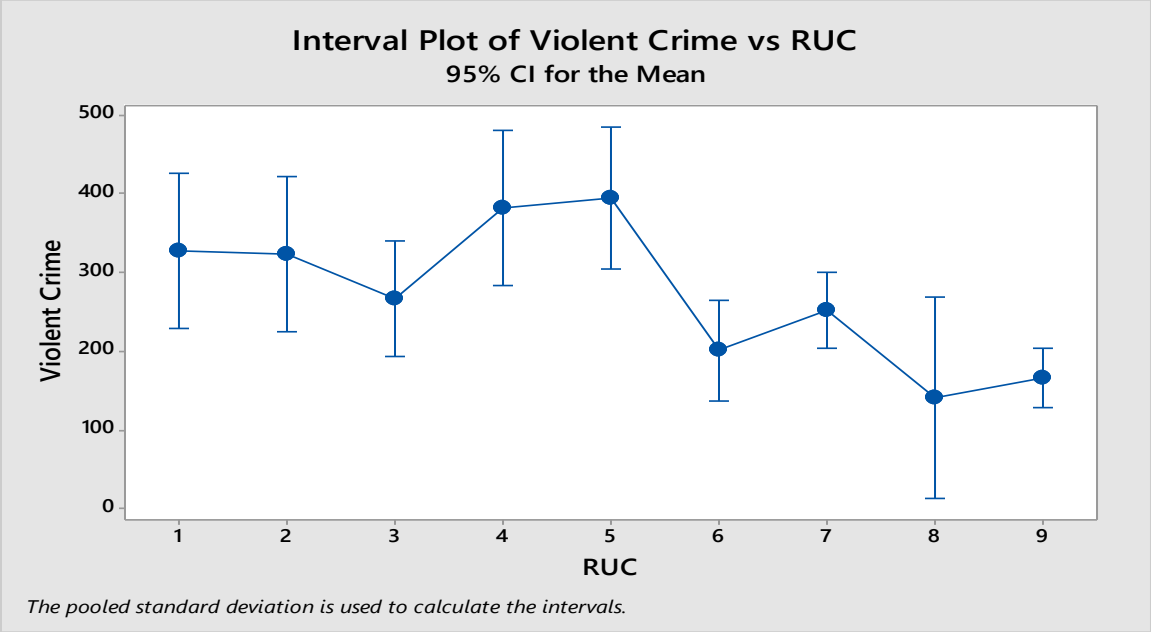
**Figure 4-12: ANOVA Percentage of Uninsured People all Kansas Counties by RUC**




*Note:* Uninsured = 16.918 - 3.34 RUC_1 - 3.52 RUC_2 - 3.409 RUC_3 - 0.54 RUC_4 + 1.30 RUC_5 - 3.172 RUC_6 - 2.059 RUC_7 + 1.68 RUC_8

The ANOVA showed that there were differences in the rate of violent crime in at least two of the RUCs ($p < 0.001$). The t-test results showed that there were significant differences in all RUCs except RUCs 6 and 8 when compared to RUC 9 (see Figure 4-13).

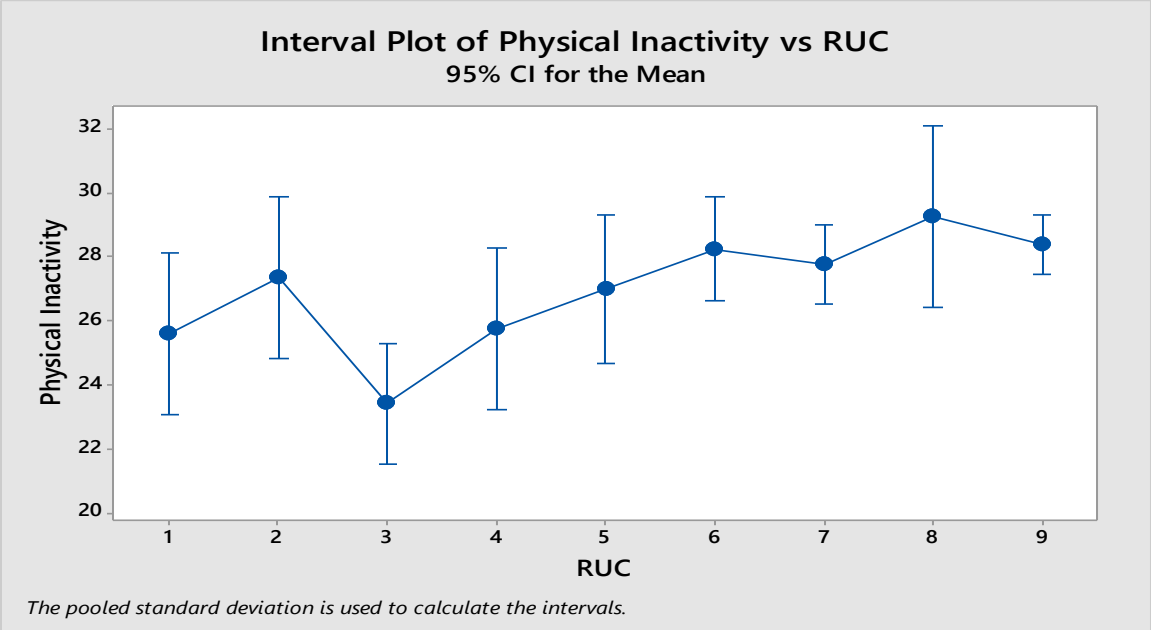
**Figure 4-13: ANOVA Violent Crime Rate all Kansas Counties by RUC**




*Note*: Violent Crime = 166.9 + 161.8 RUC_1 + 158.0 RUC_2 + 100.3 RUC_3 + 216.2 RUC_4 + 228.0 RUC_5 + 34.9 RUC_6 + 86.1 RUC_7 - 25.3 RUC_8

The ANOVA showed that there were differences in the percentage of physically inactive people during leisure-time in at least two of the RUCs (p = 0.001). The t-test results showed that there were significant differences in RUCs 1 and 3 when compared to RUC 9. RUC 3 has 4.96% less percentage of adults that report no leisure-time physical activity than RUC 9 (see Figure 4-14).

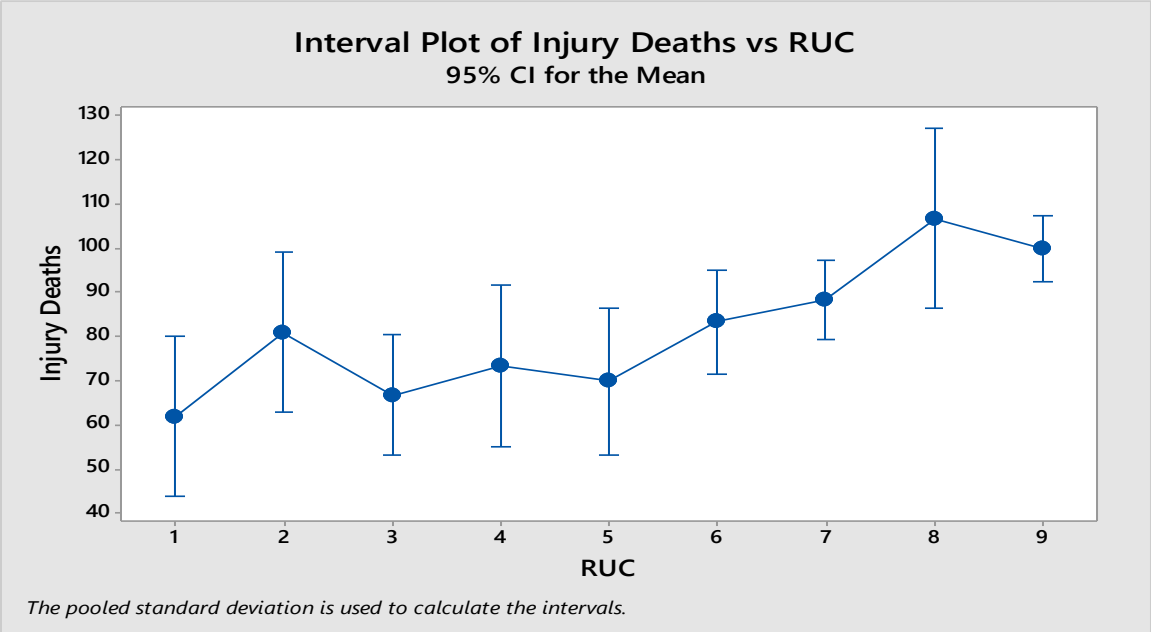
**Figure 4-14: ANOVA Percentage of People Physically Inactive during Leisure-Time all Kansas Counties by RUC**




*Note*: Physical Inactivity = 28.392 - 2.75 RUC_1 - 1.03 RUC_2 - 4.96 RUC_3 - 2.63 RUC_4 - 1.39 RUC_5 - 0.125 RUC_6 - 0.630 RUC_7 + 0.88 RUC_8

The ANOVA showed that there were significant differences in the percentage of injury deaths in at least two of the RUCs ($p < 0.001$). The t-test results showed that there were significant differences in all RUCs when compared to RUC 9 except RUC 2 and 8. RUC 1 has 37.9 less injury mortality rate per 100,000 than RUC 9 (see Figure 4-15).

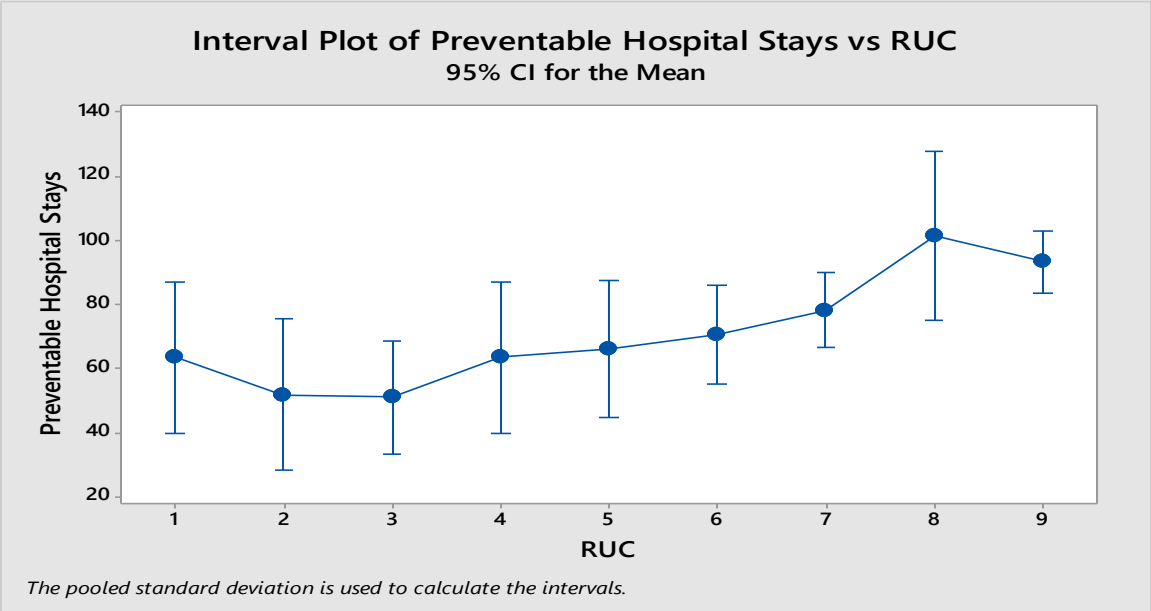
**Figure 4-15: ANOVA Injury Death Rate all Kansas Counties by RUC**




*Note*: Injury Deaths = 99.95 - 37.97 RUC_1 - 18.97 RUC_2 - 33.13 RUC_3 - 26.58 RUC_4 -29.96 RUC_5 - 16.54 RUC_6 - 11.70 RUC_7 + 6.7 RUC_8

The ANOVA showed that there were significant differences in the percentage of hospital stays in at least two of the RUCs ($p < 0.001$). The t-test results showed that were significant differences in all RUCs when compared to RUC 9 except RUC 8. The rate of preventable hospital stays is 42.4 less in RUC 3 than RUC 9 (see Figure 4-16).

**Figure 4-16: ANOVA Preventable Hospital Stays all Kansas Counties by RUC**



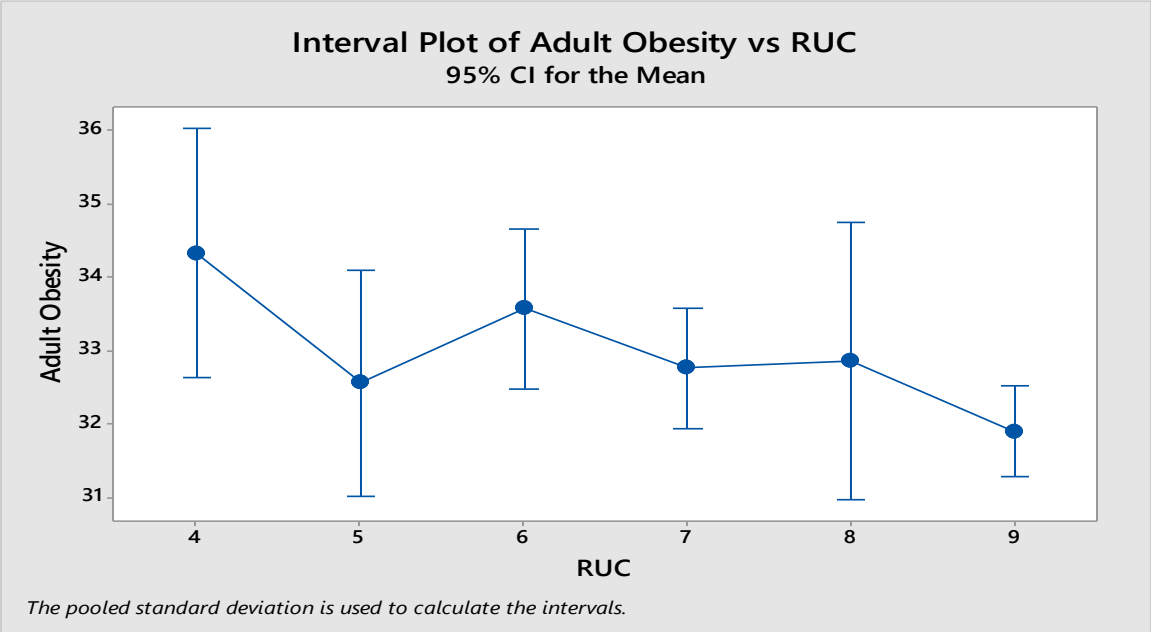

*Note*: Preventable Hospital Stays = 93.59 - 29.9 RUC_1 - 41.7 RUC_2 - 42.4 RUC_3 - 29.8 RUC_4 - 27.3 RUC_5 - 22.74 RUC_6 - 15.15 RUC_7 + 8.1 RUC_8

## Comparison of RUCs 4-9

Analyses of variances (ANOVA) were conducted to determine the differences specifically among the rural counties when grouped by RUC Codes. When there were differences in at least two of the RUCs 4-9, a t-test was conducted to compare those that were significantly different. In the case of adult obesity, the t-test results showed significant differences between RUCs 4-9 that did not result when comparing RUCs 1-9. The results follow.

The ANOVA showed that there were differences in the percentage of adult obesity (BMI ≥30) in at least two of the RUCs ($p = 0.034$). The t-test results showed that that there were significant differences in RUCs 4 and 6 when compared to RUC 9. RUC 4 has 2.44% and RUC 6 has 1.68% more adult obesity than RUC 9 (see Figure 4-16).

**Figure 4-17: ANOVA Adult Obesity**




*Note:* Adult Obesity = 31.905 + 2.435 RUC_4 + 0.661 RUC_5 + 1.678 RUC_6 + 0.861 RUC_7 + 0.970 RUC_8

## Multiple Regression Models

Using the standard stepwise selection procedure multiple regression models were built for each of the health outcomes considered in this study. The five health outcomes considered were adult obesity, alcohol-impaired driving deaths, injury deaths, preventable hospital stays, and premature death. All health factors considered in this study and demographic factors were included as candidate predictors for these models. The significant predictive variables for each health outcome will be presented here (see Table 4-11).

Six variables were significantly related to **adult obesity**: children in poverty, physical inactivity during leisure-time, the Asian, Native Hawaiian/Other Pacific, and Non-Hispanic white demographics, and RUC. The model for adult obesity indicated that on average, for every one percent increase in children in poverty, adult obesity would increase by 0.1996 percent holding all other variables constant ($p < 0.001$). The model also indicated that on average, for every one percent increase in physical inactivity during leisure-time, adult obesity would increase by 0.1440 percent holding all other variables constant ($p = 0.114$). Also, on average the adult Asian demographic were 1.712 percent less likely to be obese, holding all other variables constant ($p < 0.001$). Likewise, on average the adult Non-Hispanic white demographic were 0.0404 percent likely to be obese ($p = 0.066$). Conversely, the adult Native Hawaiian/Other Pacific demographic were 3.50 percent more likely to be obese ($p = 0.113$). The model also indicated that on average the adults in RUC 9 were 0.4224 percent less likely to be obese ($p < 0.001$).

Seven variables were significantly related to **alcohol-impaired driving deaths:** income ratio, social association rate, the 18 and under demographic, the 65 and over demographic, the Asian demographic, the female demographic, and RUC. The model for alcohol-impaired driving

deaths indicated that on average, for every one percent increase in income inequality (income ratio) alcohol-impaired driving deaths would increase by 13.79 percent ($p = 0.004$). The model also indicated that on average, for every one rate increase in social associations, alcohol-impaired driving deaths would decrease by 1.055 percent holding all other variables constant ($p = 0.002$). On average, the 18 and under demographic were 2.59 percent more likely to have alcohol-impaired driving deaths ($p = 0.016$). Similarly, the 65 and over demographic were, on average, 3.95 percent more likely to have alcohol-impaired driving deaths ($p < 0.001$). On average, the Asian demographic were 6.40 percent more likely to have alcohol-impaired driving deaths ($p = 0.013$). Conversely, the female demographic were, on average, 3.38 percent less likely to have alcohol-impaired driving deaths ($p = 0.039$). Lastly, on average, the people in RUC 9 were 2.66 percent more likely to have alcohol-impaired driving deaths ($p = 0.022$).

Three variables were significantly related to **injury deaths:** adult smoking, 65 and over demographic, and the Hispanic demographic. The model for injury deaths indicated that on average, for every one percent increase in adult smoking, injury deaths would increase by 1.397 percent ($p < 0.001$). The model also indicated that on average, the 65 and over demographic were 3.385 percent more likely to have injury deaths ($p < 0.001$). Also, on average, the Hispanic demographic were 0.446 percent more likely to have injury deaths ($p = 0.005$).

Four variables were significantly related to **preventable hospital stays:** dentist rate, adult smoking, the 65 and over demographic, the Native Hawaiian/Other Pacific demographic and RUC. The model for preventable hospital stays indicated that on average, for every one increase in the dentist rate, preventable hospital stays would decrease by 0.567 percent ($p < 0.001$). The model also suggested that on average, for every one percent increase in adult smoking, preventable hospitals stays rate would decrease by 1.371 ($p = 0.041$). On average, the Native

Hawaiian/Other Pacific demographic were 71 percent more likely to have preventable hospital stays ($p = 0.012$). The model also indicated that on average, the people in RUC 9 were 5.47 percent more likely to have preventable hospital stays ($p < 0.001$).

Four variables were significantly related to **premature death:** primary care provider rate, children in poverty, adult smoking and the Asian demographic. The model for premature death, as measured by years of potential life lost, suggested that on average, an increase in the primary care provider rate would also increase the premature death rate by 13.88 years ($p = 0.018$). The premature death rate model also indicated that on average, a one percent increase in children in poverty would increase the premature death rate by 185 years ($p < 0.001$). On average, for every one percent increase in adult smoking, the premature death rate would increase by 64.3 years ($p = 0.086$). On average, the Asian demographic had 618 years less premature death rate ($p < 0.001$).

**Table 4-11: Multiple Regression Models for Health Outcomes**

| |
|---|
| ADULT OBESITY: |
| Adult Obesity = 32.24 + 0.1996 Children in Poverty + 0.1440 Physical Inactivity - 1.712 % Asian + 3.59 % Native Hawaiian/ Other Pacific- 0.0404 % Non-Hispanic white - 0.4224 RUC |
| ALCOHOL-IMPAIRED DRIVING DEATHS: |
| Alcohol-Impaired Driving Deaths = 15.6 + 13.79 Income Ratio - 1.055 Social Associations + 2.59 % < 18 + 3.95 % 65 and over + 6.40 % Asian - 3.38 % Female + 2.66 RUC |
| INJURY DEATHS: |
| Injury Deaths = -9.0 + 1.397 Adult Smoking + 3.385 % 65 and over + 0.446 % Hispanic |
| PREVENTABLE HOSPITAL STAYS: |
| Preventable Hospital Stays = 83.3 - 0.567 Dentist Rate - 1.371 Adult Smoking + 71.0 % Native Hawaiian/ Other Pacific + 5.47 RUC |
| PREMATURE DEATH: |
| Years of Potential Life Lost R. = 2764 + 13.88 PCP Rate + 185.0 Children in Poverty + 64.3 Adult Smoking - 618 % Asian |

*Note:* Standard stepwise regression, .15 significance levels

# Chapter 5 - Discussion

Kansas lags behind the best counties in the nation on many health factors. The 2015 Kansas Health Gaps Report, generated by The County Health Rankings & Roadmaps program, indicated that Kansas counties do worse than the best US counties in percentage of current adult smokers (18 to 14), percentage of adults that are obese (30 to 25), percentage with access to exercise opportunities (78 to 92), percentage of alcohol-impaired driving deaths (33 to 14), percentage of high school graduates (85 to 93), percentage unemployed (5 to 4), and with the violent crime rate (360 to 59) (Catlin et al., 2015). Even the average of the best Kansas counties faired more poorly than the average of the best US counties in the percentages of adult obesity (30 to 25), percentage with access to exercise opportunities (83 to 92), and the violent crime rate (88 to 59) (Catlin et al., 2015).

While Kansas, as many other agriculture economy based states, has majority rural counties (86/105), most of the population (~2M/2.9M, 67%) is located in the urban centers of Kansas City, Wichita, and Topeka. Regardless, the other almost million Kansans living in nonmetropolitan areas and their lives are of particular interest. As the literature presented earlier suggested, since many of these negative health factors are more prominent in rural areas than urban areas (the exception being the violent crime rate), understanding the impact of living in those rural communities remains pertinent. Therefore, this study was useful for examining the types of factors specifically impacting health outcomes in rural Kansas counties, and if they were different from those impacting the urban counties. Further, the use of more refined distinctions among rural and urban counties allowed for more specificity when considering the impact of those determinants.

It was expected that living in a compromised socioeconomic position would act as a barrier for individuals being able to achieve healthy outcomes. Further, it was expected that a larger percentage of the rural population would be living under these more compromised circumstances. Measures of socioeconomic position included a variety of factors and the initial comparison of urban vs. rural areas (RUCs 1-3 vs. RUCs 4-9) actually suggested that people living in urban areas were in a more compromised social and economic position. While educational attainment, as measured by college completion, was significantly higher in urban areas and percentage of uninsured people significantly lower  the other conditions were mostly unfavorable. For example, the percentage of food insecurity, percentage of children eligible for free lunch, and percentage of unemployed were significantly higher in urban areas. There was also more income inequality, children in poverty, and children in single-parent homes in urban areas, though it is important to note that these differences were *not* statistically significant. The social association rate was significantly lower in urban areas and the violent crime rate significantly higher. Aside from college completion, the percentages of the population without health insurance was the only other significantly unfavorable circumstance in rural areas.

It was also expected that there would be more limitations in the built environment in the rural counties as compared to urban ones, and that those limitations would act as barriers for individuals living in rural Kansas counties being able to achieve a healthier status. The comparison of urban vs. rural areas did not meet all of these expectations. Severe housing problems were shown to be significantly higher in urban areas. The percentage of the population with access to exercise opportunities was expected to be significantly less in rural areas, however the urban vs. rural comparison found no significant differences. The exact same can be said for the measure of the food environment index and limited access to healthy food. There are many

other characteristics of the built environment not examined in this study that, if included, could have shown rural areas to be more disadvantaged. The urban and rural examination of these limited characteristic, of which data was available, did not reveal a pattern of barriers in rural areas that were anticipated.

It was also expected that there would be less access to health care providers in the Kansas rural counties, and that these would compound the already more difficult health status for those living in Kansas rural counties. The urban vs. rural comparison revealed no significant difference in the primary care provider rate nor the dentist rate though. As expected, however, the rate of preventable hospital stays was significantly higher in rural areas.

Though the results from the urban vs. rural comparison did not support all of the expectations, the findings actually point to the merit of the second hypothesis. That is, it was expected that significant population health factors and health outcome differences between rural and urban areas would not be as discrete as might generally be assumed. It was expected that differences along a continuum of ruralness to urbanness would be masked when categorizing areas as either urban or rural strictly. It was hypothesized that the results would indicate varying health disparities depending on where a Kansas county falls on the rural-urban continuum. This perspective was supported by the findings of this study.

This investigation showed that differences in health determinates, including health behaviors, and their impacts on health outcomes are not uniform in all urban areas nor rural areas in Kansas. Therefore, using only the strict dichotomy between urban and rural masked the nuances in those differences. When the actual context of the specific urban or rural area was considered, rural areas did fair worse on many of the measures examined in this study.

As stated, the strictly urban vs rural comparisons revealed that when differences were significant, many of the unfavorable circumstances were more prominent in urban counties not in rural ones as had been expected. This initial comparison indicated that urban areas faired significantly more poorly on several social and economic factors: the percentage of severe housing problems, percentages of families with food insecurity, percentage of children eligible for free lunch, social associations, percentage of unemployed, and the violent crime rate. The only factors more unfavorable in the rural areas were that they had a higher percentage of uninsured people and a higher percentage of physically inactive people during leisure-time.

As predicted, though, there were a greater number of significant disparities evidenced by RUC comparisons than by the strict urban vs. rural comparisons. The social and economic factors that showed to be significantly different when examined by RUC, but not by the initial urban vs. rural comparison, were children in poverty and children in single-parent home. Additionally, the more fluid measure of the rural and urban continuum clarified that, in fact, the majority of the unfavorable social and economic circumstances were found in RUC 4 and RUC 5. These are both midsized rural communities of 20,000 people or more and RUC 4 communities are adjacent to a metro area while RUC 5 communities are not.

The RUC 4 communities had the greatest average percentage of food insecurity and the RUC 4 and 5 communities had the greatest percentages of children eligible for free lunch. The RUC 4 communities followed only the RUC 8 communities (also rural) with the highest average percentage of children in poverty. Again, RUC 4 and RUC 5 communities had among the highest average percentage of children in single-parent homes, following only RUC 1 areas (the most urban classification). Similarly, while RUC 1 urban areas maintained the lowest average social associations rate and the highest average percentage of unemployment, RUC 4 communities

followed close behind in second place for both circumstances. RUC 5 communities also had average social associations rates more comparable to urban areas than the more rural areas. Interestingly, RUC 4 and RUC 5 communities also had some of the highest averages of people without health insurance (along with the most rural communities of RUC 8 and 9). Quite unexpectedly RUC 4 and RUC 5 communities also had the highest averages of violent crime rate, exceeding the averages of all of the urban areas.

Regarding the built environment, severe housing problems were determined by the urban vs. rural comparison to be significantly unfavorable in the urban areas. Yet the context of the rural and urban continuum revealed that the highest average percentages of severe housing problems were actually in the RUC 4 and RUC 5 communities. The urban vs. rural comparison indicated no significant differences in the percentage of access to exercise opportunities. The RUC comparison, not unexpectedly, showed that the most rural areas (RUC communities 6 through 9) are the most impacted by this unfavorable circumstance. Unexpectedly though, it was also revealed that RUC 4 and RUC 5 communities have average percentages that are more like the urban RUC 1 areas. In fact, RUC 5 communities on average have the highest percentage of access to exercise opportunities along the continuum. While the RUC comparisons continued to show no significant differences in food environment index scores across the continuum, differences in limited access to healthy food were realized. In this case, the highest average percentages were found in the most rural RUC communities (RUC 8 and RUC 9).

Regarding access to care, the dentist rate was shown to be highest in urban areas initially, but along the rural and urban continuum again RUC 4 and RUC 5 communities had the highest average dentist rates of all the areas. Like the urban vs. rural comparisons, the RUC comparisons revealed no significant differences in the primary care provider rate. Further, like the urban vs.

rural comparisons, the RUC comparisons revealed that the preventable hospital stays rate was greatest in rural communities and offered clarity that on average this rate increases as degree of ruralness increases.

Despite the initial appearance of an imbalance of unfavorable mitigating circumstances tipped against urban areas, there were higher rates of injury death, preventable hospital stays, and premature death in rural areas suggesting that something significant was being missed. One would expect those living under more compromised circumstances to have poorer health outcomes, yet this was not captured when the urban and rural areas were treated as strict dichotomies. By examining the data in the context of the rural-urban continuum, a deeper understanding of health disparities in Kansas was realized. This was made apparent by the above findings that shifted the majority of unfavorable conditions in the direction of rural areas, specifically to RUC 4 and to a lesser degree RUC 5.

There are several plausible explanations for the many unfavorable circumstances found in RUC 4 and RUC 5 communities. The RUC 4 and RUC 5 classification is assigned to communities that have a population of 20,000 or more and RUC 4 communities are adjacent to a metro area whereas RUC 5 communities are not. An argument can be made that RUC 4 and RUC 5 communities are caught between their more rural counterparts and the urban centers. They are not necessarily akin to large fringe metros or the suburbs, yet they can have significantly higher population density than the other rural classifications. This is important to note because research has found suburban areas have some of the most favorable health factors and health outcomes (Meit et al., 2014; Eberhardt & Pamuk, 2004). Further, other research has found favorable health factors and health outcomes in the most rural areas; particularly a favorable mortality profile in RUC 9 communities and lower incidences of adult obesity in

frontier vs. nonfrontier counties (James, 2014; Nayer et al., 2013). These results were all based on studies conducted with nationwide datasets and help to establish some credibility to the results of this more focused study. This seems to suggest that overall it is not the urban areas nor the most rural areas that contend with the majority unfavorable circumstances and health outcomes, rather it is the communities that fall somewhere in between.

Interestingly the RUC 4 and sometimes RUC 5 communities possess some conditions that are also found in the most urban centers (RUC 1), like high percentages of access to exercise opportunities and dental providers. Unfortunately, they also possess many of the unfavorable circumstances already detailed including a higher violent crime rate. It could be that RUC 4 communities, and to a lesser extent RUC 5 communities, are grappling with the sheer number of social and economic factors stacked against them while lacking some of the favorable conditions associated with more rural areas and possibly some of the resources more readily available in urban areas. It is also imperative to recognize that of the four majority-minority counties in Kansas, three are RUC 5 counties (Finney, Ford, and Seward).

On average, RUC 4 communities have the second smallest amount of social association rate following only the most urban area (RUC 1), for example. From the very conception of the social determinants of health, social support has been determined to have health benefits and social isolation adverse effects (Wilkinson & Marmot, 2003). After RUC 5 communities the social associations rate increases on average with degree of rurality. This could account for the similar decreases in the average severe housing problems and violent crime rate after RUC 5 communities, and the similar decrease in food insecurity after RUC 4, in that the people in these areas may be looking out for one another more vigilantly. These favorable decreases in food insecurity are found despite increases in limited access to healthy food (RUCs 8 and 9) again

suggestive of social supports in place. It is noteworthy, that an increase in the social associations rate was found to decrease the percentage of alcohol-impaired driving deaths by the multiple regression model produced in this study.

The multiple regression models suggested various predictors significantly influence the health outcome and given the presence of these predictors vary along the rural and urban continuum it follows that the health outcomes would too. Additionally, and paramount to this study, RUC was shown significantly predictive of three of the five health outcomes examined. These results suggest that where a person lives may have implications upon his or her health. Whatever the exact predictors were, there were significant differences found in three of the five health outcomes and all were less favorable in rural areas. Adult obesity, while not significantly different between urban vs. rural locations, was significantly different among the rural areas (with RUC 4 communities having the highest average percentage). The only exception, then, was alcohol-impaired driving deaths which were more frequent in rural areas though the difference was not quite significant ($p = 0.059$).

The various findings of this study support the idea that health determinants, health behaviors and health outcomes are not uniform in either urban or rural areas. These finding are useful for providing more in depth knowledge about the specifics of health disparities in Kansas and suggest that similar findings could be uncovered in other states. However, at least one result was clearly unexpected and counter-intuitive, requiring that we consider it more closely. Specifically, a seemingly nonsensical predictor variable suggested that an increase in the primary care provider rate would increase the premature death rate ($p = 0.018$). Lack of significant difference between the urban and rural primary care provider rate was also not expected.

There are several possible reasons for the lack of expected differences in primary care provider supply between rural and urban Kansas counties. The first noted is that the federal Health Professional Shortage Areas designation has been assigned to ninety-two of the 105 Kansas counties reflecting the statewide below-average level of doctors per ([PCHPUAR], 2014). Another may reflect a partial success in the state's recruitment and retention efforts of primary care providers into rural communities. Specifically, the University of Kansas Medical School (KUMC) has been at the heart of addressing rural physician shortages in the state. They facilitate a variety of loan forgiveness and repayment programs with various incentives in exchange for practice in rural areas upon completion of residency. They also have a Kansas Scholars in Rural Health program that guarantees acceptance into their medical school to about a dozen high school junior from rural areas each year. These students must intend to practice primary care, maintain satisfactory grades, and shadow a physician working in the rural area they are from during their last two years of study. KUMC has also begun a four-year medical education site on their Salina campus, the smallest in the nation, and aimed at students with a desire to practice in rural areas. These efforts cannot go unnoticed and certainly help to get more primary care physicians to practice in rural areas throughout the state. Yet, by their own admission, more primary care providers are needed to address state-wide shortages and specifically shortages in rural areas.

As to why having a relatively favorable primary care workforce compared to the urban areas has been insufficient to impact the health outcomes of those rural populations, there are several possible explanations. For one, access to care involves many more facets than simply the provider to population ratio. The variable used in this study was based on a primary care provider to population per 100,000 people. This ratio only measures presence of primary care

providers. It does not account for specialists, which are certainly found in greater numbers in urban areas. If they were counted as well, there were certainly be a significant difference in rate of providers and it would favor urban areas.

More substantively, when considering access to care as a whole, the primary care provider rate is an insufficient measure of access to care. For one, it does not account for travel time to that provider. Travel time to provider is important to consider because it is a burden that is more complex than one might initially consider. Those in close proximity with their primary care providers may have better health status because they are able to see him or her for preventive care and similar checkups with more ease. They are also able to more easily return for clarification or needed follow-up treatment. The additional travel this would require really compounds the burden for those traveling longer distances and may, in turn, create a larger barrier to care than first meets the eye.

The primary care provider rate also does not account for barriers to care that might emerge due to lack of choices in providers. There may be cultural, religious, or simply personal preferences that prevent the female population from seeing the area physician because he is male or vice versa. The presence of a physician alone is not an indicator of his or her ability to practice medicine in a culturally sensitive manner nor is it assurance of quality of care. There are too many nuances to list but lack of choices may produce barriers to care not measurable by the primary care provider ratio.

Indeed, overall there are far too many potential nuances and explanations to list in an attempt to account for all of the differences in health factors and health outcomes captured by the findings of this study. Of the 18 health factors and five health outcomes considered in this study 13 health factors and four health outcomes showed to be statistically significantly different by

either the urban or rural comparisons or by the RUC comparisons. Different patterns were uncovered using the RUC comparison than by the urban vs rural comparison. The favorable and unfavorable health factors did not present only in urban areas nor only in rural areas nor did they present only in one RUC. The same was true of the health outcomes. By examining these matters by this method the results were more reflective of the actual manifestation of health disparities in the state of Kansas.

## Implications

This study has opened up some new avenues for exploring health determinants and health outcome differences between rural and urban counties in Kansas, and elsewhere. As previously mentioned, there are many different criteria used by various organizations and policy-makers to classify rural populations. It is clear that recognizing different classification schemes matter. Understanding the context of the specific rural population is imperative when considering health determinants, what might drive health risk behaviors, why certain health outcomes occur, and ultimately how to shape effective policies and interventions. All rural areas are not equal as evidenced by the many findings presented above. It is safe to assume there are differences even among the counties assigned the same RUC, but this classification scheme aides in uncovering a more accurate reflection of the circumstances of various rural populations as suggested by the findings of this study.

The degree of rurality certainly shapes a particular community as well as the needs of the people residing in that particular area and all of this influences behavior. As noted, and represented in the model for this study, there is a principle of interconnectedness between the policies that shape an environment, that environment, and the individual behaviors prominent in

that environment. As the social ecological model posits there is a complex nesting of the factors at play with human development and in this case with health outcomes. To develop effective policies and interventions it is imperative to understand the actual context of the environment.

Policy makers and those seeking to reduce health disparities in Kansas, and elsewhere, should consider first the actual environment and characteristics of people they are aiming to help rather than assumptions that might apply based on broader literature findings. Population health approaches focusing on the prevention of negative health behaviors and their potential contribution to health outcomes need to also be mindful of the actual environment and characteristics of people they are aiming to help. Efforts to address health disparities, like those aimed at improving primary care provider ratios, are needed and should continue. Existing literature, as detailed previously, largely suggests that there are more influential factors in shaping health outcomes though. This was further suggested in the findings of this study.

The variables determined to be most significant, as reflected in the multiple regression models, were related to social and economic position and these are, of course, interrelated with environmental factors and behaviors. The greatest amount of unfavorable circumstances were found in rural areas broadly and RUC 4 and RUC 5 communities specifically. Those communities had the greatest number of unfavorable health factors despite having favorable access to exercise opportunities, a favorable dentist rate, and consistent primary care provider rate when compared to the other communities on the continuum. Ultimately, RUC 4 communities had the greatest average percentage of adult obesity despite these latter favorable circumstances. All of this suggests that addressing disparities in social and economic position is paramount to promoting health equity for all people whether they are urban or rural residents.

## Limitations

The study, as all, has its own limitations. First, this was a cross-sectional descriptive study therefore the findings are useful for drawing associations between circumstances, however no causation could be established. Second, the data used represented a range of years from 2006 to 2013 and therefore the results do not fully reflect access to care and prevention effort developments that may have arisen from the implementation of the Patient Protection and Affordable Care Act signed into law in 2010. Further, while examining the data in the context of the RUC codes produced more insight than would have been given by the urban and rural comparison alone, there are many other systems used for rural and urban classification. Applying those classification systems may, too, have produced variations in the findings. Also, there were some variables of interest precluded from the study due to missing data in excess of 15 percent. They were the age-adjusted percentages of adults reporting fair or poor health, the mental health provider ratio, percentage of high school graduates, and percentage of adults that reported binge or heavy drinking. These factors, if examined, could have added insight to differences in health determinants and health outcomes not captured in this study. Finally, it is important to also note that the stepwise regression procedure has some known limitations. The procedure produces one final model of significant variables and it is possible that there are other equally good models. Due to the high number of t-tests conducted in the process there is a possibility that some unimportant predictors were included while other important predictors were excluded. Therefore, the regression model produced by the stepwise regression procedure should not be over interpreted nor the findings overstated.

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