

Population Health Outcomes and Rural Physician Practice Longevity:

A Colorado Perspective

by

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Abstract

Retention of rural physicians is a common topic among workforce experts, yet little research has been conducted evaluating the relationships between longevity and population health outcomes.

Emphasis is placed on retention of rural practitioners through multiple methods including medical school training and recruitment incentives. This study answered the question of whether there is a relationship between rural physician longevity and population health outcomes in rural

Colorado. Using an experimental, correlational design, the research identified the level of relationship between rural physician five-year retention rates and thirteen population health outcomes of 48 rural and frontier counties. Pearson correlation coefficients ranged from -0.269 to 0.123, with an average coefficient of -0.08. The results indicate that there is not a statistically relevant correlation between population health outcomes and physician retention in rural and frontier Colorado counties. Recommendations for further study include repeating the analysis by

comparing frontier and rural counties and accounting for socioeconomic class. Most importantly, however, further research is needed to compare practices with and without integrated care models where supporting clinical staff is present and active in the care team.

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CHAPTER ONE

In 1997, Dr. Robert Bowman, a leader in physician workforce studies, depicted the problem with healthcare in rural America.

Small rural health systems represent a variety of ever changing environments with two endangered species: hospitals and practitioners. Those who would treat rural communities with the disease of “retentionitis” would do well to learn from experienced healers such as Sir William Osler who said that prescribing external remedies is far less important than studying the lifestyle and habits of the patient (We need people who understand underserved communities, para. 1).

Studying the retention of rural physicians has been an elusive activity and, as Dr. Bowman identified, examining the health of community members, who are also the patients, may be the most important remedy.

Today approximately twenty percent of the United States population resides in rural communities (Shi & Singh, p. 440), although only eleven percent of physicians practice in these areas (Rosenblatt, 2010). During the turn of the twentieth century, rural living was the norm and the quality and access of healthcare was fairly equitable to that of urban areas. Industrialization had yet to make roots in American society, and therefore medicine was elementary with few practice standards. Physicians’ knowledge of medicine often was less than that of the wealthy, well-educated and clergymen, therefore equitable healthcare was not a societal problem (Shi & Sing, pp. 82-84). As industrialization took grasp of American households and the economy, the outmigration of rural physicians began the steady decline of access to healthcare that we are experiencing today.

While recognizing the overwhelming educational debt of young physicians and the inequitable availability of primary care in rural communities, the federal government devised incentives based on geographical and economic demographics. The Health Resources and Services Administration (HRSA) has defined these localities as Health Professional Shortage Areas (HPSAs) and designated funds for loan repayments in exchange for one to three year commitments of practice within the HPSA. The program is called the National Health Service Corps (NHSC) (U.S. Department of Health and Human Services, Health Resources & Services Administration, 2012). Although this has placed thousands of physicians into HPSAs, retention rates are still unclear.

An additional factor playing into the rural healthcare crisis is the failing health outcomes of its residents. The poorer health of rural communities is exacerbated by lower socioeconomic persons and that aging people tend to be the only growing population, who ultimately require more healthcare services. The government chose to define America's most problematic population health issues and set goals under the Healthy People 2020. The initiative is a ten year project focusing on improving the overall health of Americans, including those in rural communities (Healthy People 2020, 2012).

State-based initiatives followed the Healthy People 2020 to focus on localized health outcomes, including Colorado's Ten Winnable Battles. The goals mirror the national program, but narrow the objectives to specific Colorado issues: clean air, clean water, infectious disease prevention, injury prevention, mental health and substance abuse, obesity, oral health, safe food, tobacco, and unintended pregnancies (Colorado Department of Public Health and Environment, 2012). Prowers County, population 12,361, offers a generalized example of rural communities in Colorado. Through a community health needs assessment facilitated by the Colorado Rural

Health Center and Dixon Hughes Goodman, LLP, the county was compared to the state population through health outcome measurements. Out of 59 counties in the state, Prowers ranked 57th using Colorado's Ten Winnable Battles. With six primary care physicians, there are only 0.5 physicians per 1,000 people, unfortunately describing similar scenarios in the state (Dixon Hughes Goodman, LLP).

Along with the federal loan repayment incentive, NHSC, Colorado has designated funds to supplement the national program with the Colorado Health Service Corps (CHSC). As a recruitment method, CHSC "seeks to improve access to health care professionals in underserved Colorado communities by repaying the educational loans of providers who agree to practice in areas of with a health professional shortage" (Colorado Department of Public Health and Environment, 2012). Also like NHSC, however, retention of CHSC recipients after their service commitment is unknown but anecdotally considered poor.

A large factor influencing poor retention of rural physicians is inequitable salaries when compared to urban practitioners. The average rural primary care physician practicing in a rural health clinic or critical access hospital has a mean salary of \$124,995 (Colorado Rural Health Center, 2011). In contrast, the state averaged annual salary for a physician in family practice is \$183,630 (United States Department of Labor, Bureau of Statistics, 2011), giving additional incentive to abandon rural practice for the city.

To give a perspective of rural Colorado in comparison to urban, definitions must be given for both. A Colorado rural county is a municipality with less than 50,000 people. Any county with a denser population is considered urban. Further, Colorado consists of 23 frontier counties, which are made of less than six people per square mile. Colorado frontier counties constitute 43

percent of the state's landmass but only represent three percent of the population (Colorado Rural Health Center, 2006).

Statement of the Problem

Primary care in rural communities across the country is inequitable to urban and in need of successful interventions that have yet to be developed and implemented. Additionally, it is unknown whether the length of a physician's continuous tenure in a community has an effect on the health outcomes primary care providers attempt to accomplish with their patients. There are three factors that can be directly attributed to the problem that deserve address including physician shortage in relation to poor health outcomes, recruitment incentives, and preceptor deficits.

Problem Area One – Poor Health Outcomes and Physician Shortage

The poor health outcomes found in rural Colorado can be correlated with the physician shortage in communities with less than 50,000 people. In Prowers County, along with many other similar communities, the only growing demographic is that of people over the age of 65. The geriatric population is growing faster than any other and therefore requires concentrated physician interventions as the rural elderly, in particular, suffer higher disease prevalence with lower quality of life outcomes (Weeks, 2006).

In addition to gerontology, pregnancy and birth statistics are key measures to population health. In rural communities, where primary care is harder to access because of fewer physicians among other variables, residents are at risk for post-natal mortality and late prenatal care (Larson, 1997).

Although active attention on preventative versus curative medicine has just recently become popular and the role physician shortages play into health indicators, the federal and state governments have intervened with incentives to bring physicians into rural communities.

Problem Area Two – Recruitment Incentives

Three major recruitment incentives have been employed to address the rural healthcare shortage including the NHSC, the CHSC, and the Colorado Rural Outreach Program (CROP). In comparison to the government programs that have been described, the CROP award is unique to both. A program of the Colorado Rural Health Center, CROP aims to increase community engagement by requiring a financial match of the loan repayment award. A service commitment of a year is required, and it differs from the government programs in that the funding can also be used as a retention bonus if the physician's loans have already been paid (Colorado Rural Health Center, 2012). Yet, retention after the commitment has been fulfilled, in all programs, has yet to be validated but national studies indicate that it is low.

A recent study conducted by the North Carolina Office of Rural Health and Community Care examined the ten year anticipated retention rates of NHSC recipients from six states including: Alaska, California, Delaware, Nebraska, New Mexico, and North Carolina. Not based on actual statistics, the research focused on how long the physicians *expected* to stay in their current sites after their loan repayment commitment. Within one year, 69.4 percent expected to be practicing in their site, in three years, the number dropped to 42.5 percent, five years equaled 36.5 percent, and finally after ten years only 20.1 percent of physicians anticipated staying in their rural community (Pathman, 2012).

Loan repayment programs are specific to rural and underserved areas of Colorado, and although a temporary financial incentive, they do not take into account the need for a physician

and his or her family to make their own roots in the community. Studies have indicated that the family needs to be fully engaged with their community to make a long term commitment desirable. Little is known about community health outcomes and its effect on retention, and vice versa.

Loan repayment has played a large part with introducing physicians to rural communities, but educational institutions have also attempted to reach young doctors before they graduate with rural residencies and clinical rotations.

Problem Area Three – Preceptor Shortage

Medical schools have developed programs to place their students with preceptors in rural areas, but barriers exist to entice rural physicians to participate. Continuing medical education can be obtained by those willing to teach, but if compensated at all, the hospital or individual rural practice may find it difficult to financially support a student. There is, however, a positive correlation between students who complete part of their clinical training in rural and those who then choose to practice in those communities (The Colorado Trust, 2011).

With today's reduction in public reimbursement for healthcare services, and with a high majority of rural residents covered under Medicaid or Medicare, physicians are becoming more financially taxed. Controversially, current quality initiatives are drastically increasing the overhead expense of practices and hospitals. And where urban hospitals are able to absorb the cost, rural facilities are struggling to maintain positive revenue. Facilities and medical practices can bill for a limited scope of services performed by a resident through Medicare, but to date, private insurance companies will not honor claims performed by a medical student (Association of American Medical Colleges, 2012). With increased demand and decreased reimbursement,

facilities and practices struggle to find the ability to accept new medical students or develop rural residencies.

Rural Colorado communities are not normally desired by young medical students, excluding the mountain resort areas. Therefore, what individual community members or the aggregate can offer to the student may determine whether they choose to settle in a rural area or return to the urban areas of their educational institution for their careers.

Background and Need

The geographic maldistribution of physicians includes the variables described above, but also several others, resulting in complicated and intertwined solutions to the problem. Additional factors are limited professional interaction, reduced access to expensive medical technology, and often decreased social amenities (Shi & Singh, pp.132-133). Rural communities, however, have unique characteristics that make smaller towns more desirable to some than cities. When asked about the quality of life in rural Colorado, rural resident respondents answered that “our rural communities and smaller towns allow people to become more involved in the community and each other’s lives. The sense of support and strength that comes from across rural Colorado is nothing short of inspirational” (Colorado Rural Development Council, 2008).

The value of rural communities is still realized by thousands in Colorado which has been recognized by federal and state governments resulting in the identification of key problems facing healthcare because of physician shortage.

Purpose of the Study

The purpose of this study is to determine if correlations exist between physician longevity in rural Colorado communities and the health outcomes of their residents. Age related disorders and those beyond the patient's control will be excluded.

Research Question

Is there a correlation between physician practice longevity and the overall health of a community?

Hypothesis

There is an association between physician longevity and population health outcomes in rural Colorado communities.

Rationale

Incentives to introduce physicians into rural communities have been explored and implemented; however, a larger problem lies with keeping those physicians in their chosen neighborhoods. The literature suggests that many have examined the problem by studying the physician's perspective, yet very little research explains the association between poor physician retention and the overall health of a rural community.

Definitions

- Health outcome: The result of health indicators which can be individual or population based.
- Physician Retention: The amount of time a community maintains the same physician – usually measured on an average.
- Practice Longevity: The average amount of time that a group of physicians maintain a practice in the same community.

- Rural Areas: For the purposes of this research, rural will be defined as a county with less than 50,000 residents.

Conclusion

Studying rural physician longevity is significant to healthcare administration because improvements must be made at a systemic level, versus clinical, to create infrastructures to improve the population health of current and future residents of these areas. The next chapter describes the research that has been conducted on rural physician retention including the sub-problems of poor health outcomes and physician shortages, recruitment incentives, and preceptor shortages.

CHAPTER TWO

Defining the Problem

There is a singular truth regarding rural physician practice longevity and population health outcomes – both are poor. The literature has yet to fully examine the correlations between the two, but research has examined health outcomes and physician retention individually.

Colorado rural communities represent 31.6 million acres of farmland across the state, they produce \$7 billion annually to the state's economy, and the rural agriculture business provides over 105,000 jobs annually (Agriculture in the Classroom, 2010). The remainder of the state and those across the nation depend on the goods produced through agriculture to sustain their own families. Without adequate healthcare systems to support agricultural professionals, their families, and neighbors, the rest of the country is most likely to be negatively impacted. Because of the dense geography separating rural and urban communities, separate healthcare systems must exist to allow access for rural residents.

The foundation of modern healthcare lies within the primary care system and the practitioners who create the personal relationships with their patients – those trusting partnerships aimed to preserve the health of the individual and community as a whole. The health and sustainability of the rural community is in jeopardy due to the low physician retention in non-urban areas. Primary care has already been identified as a shortage in that 56 percent of patient visits are for primary care treatment, while only 37 percent of physicians practice in primary care (Health Resources and Services Administration, 2008). The impact of the shortage on rural communities is exacerbated by the inability of small towns to maintain physician supply in correlation to the relative population and demographic demand.

Contemporary researchers have studied this problem from multiple angles by addressing the globalized issue, national impacts, and from the perspective of the physician. One such study focused on the perspective of 338 rural hospital Chief Executive Officers (CEOs) by obtaining their opinion of their community's physician shortage. The conclusions weren't drawn on raw data, but rather the perceptions of rural hospital leaders. Nearly 76 percent of respondents indicated that their communities needed at least another primary care practitioner, whether family or internal medicine (MacDowell, et. al, 2010). Although this research focused on rural hospital administrators who are more likely to understand the healthcare staffing needs of the community, other rural residents are the people directly interacting with the physician and their perspective also needs a voice.

Geographic maldistribution is another important factor contributing to rural physician shortages. By measuring the growth of licensed physicians in comparison to the overall population in Japan and the United States, Matsumoto and his colleagues discovered that physicians in both countries choose their location of practice with the potential for income. Rural physicians in the United States earn an annual salary of \$50,000 less than urban doctors. Matsumoto wrote that between 1980 and 2005 that physician supply had increased 47 percent in the United States, but that these physicians did not diffuse according to the population growth. Instead, physicians are practicing in areas where the income potential is the highest (2010). Geographic maldistribution is not a problem of primary care shortage alone; it's also a problem of choice.

Researchers in Australia attempted to determine the individual attributes of the long-term rural physician in attempts to assist with retention in the outback. The Australian aborigine population and others living in the outback represent similar health disparities as seen in the

United States. The researchers designed a survey measuring personality characteristics and correlated the responses to the length of time the practitioner had been working in the rural area. To add another layer, their personality results were compared with urban doctors who completed the same survey. They found that rural general practitioners tended to be more conscientious and agreeable than their urban counterparts, but less open and down-to-earth. However, rural general practitioners who rated themselves as open and down-to-earth represented the majority of long-term physicians, therefore identifying a personality trait that can be associated with retention (Jones, et. al, 2012). Open and down-to-earth are subjective terms, yet this finding has the potential to lead to the development of personality-based recruitment.

Physician assistants (PA) have been studied to additionally identify personality traits of practitioners with high retention rates. In rural areas around Texas, PAs and their patients were qualitatively interviewed to determine common attributes that could be correlated directly with retention. Providers with the highest retention shared confidence in the quality of healthcare they were providing, a desire to live in a rural community, living in the community themselves, and actively participating in the community (Hooker, 2007). PAs provide primary care services in equitable levels as physicians, with a degree of limitation. The differences between the groups, however, have not proven to be significantly different with regards to retention. While recruiting and changing retention systems, care should be taken to find practitioners that are eager to serve, participate, and feel accountable for the sustainability of their community. Methods on how to measure a provider's readiness to meet the criteria have not been published.

Additional factors external of the physician's personality also influence rural practice retention. Those who are raised in rural areas are more likely to return to their home town as professional adults and this is also true with physicians. Upbringing determines the comfort of a

person with their surroundings and community amenities. Although people may not return to their specific hometown, they most often return to a similar size of town with similar demographics, even if they receive their education in a different setting. Clinical rotations and residency options also predict whether a physician will choose rural or urban practice in that a physician with exposure to a rural community is more likely to settle in a rural area. Lastly, more and more physicians are choosing their practice location based on liability insurance rates that often differ by state. Upbringing, training and malpractice variables were identified when researchers studied the factors of retention among Wyoming physicians (Pepper, et. al., 2010).

To further echo the findings, Auer and Carson looked at the Northern Territory in Australia and identified that although new physicians enjoyed the outdoor activities in their rural community, they ultimately left because of their former networks. Integrating into their community appeared to be the most difficult aspect of rural practice and caused the majority of their research subjects to move back to urban settings (2010).

Internal and external factors have been studied and documented to contribute to the shortage of rural physicians including personality and community integration. Although these attributes can be identified prior to placement through personality testing and qualitative inquiry, the pool of primary care providers from which to choose is already limited, leaving little room for options. The remainder of the chapter will focus on literature around the problem of health outcomes and its relation to the shortage, recruitment incentives, and the issue of preceptor shortages. Finally, interventions found in current research will be discussed to give a full scope of the lack of adequate primary care in rural communities.

Problem Area One – Poor Health Outcomes and Physician Shortage

A common assumption is that people with less access to primary care generally have poorer health. Usually poor access to healthcare accompanies other problems such as poverty and difficulty affording healthy food. In rural areas, that problem is exacerbated by food deserts that are “areas that lack access to fruits, vegetables, whole grains, lowfat milk, and other foods that make up the full range of a healthy diet” and where residents are more than ten miles from a grocery store (Centers for Disease Control and Prevention, 2012). In Colorado, 141 food deserts exist comprising a large portion of the state (United States Department of Agriculture, 2011). Contrastingly, there are 323 McDonald’s spread out through Colorado, including areas of food deserts (McDonald’s, 2013). Further, approximately 1,000 physicians practice primary care, full-time and part-time, in rural Colorado (Colorado Health Institute, 2012). With a rural population of 685,804 in the state (Rural Assistance Center, 2011), one in nearly 5,000 live in a food desert, while one in 2,000 have easy access to McDonald’s, but there is only one primary care physician per 1,256 rural residents in Colorado. Many other variables besides access to healthy food play into poor health outcomes, but at the forefront is the physician shortage.

Butler and his colleagues used spatial analysis to determine the ratio of health outcomes with physician supply in remote areas of Australia. They found that the socioeconomic class of populations proportionately decreased as they moved their analysis further from urban areas. Physician supply became scarcer and avoidable mortality and incidence of diabetes significantly rose (Butler, et. al., 2010). Similar results may be likely in the United States and without a strong focus on population health and preventative medicine, the burden of care lies solely on the primary care provider.

Midlevel providers like PAs are helping to fill the primary care gap in the United States. In Texas, patients of PAs were asked to give their perception of their health in relation to the treatment they received at the PA clinic. The patients with long-term relationships with their provider indicated feeling the healthiest with the least amount of health complaints (Henry & Hooker, 2008). Quantitative and qualitative data have shown that the level of continuum of care with the same provider and residency location can negatively or positively impact the health outcomes of individuals and populations, especially in rural areas.

Problem Area Two – Recruitment Incentives

Since 1978, tuition has been waived for Japanese physicians willing to practice in rural areas of the country. Masutoshi and Eiji collected the demographic data of 2,988 recipients of tuition waivers between 1978 and 2006 with the goal of identifying trends among physicians who fulfilled their contract. Physicians with public school educations, those specializing in primary care, and who had mothers without higher academic backgrounds were the most likely to fulfill their contracts and practice long-term in rural Japan (2009). Researchers of rural provider retention agree that physicians raised in rural communities, where public schools predominate, tend to return to towns of similar size to practice. Additionally, rural areas have limited demand for specialized providers, and many rural citizens migrate out of their communities to receive specialized care.

Japan has faced a similar problem of rural physician supply and researchers have studied incentives that have made an impact on primary care in their country's most vulnerable areas. One such study examined the government-established institution, Jichi Medical University, which requires rural residency program for each graduate. Although the placement of physicians was temporary and did not positively contribute to the continuum of care indicated for long-term

health outcomes, placing residents in Japanese prefectures of need led to a significant decrease in physician shortage. By placing physicians in rural areas during their residency program, Japan realized a shortage decrease of 73 percent, meaning an adequate supply of physicians were in 73 percent more of their rural areas than prior to the residency implementation (Matsumoto, et. al., 2010). Although not a direct incentive, but a directive, the Japanese's government addressed the problem of rural physician shortage with a solution that drastically improved the access of healthcare. In addition to the residency program, the government requires public hospitals in every rural territory of the country, therefore giving the residents a full-spectrum of primary and specialty care opportunities (Matsumoto, et. al., 2010).

In the United States, the federal loan repayment program, the NHSC, forgives the loans of thousands of primary care providers across the country. Many stipulations including the level of need in the provider's chosen community, characterized by the HPSA score, the length of commitment required, and the level of funds available, have led to the creation of state service corps. Many states have their own funds available for loan repayment, and although they all have the requirement of the provider practicing in an area of need, states are able to determine the specific criteria without federal requirements. With the passage of the Patient Protection and Affordable Care Act (PPACA), NHSC funding will be doubled. Many states, however, have had to significantly cut their local programs due to economic hardship. Pathman and his colleagues interviewed rural health professionals and state officials to gain their perspective of the NHSC and its interplay with state programs. Respondents all appreciated the NHSC program and valued its contribution to their healthcare workforce. Complaints included concerns about competition for clinicians and service sites between their own state programs and the NHSC, which required states to target a niche of providers (2012). Colorado's program is unique in that

it's publicly and privately funded and has successfully placed providers in the state's neediest sites while paying \$20,000-\$50,000 worth of debt annually per provider (Colorado Department of Public Health and Environment, 2012).

Placement incentives have been established and practiced, but another problem arises when attempting to give rural exposure to medical students.

Problem Area Three – Preceptor Shortage

Most medical education institutions in the United States are in urban areas leading to difficulty in exposing medical students to rural America as a possible choice of practice. Yet, medical students in rural communities are often exposed to a greater diversity of practice because of the scarcity of specialists and are more likely to work in a rural area after graduation. Due to cost, administrative burden, and the inability to bill, an adequate number of rural preceptors are hard to maintain. Further complicating, competition arises between institutions approaching the same willing preceptors. In rural communities where shortages exist, physicians are often already over-burdened with patient loads and administrative tasks and are unwilling to take on another responsibility with little or no compensation (The Colorado Trust, 2011).

The northern area of Norway is minimally populated and the country has struggled to provide primary care access in this rural region. In the 1990's, the country built a medical school in the northern territory hoping graduates would stay and practice in the vulnerable communities. Although somewhat effective, access to care was still geographically maldistributed. Post-graduate medical training through residency programs was developed in the rural areas to combat the problem. Further, Norway identified that retention of the graduates had to be addressed as well. Through telemedicine programs for continuing education and professional development, rural physicians were given tools to fight the isolation often experienced by

provider transplants. Their retention of northern territory physicians practicing in a rural location over five years increased to 65 percent, much above the United States average of approximately 30 percent (Straum & Shaw, 2010).

Massachusetts has an estimated 227 rural primary care physicians in the state, and as the rest of the country, rural residents have trouble accessing treatment due to a shortage of practitioners. A survey was sent to these physicians in 2005 and 2006, with a 70 percent response rate. The goal was to ascertain medical education opportunities and correlate it with retention. Satisfaction rates were highest when the students were integrated into the rural communities. Respondents stated that the feeling of isolation from the established physicians was decreased and students were then given the opportunity to experience rural life and the communities they serve (Stenger, et. al., 2008). Given the study findings from Norway, it appears as though rural physicians across the globe have higher retention rates if they feel connected with their colleagues and are given opportunities for professional development.

Through the problems of poor health outcomes and physician shortage, the efficacy of recruitment incentives, and preceptor shortage, the impetus and effects of rural primary care provider shortages have been identified. Yet, professionals have researched many innovative interventions to address the problem.

Interventions

The University of North Carolina has been a leader in studying rural healthcare, in particular the rural healthcare workforce. Their findings have led to private, state, and federal programs that have attempted to work towards equitable healthcare in rural America. In 2009, Wright published a historical account of rural health clinics using a previous study from the university conducted between 1978 and 1983. Nearly thirty years later, Wright examined the

successes and failures of four of the documented clinics in attempt to determine trends. Four attributes were found in common and thought to be directly linked to the success of the clinic: patient advocacy, innovative practices, organizational flexibility, and community integration (Wright, 2009). Innovative interventions are necessary to break the cycle of poor rural provider retention, and as this study indicated, community integration is a key aspect of healthcare success. Change must include the participation of the community in their own solutions.

Research in northern California and rural Nevada further explored community traits and applied them with possible interventions associated with retention. In addition to rural upbringing, these researchers found that exposure to rural communities through family visits as a child or vacations were just as effective as spending an entire childhood in a rural area. They identified four specific pathways for determination of practice, whether urban or rural including familiarity, sense of place, community involvement, and self-actualization. A person will be predisposed to settle in a location that is familiar to them or has a likeliness of a setting they remember from their childhood. The ability of a person's family to find their sense of place and create their own home will determine how long the family stays in the community. People tend to stay in their residence if they feel integrated in their community which incorporates community acceptance of the person and their family, and it involves the level that the family is willing to participate in their community. Finally, self-actualization refers to adverse events and the resilience a person demonstrates during the hardship. If the outcome is successful after a significant hardship, a person and their family are very likely to stay in their rural community. Rural communities pride themselves on being more resilient to resource shortages, weather, and isolation than their urban counterparts. The rural individual must also show a resilient trait in order to find a sense of place within their community. Only after these pathways were realized,

did rural physicians begin to question salary disparities as a reason to move. And only if the pathways were not fully realized, did physicians choose to move. The trends were identified through qualitative interviews and community-based participatory research as one of the researchers is a rural physician who congruently spent significant time with his rural colleagues. Interventions suggested by the researchers included the adjustment of medical school application criteria to include the questions about the pathways and a type of mentorship program for new rural physicians with surrounding, seasoned practitioners (Hancock, et. al., 2009). To encapsulate the message of this article, rural physician retention requires the collaboration of every aspect of the medical profession including medical institutions, communities, colleagues, patients, and the person from their childhood into adulthood. All successful interventions will need to incorporate each participant in their solutions.

Telemedicine has begun to be regularly implemented in clinical practice, including rural communities across the United States. Administrative uses to address problems have been less utilized or researched. Continuing education is a requirement for licensed physicians and usually requires attendance of conferences or lectures and clinical applications. Rural physician attendance to medical events can prove difficult because of distance and the ability to leave their practice without on-call assistance. The applications in technology, however, can combat this problem while also decreasing feelings of professional isolation. Videoconferencing and other modalities can allow rural physicians to see their colleagues while learning and collaborating to earn continuing education units. During a 2008 research study, rural primary care physicians, nurse practitioners, and PAs were surveyed and the results reflected that their ability to interact with their colleagues through technology and for the purposes of continuing education, contributed heavily to their choice to stay in their rural practice (Martin, et. al., 2012). Where the

community may lack the professional expertise to connect with their rural healthcare providers, technology can intervene and give the outlet necessary to reduce feelings of isolation for the physician.

Creative interventions include bringing retired rural physicians into the discussion of retention, and even further, back into the workforce. Nasbaum professes that educational institutions will not prevent a further crisis of rural physician shortage. Although Nasbaum believes that the primary care crisis will eventually taper, he suggests that the baby boomer generation can help fill in the gap. Rural physicians are retiring not only because of their age, but also because they've become disillusioned with lack of support they receive (2009). If the rural retired physicians were coordinated and integrated with practicing rural physicians in the beginning or middle of their careers, the burden on one practitioner would be lessened while also providing additional access to their community. Retired rural physicians could become semi-retired while also working a modified schedule or offering their services on a temporary or locums basis.

Australians struggle with the same rural health disparities as the United States. Their complete healthcare system is different, as they have a nationalized system, yet rural access to healthcare looks quite similar in both countries. By studying the rural primary healthcare clinics in Australia, Wakerman and Humphreys determined that rural physician retention must include every level of government and healthcare authority to determine structure and funding mechanisms. The workforce relies on interlinking factors including governance, leadership and management, and funding of the systems. Without addressing each factor independently and with one another, the crisis will continue (2011). Ideally, policy leaders, patients, practitioners and healthcare administrators could all come together to establish agreed upon parameters with

adequate funding sources, yet this is not realistic. If funding mechanisms and systems were agreed upon, there would be no need for healthcare reform or the bodies of research conducted on the topic.

As with Australia, Japan and America, Canadians lack enough rural physicians to service their population. And as with Japan and Australia, but unlike Americans, they have nationalized healthcare systems where access should be equitable. Yet, the problem doesn't appear to be linked with the structures of the systems, but with the systems of education, population ratios and urban migration. Recruitment incentives although fully established, were not available for most Canadian doctors over the age of 45. Chauhan and his associates found that 70 percent of rural physicians older than 45 did not receive incentives, while only 41 percent of doctors under the age of 45 chose rural practice without financial incentives (2010). The survey conducted by the Canadian Medical Association drew the conclusion that the majority of younger doctors put a high priority on financial incentive as a means to move to rural Canada and practice. The survey also found that rural physicians with a heavy workload and without reprieve were planning on moving within the next two years (2010). Using telemedicine and retired physicians as alternatives for an over-burdened rural practitioner may serve as a successful retention tactic.

Community Health Centers (CHCs) are critical aspects of rural healthcare. They often act as a safety net by treating patients without coverage and those who are publicly insured. Workflow problems with administrative personnel and entry level clinical staff can negatively affect the profit and sustainability of the clinic. A study with rural CHCs conducted between 2007 and 2010 found that training and opportunities of professional development led to higher retention of all staff, which also had a positive impact on the profitability and patient flow of the clinic (Farrar & Chuang, 2011). This research leads to a new hypothesis that rural physicians

employed by CHCs may also have a higher retention if administrative and other clinical staff were trained and performed in a manner that kept the clinic performing at its highest potential. Smooth workflow operations lead to better patient experiences and a decreased administrative workload on the physician.

Few studies included the community when examining rural physician retention. One that did include the community came from Alberta, Canada. The research, qualitative in nature, approached physicians, their spouses and community members in four rural areas with high physician retention rates. Although unique in the researcher's choice to include spouses and community members, their findings were consistent with other related literature. They deemed three domains as important with retention including professional, personal, and community (Cameron, et. al., 2012). The literature indicated that professional isolation can cause a rural physician to change their location, and telemedicine combined with continuing education can help with this problem. Additionally, rural practitioners must feel a sense of place with their families, who also must integrate into their home location. Often a sense of self-actualization when resilience is tested can address the sense of place. And the rural community and physician must symbiotically accept one another through integration outside of the exam room.

In the United States, 243,457 foreign trained physicians, or international medical graduates (IMGs), reside in the country. Of those, 58 percent, or 141,205 specialize in primary care. States like New York have capitalized on this population to address their rural physician shortage – 42 percent of licensed physicians are IMGs. Yet other states, like Colorado, have strict licensing laws making IMG practice difficult and unappealing (American Medical Association, 2010). Canadian researchers Giles and Giles studied rural physician retention in their country from 1848 to 2002. IMGs constituted 23 percent of their rural primary care

workforce and their retention rates were significantly higher than Canadian born doctors (2008). IMGs represent an underutilized population of physicians and no research was found on inferior training requiring prohibitions to licensing in the United States. Rural access to care could be addressed by adapting state licensing regulations to all IMGs to practice primary care in the most vulnerable areas of the country.

The majority of literature on rural physician retention lies in the attributes of the practitioner, but not the rural community where they practice. A research study in Idaho chose to view the problem from the individual characteristics of rural communities. They created an evaluation tool, the Community Apgar Questionnaire (CAQ), to highlight the traits of rural communities and then correlated it to retention of physicians. To create the tool, the researchers interviewed eleven rural hospital CEOs and employed physicians. Five domains were identified as pertinent including geographic, economic, scope of practice available to physicians, medical support, and hospital and community support. The communities that scored the highest in the five domains also had greater success in the recruitment and retention of their physicians (Schmitz, et. al., 2011). If a tool was utilized to match physician personality and demographic traits with those of the community, retention in rural communities has the potential to be substantially increased.

Researchers have moved from simply identifying the problem of rural physician retention to creating solutions to address the global problem. Study of the literature indicates that professionals from around the world are creating innovative interventions that can cross borders to comprehensively improve rural healthcare.

Conclusion

Rural agriculture has a noted impact on the economic impact of the rest of the country in addition to providing a large portion of the goods and resources (Agriculture in the Classroom, 2010). The sustainability of rural America relies on the ability to maintain the primary care workforce, and subsequently the wellbeing of the country. Geographic and income maldistribution of physicians between urban and rural settings exist and contribute to the lack of access to care in rural communities (Health Resources and Services Administration, 2008). And personality, rural upbringing or exposure, level of resilience, rural medical training, and community integration for the physician and their family are all important contributions to retention (Jones, et. al, 2012).

Factors in addition to physician shortage impact the overall health of rural communities including the ability to access healthy foods and the average family income (Centers for Disease Control and Prevention, 2012). There's a positive correlation between low physician supply and the poor which creates higher rates of diabetes and avoidable death (Butler, et. al., 2010). Additionally, a continuum of care with long-term providers results in overall less patient health complaints (Henry & Hooker, 2008).

Loan repayment recipients with public school educations, those practicing primary care, and who have mothers without post-secondary education are more likely to fulfill their recruitment contracts. In Japan, the government directive requiring all medical graduates to participate in rural residency has drastically decreased the shortage but has not addressed the problem of retention (Masutoshi & Eiji, 2009). The federal loan repayment program in America has recently doubled its funds but, although grateful, state officials are concerned of the competition and increased problems in local recruitment (Pathman, 2012).

Because of multiple factors including cost and competition, rural preceptors are difficult to recruit and retain. Rural training experience, however, has been correlated with increased retention after graduation. Full residency programs, versus rural clinical rotations, have significantly increased the retention of physicians in rural Norway and may act as an effective tool for the United States (Straum & Shaw, 2010). Established physicians have reported they feel less isolated with the presence of students (Stenger, et. al., 2008).

Community integration and innovation in systemic solution was found throughout the literature whether looking at the problem at an individual physician level or per facility. Telemedicine through continuing education opportunities can prove as an effective tool to increase the professional development and networking for rural physicians, resulting in greater retention (Martin, et. al., 2012). Retired physicians can be persuaded back into the workforce to assist rural physicians on a per diem basis and reduce the overall workload of the practitioner (Nasbaum, 2009). Solutions to retention need to include conversations with policy makers, educational facilities, administrators, communities and the physicians (Wakerman & Humphreys, 2011). Training and professional development for the physician's support staff will reduce in workload and streamline administrative processes resulting in higher profitability and overall retention (Farrar & Chuang, 2011). IMGs offer as a solution to help fill the gap of rural physicians although licensing laws differ by state and some are more difficult for foreign trained physicians to obtain licensure (American Medical Association, 2010). When recruiting rural physicians, the community's attributes should be measured as strongly as the individual physician to assure a strong partnership. An appropriate placement the first time will lead to higher overall retention for the community (Schmitz, et. al., 2011).

A recurring theme among all the literature was that rural physician retention is symbiotic with community. One cannot exist without the other, and neither can solutions. Answers need to include an understanding of the relationship between physician retention and population health outcomes if rural communities are expected to have long-term success.

CHAPTER THREE

Literature suggests that rural physician retention is a complex problem requiring a multi-faceted solution. Educational systems, upbringing, community engagement, financial incentives, government intervention, and personality are all factors into the rural physician retention conundrum. With all the efforts being brought forth to increase the retention rates of rural physicians, a main question remains to be answered. Very little literature supports the effect of rural physician longevity and its relationship with, whether negative or positive, on the overall health of the community. Is there a correlation between physician practice longevity and the overall health of a community? That is the question being answered through this research.

Method and Approach to the Problem

The study focused on two variables – the length of practice of actively licensed rural primary care physicians and the population health outcomes of their residing county. Using a descriptive correlational design, the relationship between Colorado physician longevity and population health outcomes was examined.

A correlational study examines the extent to which differences in one characteristic or variable are related to difference in one or more other variables. A correlation exists if, when one variable increases, another variable either increases or decreases in a somewhat predictable fashion (Leedy & Ormrod, 2001, p. 191).

Causation of population health outcomes cannot be determined through this research, therefore an explanatory design was not appropriate. Further, the purpose of the research was not to predict physician longevity nor population health, but to determine whether there is an association between the two.

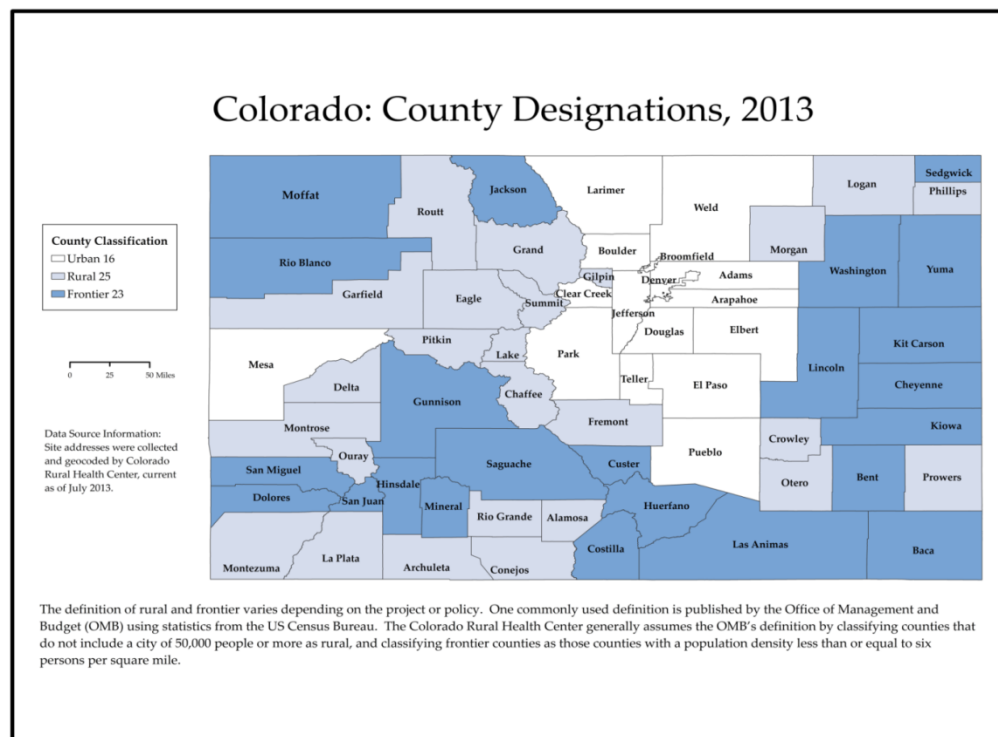
Sampling Strategy

The primary variable was the rate of primary care physician turnover between 2008 and 2013, per rural county. The secondary variable was multiple health outcomes of the community, only including those where preventative medicine can affect the outcome. Age related disorders, for example, were excluded.

Colorado Rural Physicians

Rural counties in the United States are defined by the Office of Rural Health Policy (ORHP, 2013), where they designate 48 counties in Colorado as rural or frontier. The map below is a graphical depiction of the rural counties in Colorado (Colorado Rural Health Center, 2013).

Figure 1: Colorado County Designations



Physician data was collected through the Department of Regulatory Affairs by Peregrine Management. The turnover rates were aggregated over the five year period, by county. Data collection eliminated duplication of practitioners by only recording the main area of practice. Therefore, temporary physicians or those practicing seasonally were excluded in the final count. The total sample size included 778 rural Colorado physicians.

Primary care physicians were the only practitioners measured in the study. They included those who did not list a specialty in their license registration and internal medicine, general and family practice, geriatric medicine, pediatricians, and obstetrics and gynecology doctors. Physicians with a specialty license outside of primary care, like neurology or cardiology, were excluded from the study (DORA, 2013).

Population Health Outcomes

Health outcomes were chosen based off the Healthy People 2020 goals (2012) and Colorado's Ten Winnable Battles (CDPHE, 2012). Each initiative has overlapping goals using health indicators for measurements of success. Multiple reputable sources calculate success on health indicators by county throughout the United States. The table below identifies the health indicators that were measured, the associated initiative goal, and the source of data. Indicators were chosen based on the ability of preventative medicine to change the patient's outcome. Those indicators included for measurement are preventable with education and intervention, while indicators excluded are health problems out of the patient's control.

Table 1: Population Health Outcomes

	Health Indicator	Initiative Goal	Data Source
1	Premature death (before age 75)	Health People 2020: Improve the health, function and quality of life of older adults.	County Health Rankings (2013)
2	Poor physical health days (averaged over one month)	Healthy People 2020: Related to multiple areas of Healthy People 2020.	County Health Rankings (2013)
3	Poor mental health days (averaged over one month)	Health People 2020: Improve mental health through prevention and by ensuring access to appropriate, quality mental health services.	County Health Rankings (2013)
4	Adult smoking	Healthy People 2020: Reduce illness, disability and death related to tobacco use and secondhand smoke exposure.	County Health Rankings (2013)
5	Adult obesity	Healthy People 2020: Promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights.	County Health Rankings (2013)
6	Preventable hospital days	Healthy People 2020: Improve access to comprehensive, quality healthcare services.	County Health Rankings (2013)
7	Adult diabetes (20+)	Healthy People 2020: Reduce the disease and economic burden of diabetes mellitus and improve the quality of life for all persons who have, or at risk for, diabetes mellitus.	County Health Rankings (2013)
8	Overall health outcomes	Healthy People 2020: Related to multiple areas of Healthy People 2020.	County Health Rankings (2013)
9	Overall health factors	Healthy People 2020: Related to multiple areas of Healthy People 2020.	County Health Rankings (2013)
10	High blood pressure (18+)	Healthy People 2020: Improve cardiovascular health and quality of life through prevention, detection and treatment of risk factors for heart attack and stroke; early identification and treatment of heart attacks and strokes; and prevention of repeat cardiovascular events.	Health Indicators Warehouse (2013)
11	Flu vaccinations (65+)	Healthy People 2020: Increase immunization rates and reduce preventable infectious diseases.	Health Indicators Warehouse (2013)
12	HIV prevalence	Healthy People 2020: Prevent HIV and its related illness and death.	Health Indicators Warehouse (2013)

13	Low birth weight	Healthy People 2020: Improve the health and well-being of women, infants, children and families	Health Indicators Warehouse (2013)
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Measurement Strategy

Data for the health indicator analysis was collected from County Health Rankings and the Health Indicators Warehouse.

The Office of Rural Health Policy (ORHP) is charged with determining a relevant definition of rural in regards to American communities. They have declared that any county without a metropolitan area will be designated as rural. ORHP recognizes, however, that counties with a metropolitan area may also have rural areas within its borders. In regards to federal incentives, such as loan repayment, for rural areas, ORHP separates the rural designations into smaller catchment areas (ORHP, 2013). For the purposes of this study, the county level definition of rural was be utilized for a clear correlation between available health outcome data.

The Health Indicator Warehouse (HIW) is a collaborative project of multiple agencies within the United States Department of Human Services and is maintained by the Centers for Disease Control. The goals of the HIW are to provide a national, state, and regional database of health indicators, meet the needs of health initiatives, facilitate cross-relational studies, and to promote community health innovation (2013).

Launched in 2010, County Health Rankings (CHRs) is a collaborative effort between the Robert Wood Johnson Foundation and the University of Wisconsin. In addition to ranking counties based on health indicators, CHR provides technical assistance to organizations with the mission of improving health (2012).

Method of Analysis

The data was examined using an individual samples tests of means. Population health outcomes were collected in multiple units of measurement but calculated as rates to obtain consistent measurement of variables. To obtain a reliable measurement tool, all data was calculated on a rate scale per 100,000 people.

Physician tenure was evaluated on the average retention rate over five years, per rural county. Physician turnover rates were compared to each individual health outcome to identify existing correlations. The purpose of the analysis was to determine if physician practice longevity can predict the health of a community.

CHAPTER FOUR

Introduction

Using SPSS statistical analysis to identify correlations between rural longevity and population health outcomes, the research hypothesis and question were answered. The research question asked if there is a correlation between physician practice longevity and the overall health of a community. The hypothesis stated that there is an association between physician longevity and population health outcomes in rural Colorado communities.

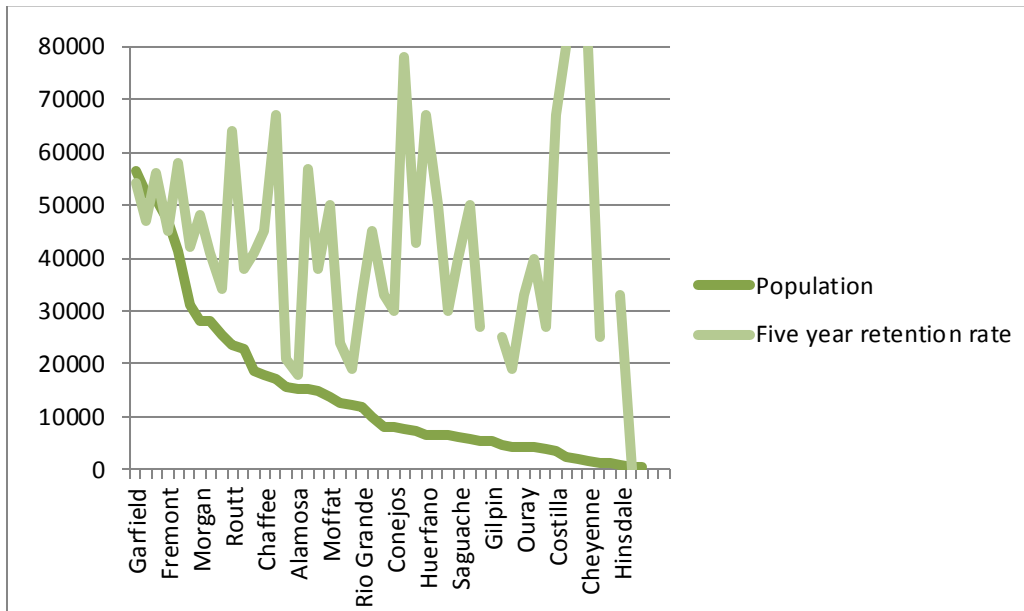
The quantitative analysis testing thirteen population health outcomes against each county's five year physician retention rate found that there is not a correlation between physician practice longevity and population health outcomes. The following charts and explanations describe the results further.

Physician Retention Rates

Retention rates among rural Colorado counties ranged from zero to 100 percent with an average of 39 percent. Chart 1 illustrates the retention rate in relation to population of each county. Although population size and retention rates were not indicated as measurements of the hypothesis, graphical representation describes that there is not a direct correlation between retention and population, excluding the rural counties with the highest populations.

The county with the lowest retention rate of zero percent has a population of 712, while the county with 100 percent physician retention over five years has a population of 843. Therefore, population is not an indicator of retention.

Figure 2: Physician Retention and County Population



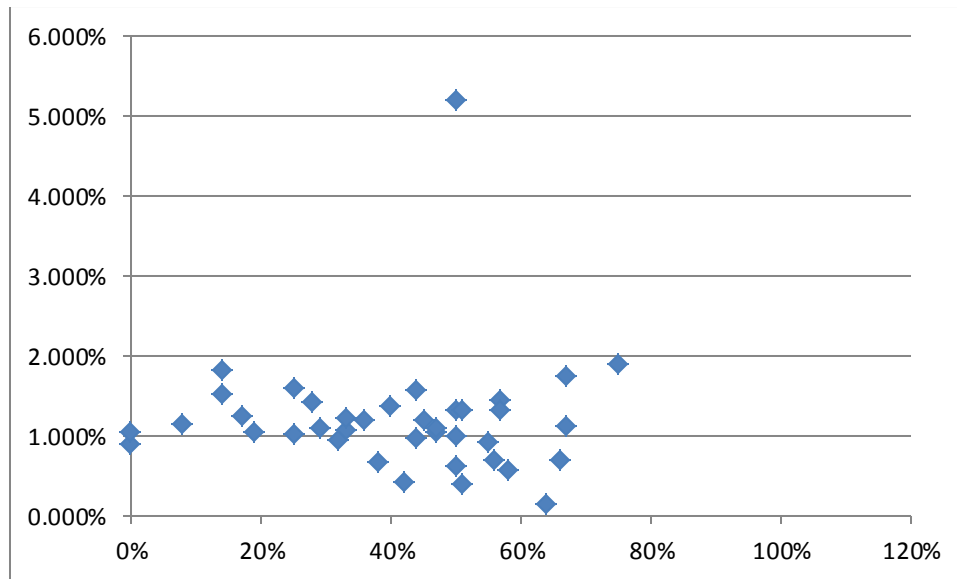
Correlation Descriptions

Between the thirteen outcomes measured, Pearson correlation coefficients ranged from -0.000 to -0.269 with a mean correlation of -0.083. Therefore, statistically relevant relationships do not exist between five year physician retention and population health outcomes in rural Colorado communities.

Premature Death

The premature death outcome is based on the number of residents who die before the age of 75. With a Pearson correlation coefficient of 0.003, there is no statistically relevant relationship between physician retention and premature death. Premature death rates ranged from 0.13 percent to 5.19 percent.

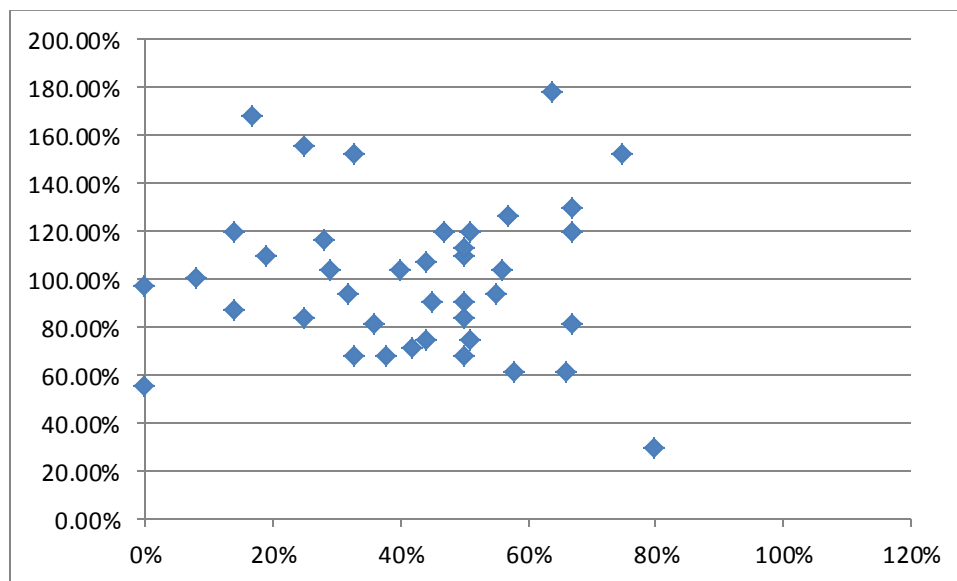
Figure 3: Physician Retention and Premature Death



Poor Physical Health Days

The poor physical health day's outcome is based on the average number of days per month the population reported having poor physical health. With a Pearson correlation coefficient of -0.018, there is no statistically relevant relationship between physician retention and poor physical health days. The average deviation from the state average of 3.1 days per month of poor physical health ranged from 29.03 percent to 177.42 percent.

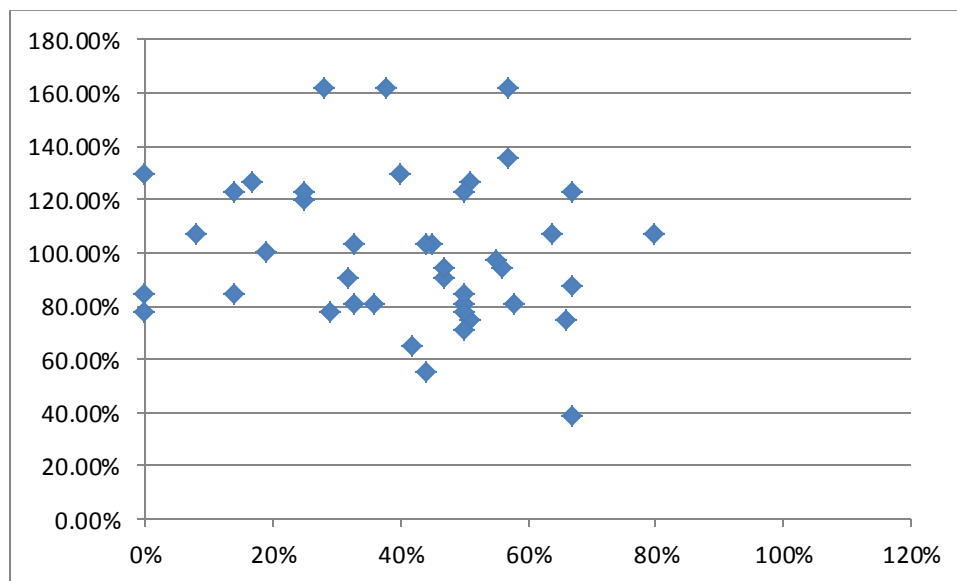
Figure 4: Physician Retention and Poor Physical Health Days



Poor Mental Health Days

The poor mental health day's outcome is based on the average number of days per month the population reported having poor mental health. With a Pearson correlation coefficient of -0.134, there is no statistically relevant relationship between physician retention and poor mental health days. The average deviation from the state average of 3.1 days per month of poor mental health ranged from 38.7 percent to 161.29 percent.

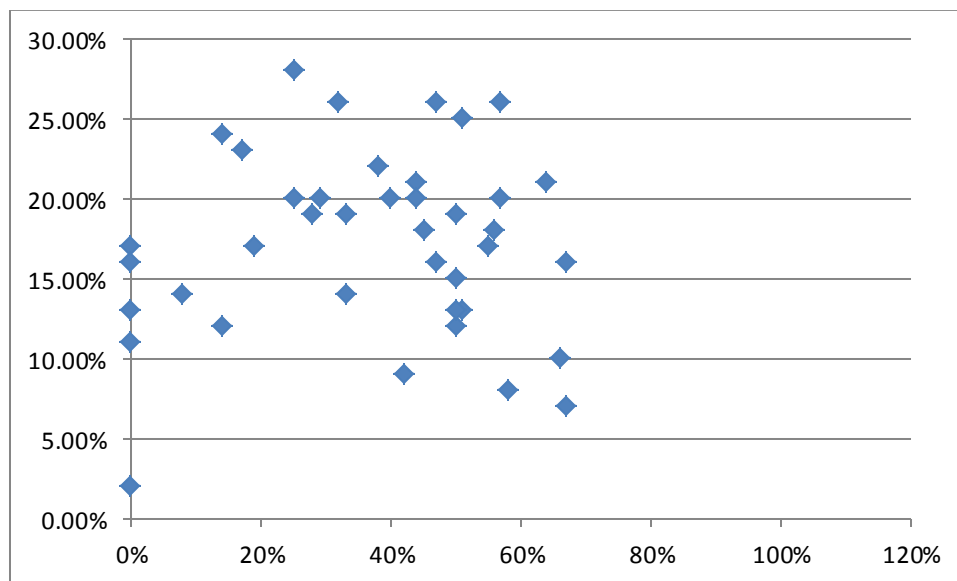
Figure 5: Physician Retention and Poor Mental Health Days



Adult Smoking

The adult smoking outcome is based on the percentage of the adult population who report smoking tobacco. With a Pearson correlation coefficient of 0.070, there is no statistically relevant relationship between physician retention and number of adult smokers. The percentage of adult smokers per county ranged from two percent to 28 percent with an average smoking population of 17.18 percent.

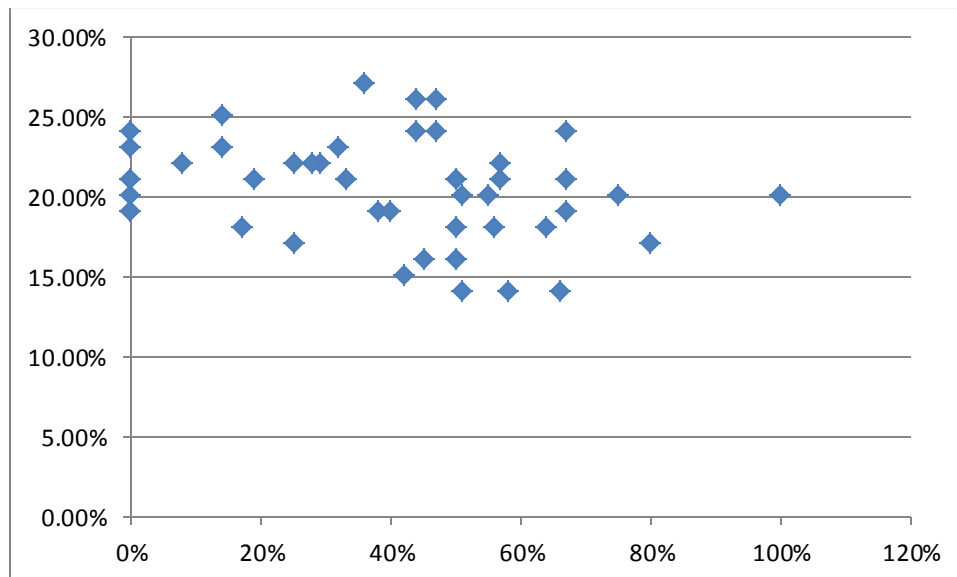
Figure 6: Physician Retention and Adult Smoking



Adult Obesity

The adult obesity outcome is based on the percentage of obese adults per county population. With a Pearson correlation coefficient of -0.269 , there is no statistically relevant relationship between physician retention and adult obesity. This outcome, however, has the strongest correlation of all indicators. The negative correlation, although not statistically relevant, indicates that as physician retention rise, obesity rates among the population decrease. The percentage of obese adults by county ranged from 14 percent to 27 percent with an average of 20.29 percent.

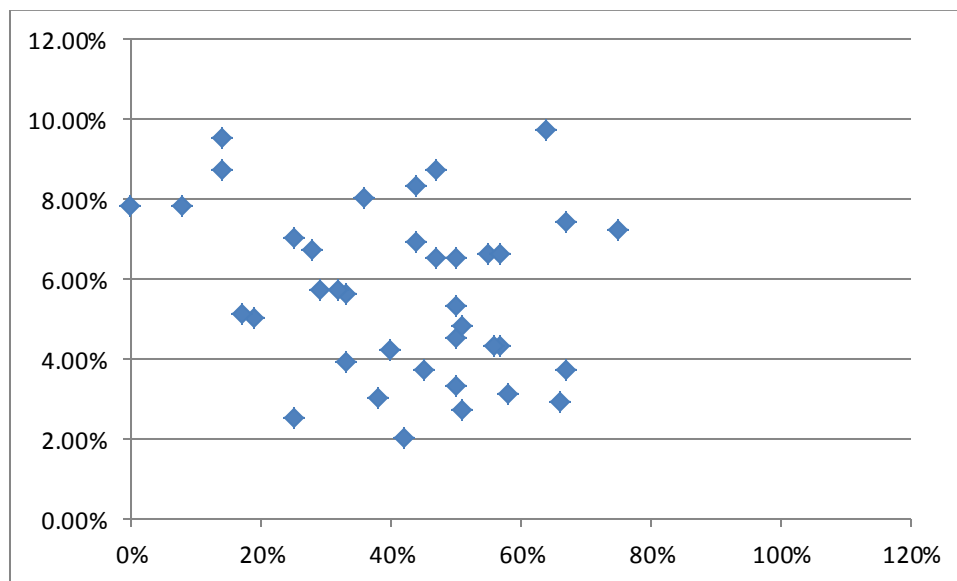
Figure 7: Physician Retention and Adult Obesity



Preventable Hospitalizations

The preventable hospitalization outcome is based on the percentage of hospital census days that could have been avoided through various factors. With a Pearson correlation coefficient of -0.229, there is no statistically relevant relationship between physician retention and preventable hospitalizations. The deviation from the state average of 47 out of 1000 ranged from two percent to 5.66 percent.

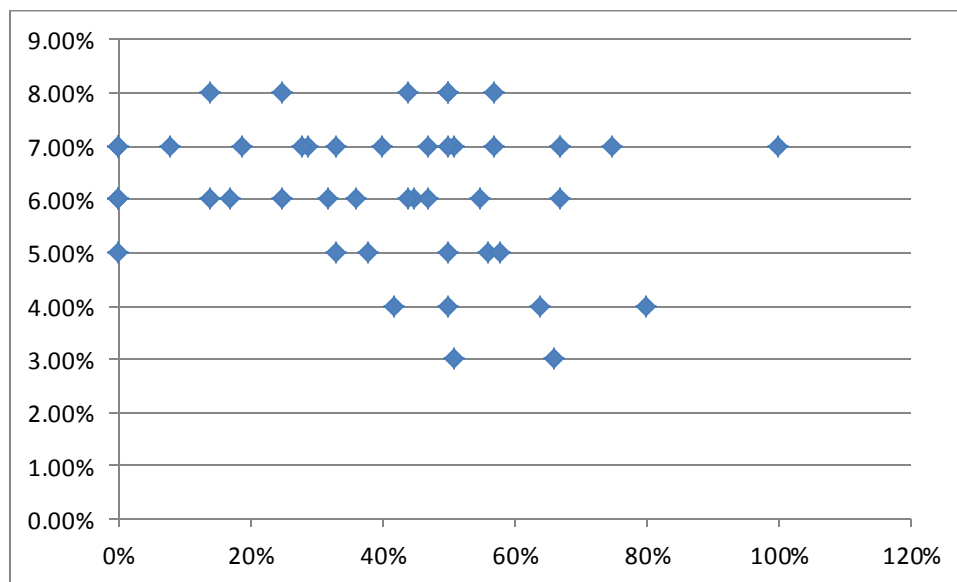
Figure 8: Physician Retention and Preventable Hospital Days



Adult Diabetes

The adult diabetes outcome is based on the percentage of the population with diabetes over the age of twenty. With a Pearson correlation coefficient of -0.176, there is no statistically relevant relationship between physician retention and adult diabetes. The population averages per county ranged from three percent to eight percent with a mean of 6.19 percent.

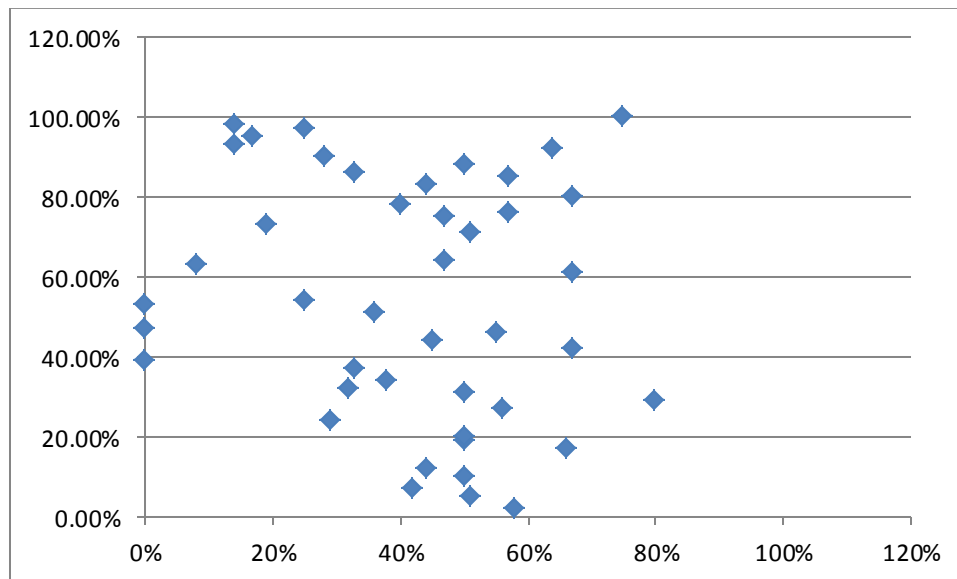
Figure 9: Physician Retention and Adult Diabetes



Overall Health Outcomes

The overall health outcome is based on a compilation of indicators related to population health. With a Pearson correlation coefficient of -0.167 , there is no statistically relevant relationship between physician retention and the overall health outcomes of the county. County health rankings range between one and 59 for the state of Colorado. The ranking percentage among rural counties ranged from the top two percent to the poorest rated county.

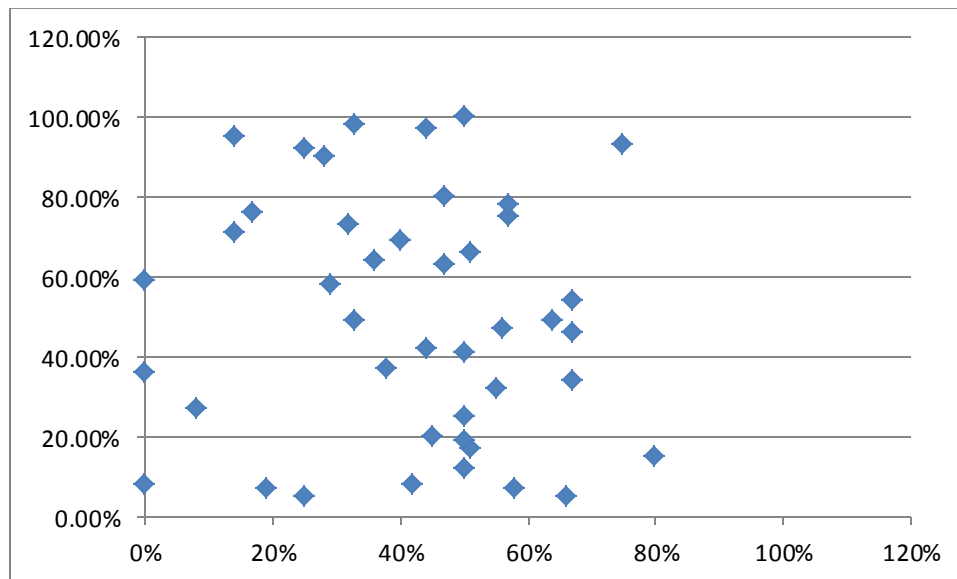
Figure 10: Physician Retention and Overall Health Outcomes



Overall Health Factors

The overall health factors are based on a compilation of indicators related to population health. With a Pearson correlation coefficient of -0.079 , there is no statistically relevant relationship between physician retention and the overall health factors of the county. County health rankings range between one and 59 for the state of Colorado. The ranking percentage among rural counties ranged from the top five percent to the poorest ranked county.

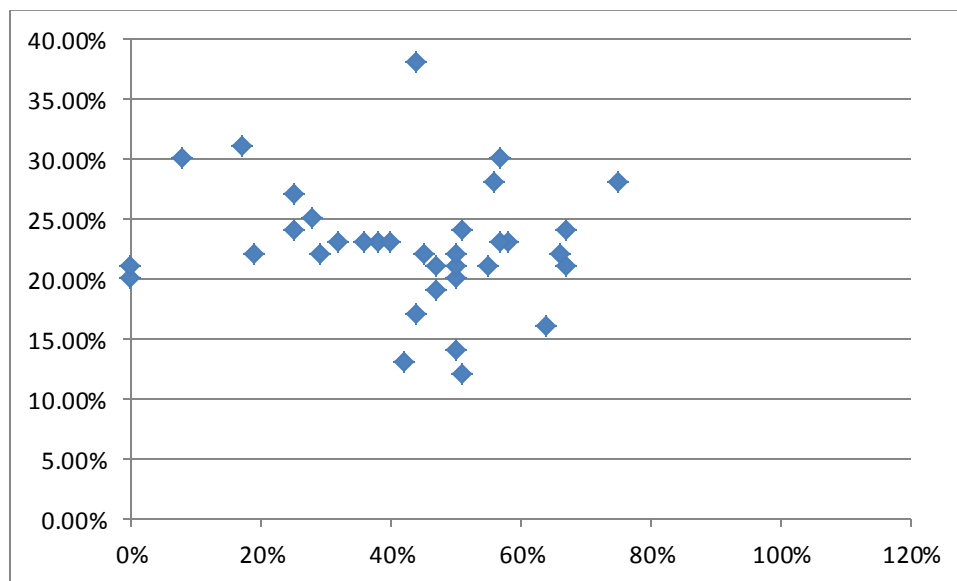
Figure 11: Physician Retention and Overall Health Factors



High Blood Pressure

The high blood pressure outcome is based on the percentage of the county adult population with hypertension. With a Pearson correlation coefficient of -0.126, there is no statistically relevant relationship between physician retention and the prevalence of hypertension in the county. The county high blood pressure averages ranged from 12 percent to 38 percent, with a rural hypertension average of 22.66 percent.

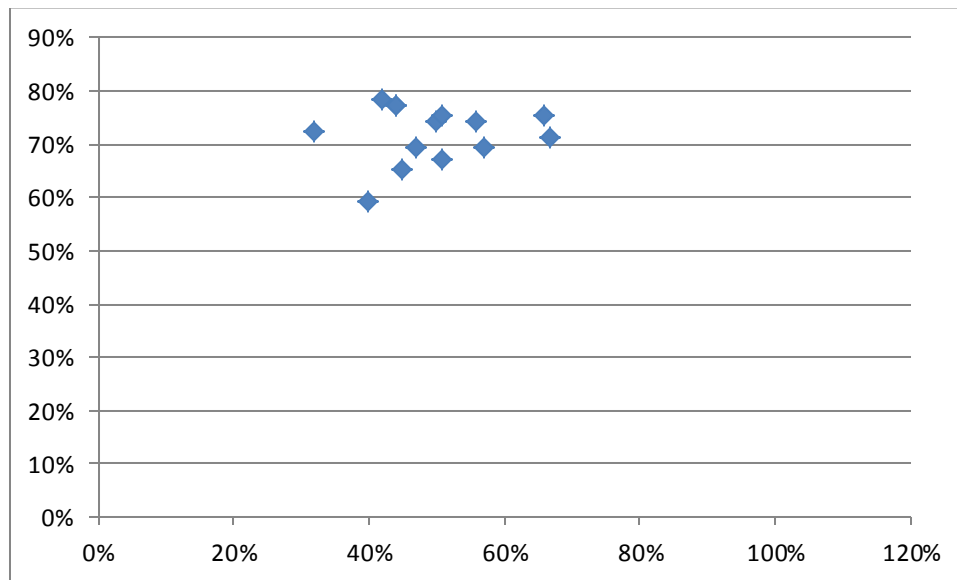
Figure 12: Physician Retention and Hypertension



Flu Vaccinations

The flu vaccination outcome is based on the percentage of population over the age of 65 who received their annual immunization. With a Pearson correlation coefficient of 0.123, there is no statistically relevant relationship between physician retention and the percentage of the population over 65 who obtain flu shots. The county flu shot averages ranged from 59 percent to 78 percent, with a rural flu vaccination rural mean of 72 percent. It should be noted that data was only obtained for 14 counties.

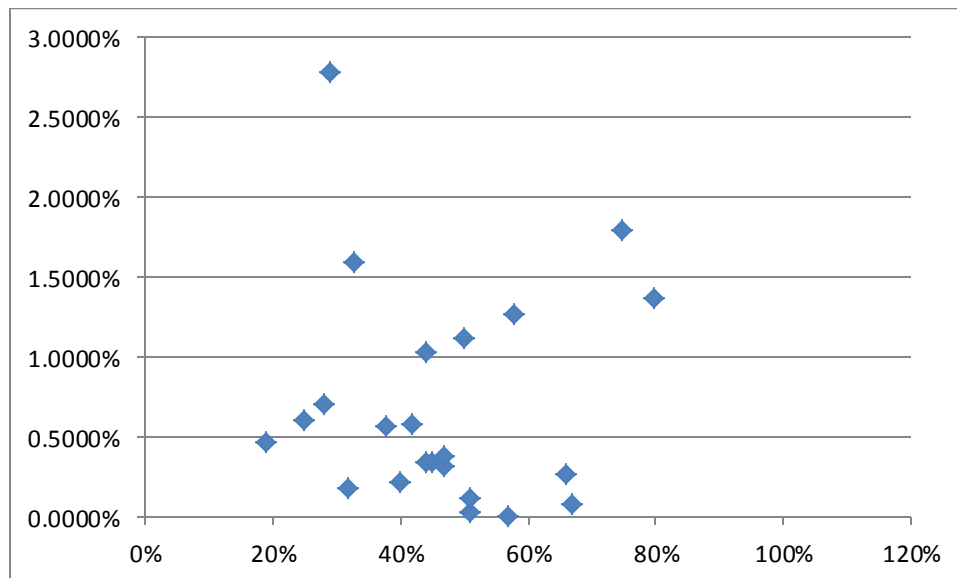
Figure 13: Physician Retention and Flu Vaccinations



HIV Prevalence

The HIV prevalence outcome is based on the percentage of population per 100,000 people. With a Pearson correlation coefficient of -0.00, there is no statistically relevant relationship between physician retention and the prevalence of HIV. The prevalence of HIV by county ranged from 0.0067 percent to 2.78 percent, with 24 counties reporting data.

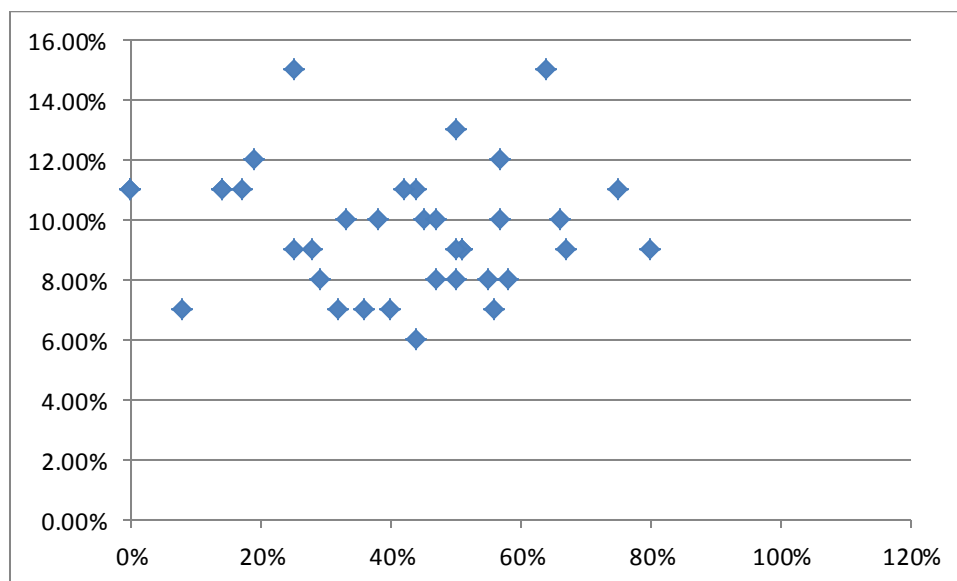
Figure 14: Physician Retention and HIV Prevalence



Low Birth Weight

The low birth weight outcome is based on the percentage of infants born under six pounds. With a Pearson correlation coefficient of -0.079, there is no statistically relevant relationship between physician retention and the number of infants with low birth weight. The county averages ranged between six percent and 15 percent, with a rural mean of nine percent.

Figure 15: Physician Retention and Low Birth Weight



Summary

Physician retention was compared against thirteen different indicators of health and none were able to show a statistically sound correlation of 0.4 or greater. The data indicates that there is not a direct correlation between five year physician retention rates and population health outcomes in rural Colorado counties. Evaluation of the results is needed to discuss possible limitations, interpretation of the data and recommendations for future research.

CHAPTER FIVE

Research Question

This study evaluated the correlation between rural physician retention and population health outcomes of the community. Using eleven outcomes and total community health outcomes and health factors, a correlation coefficient was calculated for each indicator when tested against five year physician retention rates. The hypothesis supposed that a correlation exists between retention and population health outcomes. As a physician becomes more embedded in their community, the healthier the community would become. After statistical analysis, the hypothesis must be rejected as there is no significant correlation between physician retention and the population health of Colorado rural and frontier counties.

Retention of rural physicians is a popular topic among healthcare professionals. The cost of physician recruitment is high, while their impact on population health is a minor conversation point. Instead, retention literature and professional debate has focused on recruitment incentives and preceptor shortages, among many others. If notable financial resources continue to be put toward physician recruitment to rural areas, measurement of their impact based on longevity should be a priority. This study's purpose was to identify whether physicians who stay up to five years in their rural and frontier communities have an impact on the overall health of their residents. By measuring differing indicators against retention, the purpose of the study was achieved.

The study was consistent with previous research identifying the poor overall health of rural and frontier counties in relation to urban areas. When measuring overall health factors and outcomes, rural and frontier counties generally ranked lower than their urban counterparts. Again congruent with the literature, retention of Colorado rural physicians is low averaging a 39

percent five year longevity rate. Wright's research identified that the success of rural health clinics must include integration and coordination of patient care (2009). The research suggests that physician retention alone, does not lead to healthy patients. Farrar and Chuang's study proved that physician retention within CHCs relies on their ability to increase administrative efficiencies through support staff, again supporting integration versus sole reliance on physician care (2011). Schmitz's creation of the CAQ supported the theory that each community is unique and that place-based solutions should be applied to increase physician retention and the health of the population. All research related to retention in association with population health indirectly rejects the hypothesis that physician longevity will improve population health.

Results

Strength of correlation between factors varied, although not to significant values. The lowest correlation of 0.0 for HIV prevalence shows that there is absolutely no correlation. Yet, there were very few counties able to report on prevalence rates, therefore the data may have been skewed for this indicator. Interestingly, nine of the measurements had negative correlations, meaning that as retention rates went up, the health indicator value went down. These included adult obesity (-0.269), preventable hospital days (-0.229), adult diabetes (-0.176), overall health outcomes (-0.167), poor mental health (-0.134), adult hypertension (-0.126), overall health factors (-0.079), and poor physical health days (-0.018). At first review this appears counter-intuitive. When further evaluation is done, the negative correlations are slightly aligned with the hypothesis. For example, as retention rates increase, adult obesity decreases. This is the same for preventable hospital days, adult diabetes, etc. As aforementioned, however, even a statistically weak correlation could not be proven.

Conversely, as retention rates increased, premature death (0.003) and adult smoking (0.07) also increased, yet not significantly. Premature death may have slightly increased due to the aging populations in rural communities. The geriatric population in rural and frontier counties are often the only growing demographic. Adult smoking prevalence cannot be explained.

Based on the results of this research, it is apparent that the focus cannot be solely given to physician retention to improve the health of rural and frontier communities. The answer to improved population health is much deeper with multiple complicated layers that have, most likely been individually identified, yet few have been able to integrate the care to show significant results. Although physician retention is important for continuity of care, economic impact on communities, and the satisfaction of the healthcare provider themselves, it is just one piece of the puzzle.

Several limitations arose while conducting the study. Colorado has a unique rural landscape in that the mountain resorts tend to have a higher income-level population, although surrounding areas tend to be poor. One limitation includes the gap between income levels among the counties. Second, rural and frontier counties were not separated during the study because frontier areas alone had too little data to fulfill the measurements of this research. The number of indicators that were available to measure is numerous although only a few were chosen for this study. To gain a full understanding of population health of rural communities and the correlation to retention, many more indicators should be measured. Additionally, physicians were the only practitioners studied, yet midlevel providers are often the primary care provider in the county.

Recommendations

As healthcare reform in the United States is imminent with a focus on preventative versus curative medicine, more research should be conducted to evaluate the effectiveness of costly initiatives and make adjustments for improvement. Initiatives should not be isolated from others, and priority should be given to those that integrate systems and providers. Further study should be done to evaluate population health outcomes and coordinated care, meaning that full clinical and administrative staff should be taken into account when determining overall retention rates. Additionally, integrated care should be studied in relation to population health outcomes and retention. For example, in a given rural county, the hospital, clinics, individual providers, and all associated staff should be accounted for when evaluating retention.

Conclusions

Although the hypothesis of this study was rejected, multiple new important questions have arisen. As professionals strive to increase physician retention in rural areas, they should determine why they are putting forth effort. Physician retention is still an important issue, but researchers and administrators should look at it as a factor of a larger problem. When workforce planning takes place, administrators and community leaders should evaluate the entire workforce and strengthen weak indices of health with care teams specializing in those areas. Finally, evaluation should be completed using known variables before continuing to place large financial investments into healthcare programs. If variables are unknown, investment analysis should be done on a community level, and initiatives should be regionally specific rather than blanket across large areas.

Physicians remain a significant contributor to the health of the community and are often the center of healthcare community. With aging populations, larger gaps between socio-

economic classes, and the continued complexity of fragmented healthcare systems, collaboration among providers is the answer to maintain or improve the health of rural citizens. Equal consideration of all healthcare providers and administrators must be taken to achieve integrated care, increase overall retention, and achieve the health goals of the United States.

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APPENDIX A