Primary Care Shortages In Rural Colorado

Matthew Pfeifer
Policy Memorandum: In partial fulfillment for the degree of Master of Public Policy
Executive Summary

Adequate primary care access is one of the most important aspects of an effective healthcare system. Primary care is associated with lower medical costs and better health. Unfortunately, fewer physicians are choosing to practice this form of care. At the same time an aging population and the Affordable Care Act have increased the demand for primary care. The result is a growing shortage of primary care providers. In rural Colorado these trends and the subsequent shortage of primary care providers are more acute.

This policy memorandum focuses on the primary care shortage in rural Colorado and discusses the value of ensuring adequate healthcare access for rural Coloradans. It also addresses the ability of nurse practitioners to contribute to the primary care workforce. Current efforts are addressed and three alternative policy options are proposed. Qualitative and economic analysis indicates that the best way to increase the number of primary care providers in rural Colorado is to use admissions policies at nurse practitioner training programs to increase the number of students who have rural backgrounds. These students are more likely to return to rural areas to practice medicine.
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Problem Statement

Fewer physicians choosing to practice primary care in rural areas, increased demand for care caused by an aging population, and the expansion of medical coverage through the Affordable Care Act has created a shortage of primary care providers in rural areas of Colorado.

Introduction

Primary care is a broad range of medical services usually provided on an outpatient basis to treat new symptoms, manage chronic conditions and provide preventative care. The most common health professionals to provide this care are physicians who have been trained in family medicine, general practice, general internal medicine, or general pediatrics. However, mid-level professionals such as physician assistants (PA) and nurse practitioners (NP) are increasingly providing this care. Maintaining the appropriate number of these providers is important for the United States medical system’s ability to provide primary care, and for its patients to maintain their health. Unfortunately, current demographic trends and the recent implementation of the Affordable Care Act have created a shortage of primary care providers (PCP). The problem affects Colorado as a whole, but it is more acute in rural areas. This memorandum provides a background description of the problem which includes a discussion of why focusing on rural Colorado is important. The memorandum also identifies stakeholders, outlines current efforts to address the problem, presents the strengths and weaknesses of three policy options that can be used to mitigate the PCP shortages, considers each approach in a cost-benefit analysis, and proposes a recommended course of action. Stakeholders include rural students, rural patients, rural communities, urban students, urban patients, urban communities, funding sources, and medical training programs.

Policy options include 1) creating rural residency sites for medical school students, 2) increasing the number of medical school students with rural backgrounds, and 3) increasing the number of nurse practitioner students with rural backgrounds. Including a policy option focused on nurse practitioners raises the questions whether they are appropriate substitutes for physicians. This question is addressed in the analysis of the nurse practitioner policy option. The memorandum concludes that option three is the best way to increase the number primary care providers in rural Colorado.

Background Context

The Importance of Primary Care

The usefulness of primary care is generally evident. No one would visit a surgeon to receive treatment for a sore throat, go to a urologist for an ear infection, or an emergency room for chronic knee pain. Instead visiting a primary care doctor, or increasingly physician’s assistant (PA) or nurse practitioner (NP), is the logical first step. These primary care providers (PCPs) have the general knowledge to treat most common conditions. Also, when a patient has a regular source of care provider-patient relationships can be formed, patient satisfaction increases, and health outcomes improve.

A comprehensive literature review by Starfield, Shi, and Macinko highlight the many benefits associated with primary care and adequate primary care access. Costs are inversely proportional to the number of primary care providers in an area, whereas specialists are associated with higher costs and lower levels of health. Areas with higher per capita rates of primary care providers have better overall health, fewer low-weight births, and an increased life span. Additionally, these benefits were more

<table>
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<th>Primary Care Providers</th>
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<tr>
<td><strong>Roles</strong></td>
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<tr>
<td>Diagnose and treat acute non-emergency conditions</td>
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<tr>
<td>Chronic disease management</td>
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<tr>
<td>Patient education</td>
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<tr>
<td>Encourage health maintenance and prevention activities</td>
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<tr>
<td><strong>Benefits</strong></td>
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<tr>
<td>Lower health costs</td>
</tr>
<tr>
<td>Lower mortality</td>
</tr>
<tr>
<td>Increased population health</td>
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<tr>
<td>Increased life-expectancy</td>
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pronounced in rural areas. Individuals who use a primary care provider for their regular health care see similar benefits when compared to those who use emergency departments or specialists. Primary care patients have lower mortality rates, higher completion of recommended preventative procedures, and fewer complications after any needed surgery. Specific aspects of primary care treatment are also associated with better compliance in numerous preventative health measures such as flu vaccinations, pap smears, smoking cessation efforts, and regular check-ups for children. Sufficient primary care is also linked with decreases in health disparities between income groups and between racial groups. Generally, wealthy individuals self-report better health than low-income individuals. However, in areas with more primary care providers self-reported health levels of rich and poor were similar. The same result was found in areas with African American and white residents. Generally whites reported better health, but in areas with more primary care providers the difference was minimized. As a summary the authors write, “A greater emphasis on primary care can be expected to lower the costs of care, improve health through access to more appropriate services, and reduce the inequities in the population’s health.”

**Shortages: The National Picture**

Despite the clear benefits of primary care, access across the United States is decreasing. In 2006 the U.S. Department of Health and Human Services reported on the status of the physician workforce and projections for the next 15 years. The report concluded that if conditions remained unchanged, the demand for primary care would outstrip physician supply sometime between 2015 and 2020. The authors also reported that an accelerating shortage would begin to occur almost immediately if the per capita number of primary care physicians decreased, if the demand for primary care increased due to economic or social factors, or if providers weren’t able to increase productivity. Unfortunately, these concerns

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4 Ibid. (p. 458-459)
were justified. Just two years later, the Government Accountability Office expressed concern that primary care shortages were causing decreases in preventative care and increases in healthcare costs.\textsuperscript{6}

The present shortage is caused in part by a decrease in supply of physicians caused by medical students’ diminishing interest in primary care practice. This is combined with increased demand for primary care due to an aging national population, and a rising number of people with health insurance (due to the Affordable Care Act) to exacerbate the problem.

The diminished interest in primary care is stark. As an example, in 2013 more medical students chose residencies in anesthesiology than family medicine.\textsuperscript{7} The Council on Graduate Medical Education recommends that 40% of the practicing physician workforce provide primary care,\textsuperscript{8} but only 24% of current medical students become primary care physicians.\textsuperscript{9} The decreased interest in primary care is reflected in the workforce - the percentage of practicing physicians providing primary care has decreased from about 50% in the 1970s to 32% today.\textsuperscript{10}

The passage of 2010’s Affordable Care Act (ACA) included efforts to help address the increasing primary care shortage, but it also adds to the shortage. The law expanded Medicaid eligibility, and it mandated that nearly all Americans carry health insurance. More people with insurance means more demand for primary care, and the insurance expansion associated with the Affordable Care Act creates a need for 7,000 more physicians.\textsuperscript{11}

Increased demand for primary care also comes from general population increases and the aging baby boomer generation. Taking into account the average number of primary care visits per person,


variances in age, and insurance status, Petterson et al calculate that maintaining 2010’s ratio of primary care doctors to patients would require over 20,000 more physicians by 2015 and more than 51,000 by 2025.¹²

<table>
<thead>
<tr>
<th>Condition</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>209,662</td>
<td>209,662</td>
<td>209,662</td>
<td>209,662</td>
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<tr>
<td>Aging of population</td>
<td></td>
<td>2,693</td>
<td>6,264</td>
<td>9,894</td>
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<td>Population growth</td>
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<td>11,201</td>
<td>21,952</td>
<td>32,852</td>
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<td>ACA coverage</td>
<td></td>
<td>7,104</td>
<td>8,097</td>
<td>8,279</td>
</tr>
<tr>
<td>Total</td>
<td>209,662</td>
<td>230,660</td>
<td>245,975</td>
<td>260,687</td>
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ACA = Affordable Care Act

As much as these trends are a concern, national numbers do not tell the entire story. The distribution of practitioners is not uniform and large disparities exist between specific areas. Many rural and inner city locales have significantly lower numbers of providers. While only 24% of current medical students become primary care physicians, even fewer practice in rural areas. Less than 5% of all physicians, regardless of specialty, provide care in rural locations.¹⁵ If the total rate of primary care is applied to the rate of rural practice, a mere 1-2% of recent medical school graduates provide primary care in rural areas. The result is that nationally 20% of the population lives in a rural area, and only 9% of physicians practice in rural areas.¹⁶ This translates into one primary care physician for every 1,000 people in urban areas, but only one per 2,174 in rural areas.¹⁷ Using a threshold of one primary care physician for every 3,500 people the U.S. Department of Health and Human Services’ Health Resources and Services Administration designates there are about 5,800 areas termed Primary Care Health Professional

¹³ Ibid.
Shortage Areas (HPSA),\(^{18}\) approximately 65% of which are in rural parts of the country.\(^{19}\) Compared to their urban counterparts, rural inhabitants also tend to be older, have higher rates of chronic disease, infant mortality, obesity, and they are less wealthy.\(^{20}\) The per capita demand for primary care is greater in rural areas, but the availability of those who supply care is less.

**Shortages: The Colorado Picture**

Like the nation as a whole, Colorado has an increasing primary care shortage. Prior to the passage of the Affordable Care Act workforce assessments showed that population and demographic trends would create a shortage of primary care providers in Colorado of 2,200 practitioners by 2025 (this number includes physicians assistants and nurse practitioners).\(^{21}\) The shortage is driven by Colorado demographic trends including an expanding overall population and an increasing number of Coloradans over the age of 65, who use health services at a higher rate.\(^{22}\) The Affordable Care Act adds to this shortage. Predictions estimate that the new law will increase the number of insured Coloradans by 510,000, and insured individuals use medical services more frequently than their uninsured counterparts.\(^{23}\) The Colorado Health Institute estimates it will require an additional 83-141 primary care practitioners by 2016 to meet the increased demand created by the ACA.\(^{24}\) This is in addition to the shortage that already exists, which based on primary care HPSA is estimated at 119 additional providers.\(^{25}\) The result is a total shortage the ranges from 202-260 PCPs.

The rural urban-divide in Colorado is also similar to the national picture in respect to disparities in health, primary care access, and demographics. Around 700,000 of Colorado’s 5 million total

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\(^{20}\) Ibid

\(^{21}\) Ibid


\(^{24}\) Ibid

population live in rural locations. 26 Using data from the U.S. Census and state records, the Colorado Rural Health Center details these rural realities. Forty eight of the 64 Colorado counties are considered rural. Comparing rural to urban counties, average income is lower ($45,000 vs. $61,000), poverty rates are higher (16% vs. 12%), a greater portion of the population is over 65 years of age (17% vs. 12%). 27 Coloradans also have higher health risk factors including a higher risk of being involved in vehicle accidents, higher rates of tobacco use, suicide, and obesity. 28 These factors lead to an increased need for medical care. Despite the characteristics of the rural population that increases the need of medical care, they have less access. Of the 48 counties considered rural, 43 have at least one primary care Health Professional Shortage Area designated by the Health Resources and Services Administration. 29 Other challenges to maintaining an appropriate number of rural practitioners are that current practitioners are older and closer to retirement and the fact that filling vacant provider positions takes 6 - 12 months on average. 30

Why Rural Colorado?

This memorandum focuses on rural primary care provider shortages. However, there are Primary Care Health Professional Shortage Areas in urban areas along Colorado’s Front Range as well. A utilitarian argument could be made that eliminating urban provider shortages could benefit more individuals than focusing on a relatively small rural population (Passive).

The most straightforward counterargument is that 700,000 rural Coloradans represent a large portion (14%) of the state’s population 31 and that the primary care shortage is much more severe in their

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29 Rural designation was taken from the Office of Management and Budget (Cited in Colorado Rural Health Center) cross referenced with the Health Resource and Services Administration’s HPSA database (http://hpsafind.hrsa.gov/)
communities. In Denver, even with its HPSAs, there is a primary care physician for every 1,348 people. In the nearby rural counties of Cheyenne, Lincoln, Kit Carson, and Elbert the ratio is one to 5,636.\textsuperscript{32}

The physical distance from healthcare facilities presents the rural population with an additional challenge to appropriate access, it makes preventative care more important, and highlights the need for more primary care providers. In urban areas provider access is a shorter drive away and public transportation is a viable means to access care. For rural inhabitants care is often miles away and they generally don’t have the public transportation options of their urban counterparts. For instance, eighty five percent of the United States’ urban population lives within an hour drive of a level I or II emergency room. Alternatively, only 24\% of rural residents live within this range.\textsuperscript{33} The distance means that if a farmer on Eastern Plains or a rancher in the mountains has a heart attack or stroke, their chances of survival are greatly diminished. For the state’s population living outside of urban areas, this is constant concern, and preventing such emergencies becomes more important. Because a large part of primary care is health maintenance and prevention, increasing primary care access for those living in rural areas is a way to minimize such dangerous and costly health emergencies.

The basis for the decision to focus on rural primary care also has a normative component. It considers access to appropriate health care a right in modern society, and respects the tradition of Colorado as a state with diverse rural communities and culture. Additionally, addressing primary care shortages in rural areas is an issue that requires more complex intervention. Continued competition for medical school admission slots indicate there are a large number of students enthusiastic about becoming physicians. Current trends also demonstrate that without targeted incentives or policy efforts, providers are more likely to choose to provide care in urban areas. A straightforward increase in the capacity of medical programs to train students would help address urban primary care shortages. Lastly, Colorado’s urban areas have more population, economic resources, and public visibility. As a result, these

Primary care shortages in rural Colorado communities are more likely to have the capacity to influence policies that would ameliorate their healthcare access challenges.

Despite a lower profile, Colorado’s rural residents are an active part of the state’s economy. They grow wheat and corn on the Eastern Plains, peaches on the Western Slope, mine throughout the mountains, and operate ski lifts at mountain resorts. Keeping these communities and their members healthy is important for the entire state’s economy, but the current location of health providers and the physical distance from population center disproportionately impacts rural residents. Increasing the number of urban primary care providers does nothing to support rural communities nor address the healthcare realities they face. Rural Coloradans deserve access to care, and policy initiatives can help increase the number of primary care providers able to render the most important health services.

**Methods**

**Measuring Success**

Primary care shortages are caused by a concurrent increase in demand for care and a decrease in supply of professionals able to provide the needed care. Generally, increases in demand are either positive developments such as the increase in number of individuals with insurance, or the result of relatively uncontrollable factors such as population growth and aging. As a result, the policy options considered focus on the supply side of the shortage - providers.

Research regarding primary care has consistently found higher provider to population ratios to be positively associated with a wide range of positive health outcomes. The outcomes range from specific measures for conditions such as diabetes and asthma, to general health outcomes like self-reported health levels and mortality rates. While the ultimate goal of any policy related to healthcare is population health, the number of new providers practicing in rural Colorado as a result of each policy option is the most straightforward measurement approach. Policy options were evaluated based on this measurement as well as the cost of implementation, the feasibility of implementation, and the likelihood that providers are well prepared for rural primary care practice.
Stakeholders

As with any public policy, policy choices affect stakeholder groups in diverse ways. The policy options proposed focus on provider training programs. Students and universities are important stakeholders. The complete list of stakeholders and a description of how they are impacted follows:

- **Rural students** - Policy options that use changes to the admissions process of medical and nursing schools to increase the number of students from rural areas would undoubtedly impact, and benefit, this group of students.

- **Urban students** - Because admissions spots are limited, particularly in the more competitive medical schools, urban students are also impacted by admissions criteria that is designed to increase the number of rural matriculants. These changes would mean fewer students from urban backgrounds are able to attend.

- **Rural patients** - Rural patients are recipients of care provided by the doctors and nurses discussed in this analysis. Improved access to primary care contributes to better health and longer life expectancy for these community members.

- **Urban patients** - If a greater number of PCPs are practicing in rural areas it means urban counterparts have diminished access to care. This is linked to poorer health and shorter expectancy for these urban residents. However, there are currently substantially more providers per capita in urban areas. Therefore the negative effect of fewer providers for urban patients is smaller than the gain for rural patients.

- **Universities** - This is an important stakeholder group because universities are the entities which would have to implement the policy options which modify admissions criteria. However, the economic impact would be minimal.

- **Funders such as governments and nonprofit organizations** - These are the entities that currently fund residencies and “rural track” slots. Some policy options proposed expand these programs and additional funding would be required.
• **Rural Communities** - Communities benefit from the economic activity in wages and tax revenue associated with PCP offices and residency programs.

• **Urban Communities** - When PCPs choose to practice in rural areas rather than urban areas the urban areas miss out on the associated benefits. The rural residency programs proposed in this memorandum are new programs and do not have any negative impact on urban communities.

**Status Quo: Current Efforts in Colorado**

The providers, organizations, and policy makers who comprise the healthcare system have taken steps to address primary care shortages in Colorado and its rural areas. Many of the policy recommendations made by healthcare researchers have been implemented, or already being implemented in Colorado. The following is a summary of these policy initiatives.

**Financial Incentives**

*Increased payment for rural primary care*

Directly increasing pay is the most straightforward approach to increasing the amount of rural primary care providers. The higher pay would make rural areas a more desirable place for medical professionals to practice and attract providers. While not strictly applied to Colorado, the Centers for Medicare and Medicaid services integrates this approach into the way it reimburses its providers. The result is an estimated $53,000 increase in revenue for a typical rural primary care office.\(^{34}\)

The state of Colorado has also implemented programs to incentivize primary care by changing the way Medicaid providers are paid and by paying rural providers higher reimbursement rates than their urban counterparts.\(^{35}\)

Additional policy efforts to increase reimbursement would require the participation of the other largest payer for medical care - insurance companies. Enacting these changes would require that mean

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the numerous insurance companies decided to prioritize primary care, or that legislation compel them to pay more for primary care in rural areas. The complexity of these changes and the current political animosity regarding healthcare and the Affordable Care Act make them very unlikely. However, as will be discussed at greater length when addressing policy options, research shows that finances are not the most influential factor in the decision providers to practice in a rural area. Personal background and experience are more important. Using approaches that take advantage of this influence can be more effective and less expensive.

**Student Loan Forgiveness for Primary Care**

One policy frequently cited as an appropriate means to increase the number of primary care practitioners is to use educational scholarships, grants, and student loan forgiveness programs to incentivize primary care providers to practice in underserved and rural areas.\(^\text{36}\) An example of this type of program is the National Health Service Corps which started in 1972. Every year it administers about 1,000 scholarships and 9,000 student loan repayment slots to medical providers in exchange for service in HPSAs throughout the country.\(^\text{37}\) In addition to providing care while participating in the program, about 75% of the providers plan to continue in their position after completion.\(^\text{38}\) Colorado participates in this program, and augments the efforts with similar state funded programs to create the Colorado Health Service Corps. This program disburses about $6 million per year in federal, state, and private money, and provides approximately 50 providers with incentives to practice in various HPSAs across the state.\(^\text{39, 40}\)

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\(^\text{37}\) National Health Service Corps (unknown) Who and where we serve. Retrieved from nhsc.hrsa.gov  
Scope of Practice

Increasing the scope of practice for NPs is cited ad nauseum as a way to increase the medical system’s capacity to provide primary care. Scope of practice refers to the level at which providers have the ability to prescribe medications, be reimbursed for services provided, and generally practice with more independence. In many states nurse practitioners are required to practice under the supervision of a physician thus limiting their scope of practice. Healthcare advocates and researchers assert that this requirement prevents nurse practitioners from providing the full amount of care they can and prevents them from practicing in underserved areas. Forsyth healthcare advocates and researchers assert that this requirement prevents nurse practitioners from providing the full amount of care they can and prevents them from practicing in underserved areas. Forsyth Research has also shown that broader scope of practice for NPs is associated with a larger nurse practitioner workforce because current NPs move to areas where they have more autonomy and advance practice nursing becomes a more popular career choice. Forsyth As a result, expanding the nurse practitioner scope of practice is routinely cited as a way to increase the supply of primary care practitioners, particularly in rural areas. Forsyth This may be an appropriate policy option for many areas in the United States, but it has already been implemented in Colorado and has not sufficiently increased access to primary care for Colorado residents.

The Primary Care Medical Home, Team Approach

A third approach to improving access to primary care is to make changes to the way care is administered in order to increase the medical systems capacity to provide care without increasing the number of providers. The primary care medical home model is often cited as a way to increase capacity. This is a team based approach to providing primary care where nurses, nurse assistants, medical assistants, health coaches, and social workers work under a lead provider. The lead provider is often a
Physician, but can also be a NP. Patients are organized according to levels of need, and team members have more ability to provide patients with regular appropriate care than a single primary care provider would be otherwise.\textsuperscript{45} The primary care medical home team based approach has also already been implemented in Colorado with private and public insurance plans.

Colorado has used economic approaches supply such as higher pay for rural primary care providers and student loan forgiveness for service in underserved areas. It has also implemented programs to increase the efficiency of current providers and allow nurse practitioners to provide more care. Despite numerous policy efforts, the problem of primary care provider shortages persists, particularly in rural areas. Other concurrent policies must be implemented.

### Physician Approaches

Traditionally, the most common primary care providers have been physicians. Therefore, this memorandum presents two policy approaches to increasing the number of rural primary care providers that relate to physicians. The first increases the number of medical school students from rural areas. The second creates new residency programs in rural areas.

### Physician Background

When developing policy solutions to any primary care shortage the most obvious area in which to look is at physicians. The process of becoming a licensed physician generally includes four years of medical school then three to seven years of residency. The residency process involves additional clinical training with experienced physicians who practice the specialty in which the student plans to practice. Students who plan to practice primary care often complete internal medicine, family medicine, or pediatrics residencies, and all take three years to complete.\textsuperscript{46} This includes both allopathic (M.D.) and osteopathic (D.O.) training programs which are similar except that osteopathic programs provide students

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additional training related to the musculoskeletal system.\textsuperscript{47} Colorado currently has two medical schools, the University of Colorado School of Medicine and Rocky Vista University College of Osteopathic Medicine. Rocky Vista University is a nationally accredited, private, for-profit institution\textsuperscript{48} created in 2006.\textsuperscript{49} Both programs schools graduate about 150-170 students annually.\textsuperscript{50, 51}

Physicians are the most traditional practitioners of primary care, but rural communities face challenges when it comes to attracting physicians. As mentioned earlier, physicians are choosing to practice primary care at lower rates and fewer of these are choosing to practice in rural areas. The result is an increasing shortage in rural areas. In 2009 there were approximately 1,300 physicians practicing any type of medicine in rural Colorado and 550 practicing primary care.\textsuperscript{52} Of these rural physicians 39 percent grew up in rural areas and 61 percent spent time in a rural area for a rotation during medical school\textsuperscript{53} indicating that experiences in rural areas play a part in health professionals’ decision to practice in similar areas.

\textbf{Policy Option One}

\textit{Increased admission for medical school students from rural areas who also intend to practice primary care}

Research shows that student characteristics present before entering medical school are associated with practice patterns after training is completed. Numerous studies found that the most salient factor in rural practice is where physicians were raised - rural upbringing is strongly associated with rural

\textsuperscript{52} Colorado Health Institute (2012). Rural physician chartpack revised. Retrieved from www.coloradohealthinstitute.org p. 3 and 21
\textsuperscript{53} Ibid.
In one of the most rigorous and frequently cited studies, medical students with rural backgrounds were about 3.5 times more likely to practice rural primary care than their more urban counterparts (12.4% vs. 3.6%). When this background was combined with an initial interest in rural practice, these medical students were shown to practice in rural areas 36% of the time compared to the 7% of students who expressed neither interest nor rural background. The study uncovered these results by comparing student surveys completed upon entering medical school with actual practice records post training showing location and specialty. Nineteen different characteristics were recorded for over 3,400 physicians who had graduated in a 15 year period. Other characteristics such as gender, undergraduate college experiences, and test scores were not associated with rural practice.

This relationship between rural upbringing and rural practice is true in Colorado’s neighboring western mountain states that also contain large rural areas. In New Mexico, the University of New Mexico School of Medicine has been taking steps to increase diversity and location of the state’s physician workforce since the 1970’s. Efforts include rural training programs and recruiting rural students. School records and current provider registries were used to evaluate the outcomes of these efforts. Graduates from the UNM School of Medicine, where rural recruitment was a priority, practiced in rural areas at twice the rate (39.9%) of graduates from other schools (19.5%). In Wyoming, a survey

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of over 700 practicing physicians also demonstrated that rural upbringing was associated with rural practice. Therefore, one policy option to increase the number of primary care providers in rural Colorado is to increase the number of students at the state’s medical schools with rural upbringing and an interest in primary care. The using the schools’ admissions criteria would be used to accomplish this goal. The University of Colorado School of Medicine currently includes students with rural backgrounds in their diversity calculations for admissions, but the exact process of taking into account such applicant characteristics is not public knowledge. Increasing the “weight” of a rural background and the intention to practice primary care could result in 15-20 additional students who are more likely to become rural PCPs. Rocky Vista University’s status as a private, for-profit institution means more specific admissions decision making criteria is not publicly available. However, the school does include increasing the number of primary care physicians as part of its mission, and a similar increase in priority for applicants with rural backgrounds could be made. An additional 15-20 students with these characteristics at Rocky Vista mean a total of 30-40 more students graduating each year who are likely to practice primary care in rural Colorado.

Currently, the University of Colorado Medical School also has a Rural Track where participating students receive additional training and resources related to practicing medicine in rural areas. However, the program explicitly states, “Applying to the Rural Track will neither increase nor decrease a student's chance of admission to the School of Medicine.” Ideally students with rural backgrounds would be encouraged to participate in the program if they desired. The Rural Track currently has 12-20 spaces so the program would need to be expanded to include the additional “rural primary care students.”

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61 Regents of the University of Colorado (2014). Rural Track FAQ. Retrieved from www.ucdenver.edu
62 Ibid.
no need to create a new similar program at Rocky Vista University. The school’s focus on primary care and rural practice has already led the school to require that all students spend time studying and observing medical practice in rural locations.

If 36 percent of the 30-40 students go on to practice rural primary care it would mean an annual addition of 8-12 primary care physicians. While this number may seem small, it can begin, along with already existing efforts, to make a dent in the 119 primary care providers currently needed in Colorado HPSA’s. These additional PCPs are particularly beneficial when you consider that each will care for approximately 2,300 patients (for full-time primary care physicians) so just five additional PCPs working full-time would provide care to 18,400 Coloradans. The Physician Shortage Area Program of Jefferson Medical College in Philadelphia is an example. By implementing similar admissions criteria, the program has taken only 1% of the state’s total graduates from medical school and parlayed that into 21% of the rural family medicine physicians in the state. Small changes in provider numbers can make a significant impact.

**Strengths and Weaknesses**

There are clear strengths to this policy approach to increasing the number of rural primary care practitioners. The first, and most straightforward, is that individuals with a rural upbringing already have firsthand knowledge of rural areas. They know what it is like to live there and better understand what practicing medicine in this environment will entail. Pathman, Riggins, Steiner and Williams list the key components to successful integration of practitioners into rural communities as “(1) identifying and intervening in the community's health problems; (2) responding to the particular health issues of local cultural groups when caring for patients; (3) coordinating local community health resources in the care of

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63 7% of current students practice primary care in rural areas. An increase of 7% to 36% represents an increase of 29 percentage points. 29% of 30 students equals 8.7 rounded down to 8 additional students practicing in rural areas. 64 Altschuler, J., Margolius, D., Bodenheimer, T., & Grumbach, K. (2012). Estimating a reasonable patient panel size for primary care physicians with team-based task delegation. *Annals of Family Medicine, 10*(5), 396-400. doi:10.1370/afm.1400

patients; and (4) assimilating into the community and its organizations." It is clear that doctors with rural backgrounds have a head start at gaining these skills.

This approach to increasing the number of PCPs in rural Colorado is also economically efficient. Earmarking admissions spots for rural candidates who express interest in primary care costs essentially nothing. Expanding the Rural Track program at the University of Colorado School of Medicine to accommodate these students would represent the only increased cost. Currently the program costs about $4,000 per each additional participant so an addition of 15 new participants, or 60 over the course of four years, represents an increased annual cost of $240,000.67

One of the weaknesses of this approach is that finding an adequate number of qualified medical school applicants from rural areas, particularly Colorado, might be a challenge. As a whole, rural students have fewer secondary and postsecondary educational opportunities and resources in the form of curriculum and formal guidance. Also, cultural values and expectations make advanced academic attainment less common,68 as does lower levels of important math and science training.69 For example, in Denver 41% of the adult population has a college degree, while in rural counties the rates are between 15-20%.70 It is unsurprising that rural students tend to be underrepresented in medical schools71 which require high levels of educational attainment. The issue is coupled with data from the University of Colorado Diversity report that says 18% of student body self-reported as rural, whereas the Census says

67 University of Colorado School of Medicine (2012). Rural Track at the University of Colorado School of Medicine. Retrieved from http://coruraltrack.org/wp-content/uploads/2012/05/RT-Report-13-May-2012.pdf Also, the cost estimate provided reports a $400,000 cost for 60 students and a $480,000 cost for 80 students. \((480,000-400,000) / (80-60) = 4,000\)
13% of CO population is rural. This indicates rural students might already be “over represented” in the University of Colorado School of Medicine if compared to the state population. However, it doesn’t mean that these rural students are from Colorado. Out of state students with rural backgrounds can be admitted to the state’s medical schools and can join Colorado’s rural primary care workforce.

Another potential pitfall to implementing this approach lies in the political and legal controversy surrounding medical school admissions programs. The admissions process for medical school is competitive. The University of Colorado receives over 5,000 applications for only about 160 slots. Prioritizing applicants from rural areas means some qualified applicants from urban areas will not be admitted. Applicants and their families who are not granted admission will be upset. Displeasure combined with the high-profile nature of the University of Colorado Medical School creates the risk for public controversy and legal action. A quick look at Supreme Court cases addressing affirmative action reveals lengthy list of time consuming court cases involving university admissions policies. The most recent case, Fisher v. Texas, began in 2008 and is yet to be definitively decided. Even though increased admissions for rural residents is constitutional, (see footnote) defending the practice in the media and/or courts would require significant expenditures of time and money that could be better used in other areas.

Policy Option Two

New Primary Care Residency Sites in Rural Areas of Colorado

Medical school graduates who complete their residencies in rural areas are more likely to continue practicing in a rural area. One study of Massachusetts family medicine physicians found that

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75 Affirmative action admissions programs by public institutions have a long history of constitutional legal challenges. While the issue of race is still being addressed by the courts, the programs proposed in this analysis uses the aspect of rural upbringing. This applicant characteristic is not a protected class and does not create a constitutional deterrent. The approach implemented by Rocky Vista University would be less controversial due to its status as a private institution.
only 21-24% of urban trained physicians practice in rural areas, but over 40% who completed rural residencies practice in rural areas.\textsuperscript{76} More impressive results were demonstrated in a study of physicians in Northwestern states, more similar in size and demographics to Colorado. Family practice physicians who completed their residency at Community Health Centers felt they were well prepared, their residency environment was closely correlated with later practice environment, and they were almost three times more likely to practice in rural settings.\textsuperscript{77} Also, evaluation research from a family medicine residency program where the second two years of a three year program were spent in a rural location found that 76\% of the participants practiced in rural areas compared to the 30\% national rate. The vast majority (72\%) of these rural PCPs also intended to continue practicing in rural locales.\textsuperscript{78}

The second policy option to increase the number of primary care practitioners in rural Colorado is to create new primary care residency sites in these rural areas. Colorado has 16 community health centers with 146 individual locations, many of which are in rural areas.\textsuperscript{79} These would be used to house new

Community Health Centers in Colorado

residency programs and would include 12-18 residency slots. If about three quarters of these residents go on to practice primary care in a rural area, the result would be an annual increase of 3-4 providers.\textsuperscript{80} This is similar to the Teaching Health Center Graduate Medical Education (THCGME) program that is included in the Affordable Care Act and provides grants to community health centers to expand primary care residency programs.\textsuperscript{81} Estimates for small programs in rural locations indicate that the cost to fund one resident for one year is about $115,000.\textsuperscript{82}

\textsuperscript{80} Residency programs take three years to complete, 12 residency slots mean 4 graduates annually. If 75\% of those graduates practice in rural areas it is an increase of 3 providers.
\textsuperscript{81} Health Resources and Service Administration (2014). Teaching Health Center Graduate Medical Education. Retrieved from bhpr.hrsa.gov/grants/teachinghealthcenters/
Strengths and Weaknesses

One of the benefits to this policy approach to address PCP shortages lies in the fact that residents actually provide care. Estimates show that an average primary care physician provides about 2,200 visits annually.\footnote{Petterson, S. M., Liaw, W. R., Phillips, R. L., Rabin, D. L., Meyers, D. S., & Bazemore, A. W. (2012). Projecting US primary care physician workforce needs: 2010-2025. \textit{The Annals of Family Medicine}, 10(6), 503-509.} Residents provide between 250 and 1,000 visits depending on their year of residency.\footnote{Lesko, S., Hughes, L., Fitch, W., & Pauwels, J. (2012). Ten-year Trends in Family Medicine Residency Productivity and Staffing. \textit{Family medicine}, 44(2), 83-9.} However, some of this added productivity is lost because currently practicing physicians devote a portion of their time to instructing residents instead of seeing patients.\footnote{Ibid} The net result is 200-300 more visits annually.\footnote{Ibid}

A second benefit is that by actually living and practicing medicine in a rural area, residents get first-hand experience. The Colorado Health Institute Rural Physician Survey listed areas of practice where rural physicians felt their residency training left them underprepared. These included telemedicine, occupational health and safety, and behavioral health issues.\footnote{Colorado Health Institute (2012). A profile of Colorado’s rural physicians. Retrieved from www.coloradohealthinstitute.org} Aspects of rural practice make these skills more important. Physical isolation means telemedicine is often necessary. The physical nature of work in rural areas means patient issues are more often related to occupational health and safety. The limited number of behavioral health specialists means primary care providers are force to address mental health needs. Residencies in rural areas are the best location for doctors in training to acquire the unique skills required for rural practice. Also, one study of rural PCPs found that the most important factor related to continued practice in rural areas was being prepared for the realities of living in a rural area (not actually practicing medicine), and that rural residency was the best preparation for the rural lifestyle.\footnote{Pathman, D. E., Steiner, B. D., Jones, B. D., & Konrad, T. R. (1999). Preparing and retaining rural physicians through medical education. \textit{Academic Medicine : Journal of the Association of American Medical Colleges}, 74(7), 810-20. doi:10.1097/00001888-199907000-00016}

Additionally, the absolute number of medical school graduates from the U.S. is increasing. This has the potential to create increasing competition for residency slots. The competition is becoming
increasingly tight for graduates of international medical schools who are interested in completing their residency in the U.S.\textsuperscript{89} Providing additional residency slots in rural areas of Colorado will help meet the demand, and attract more primary care practitioners to the state. Furthermore, graduates of international medical schools tend to practice primary care at higher rates than graduates of U.S. schools, but have less success in obtaining residency matches (approximately 50% match success vs. 90%).\textsuperscript{90} Seeing the increasing primary care shortage, it would be unwise to cut these future practitioners off from a pathway to practicing primary care in the U.S. and in rural areas.

The weaknesses to the approach of increasing the number of rural residency programs are significant, even if they are unsurprising. The simple cost of creating completely new programs is a drawback. Estimates place the annual cost of running a rural residency program with 12 participants at $1.5 million, in addition to the 4-5 year start-up period and associated costs.\textsuperscript{91} Because these residents are located in smaller rural medical centers they may not have direct access to the all the medical training required for accredited training programs. Providing residents with these additional training experiences often requires that they spend designated periods in different locations. This represents a financial risk for residency programs because they cannot receive government financial support when their residents are “off-site,” and coordinating these additional learning opportunities requires consistent administrative effort.\textsuperscript{92} Lastly, it could be difficult to find physicians willing to participate as instructors in new residency programs. After all these are HPSAs and by definition there are limited numbers of physicians living and working in these areas. Overcoming this challenge requires diligent efforts to identify and recruit the necessary staff. Recruitment efforts are estimated to cost over $20,000 per position, and a failure to manage human resource needs would be catastrophic for a residency program.\textsuperscript{93}

\textsuperscript{90} National Resident Matching Program (2013) Advance data tables: 2013 main residency match. Retrieved from www.prweb.com Table 4, p. 5
\textsuperscript{92} Ibid.
\textsuperscript{93} Ibid. p. 86
Medical Doctor: General Strengths and Weakness

The general positive aspects of any policy approach using medical doctors are rather straightforward. First, despite any questions about specific aspects of medical school, physicians are extensively trained. They have addressed innumerable medical situations via academic study and supervised clinical practice. Also, the concept of primary care provided by medical doctors has a long history, and is the socially accepted standard in the U.S.

The drawbacks to policy solutions using physicians include the simple fact that training physicians takes time - seven years minimum. Because the education process is so lengthy, changes to the system might take similarly long to make an impact. Just as the process of training a physician is lengthy, it is also costly. The complete cost of educating one future physician is estimated at about $105,000 - 135,000 annually for medical school\(^4\) and $80,000 for a primary care residency.\(^5\) Together this is a total of $660,000 - 780,000 to educate one primary care physician. Making even peripheral modifications to such an economically and culturally large institution can be an arduous task. Finally, as mentioned earlier, physicians are increasingly demonstrating a preference for medical specialties outside of primary care. The trend poses a risk that with even the most effectively designed program, medical students still might not choose to participate.

Nurse Practitioners

Nurse practitioners are increasingly providing primary care. Therefore the third policy option focuses on nurse practitioners. The section provides background on these providers and addresses the question of whether nurse practitioners can be adequate stand-ins for physicians. The section then describes a policy option to increase the number of nurse practitioner students with rural backgrounds, and discusses the corresponding strengths and weaknesses to this approach.


Nurse Practitioner Background

The history of nurse practitioners begins in the late 1950’s when Dr. Eugene Stead Jr. and a nurse named Thelma Ingles concluded that nurses could provide more care in clinical settings. Their attempts to create a master of nursing program at Duke University with a focus on clinical care were unsuccessful (though Dr. Stead went on to create/found the physician assistant profession). However, in 1965 Loretta Ford and Henry Silver founded the first NP certificate program at the University of Colorado which focused exclusively on pediatrics, and later became an accredited master’s program. As of 2013 there were over 171,000 practicing NPs in the U.S.

Generally, to become a nurse practitioner individuals must first obtain a bachelor of nursing degree then complete an accredited NP program, which confers a masters or doctorate degree. Program specifics vary, but usually include 2-3 years of full-time coursework, formal summer classes, and require supervised clinical experiences that range between 600 and 800 hours. The American Association of Colleges of Nursing has recommended efforts to increase the prevalence of practice based Doctorate of Nursing (DNP) programs. The goal is to better prepare nurse practitioners for the increasingly complex medical environment, and to enhance the profession’s level of respect in the field of medicine. Similarly, this more advance credential requires an additional 2-3 years of schooling. The clinical training must be supervised by a physician or a fellow NP who has the legal authority to prescribe medications.

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Nationally there are about 350 institutions offering a nurse practitioner masters or doctorate\textsuperscript{103} and in Colorado there are 6 schools training NPs.\textsuperscript{104}

Nurse practitioners in Colorado have a wide scope of practice that includes the ability to practice independently, receive reimbursement from insurance companies, and prescribe medications (prescriptive authority). The process of gaining prescriptive authority is an aspect of professional development that helps ensure patient safety and continued learning through regular interaction with experienced medical providers. It is analogous to physicians’ residency training. First, nurse practitioners must achieve Provisional Prescriptive Authority. This is achieved by gaining 1,800 hours of postgraduate practice while having weekly contact (called at preceptorship) with a physician or NP who has full prescriptive authority. At this point a NP can write prescriptions, but must maintain a formal preceptor relationship. Full Prescriptive Authority is gained by an additional 1,800 hours of similarly supervised practice, after which the NP is no longer required to maintain a preceptor relationship.\textsuperscript{105} The reality of these requirements means that for approximately one year of full-time practice, NP must work with more experienced medical providers because they do not have the ability to write prescriptions. The timeframe, from the beginning of master’s level education to the acquisition of prescriptive authority and independent practice, is about 3-4 years of full-time school and work.

**Nurse Practitioners: The Question of Quality**

The most straightforward question that must be addressed is, “Can nurse practitioners provide the same quality of care as physicians?” Multiple investigations into the issue of quality of care and customer satisfaction show that the simple answer is yes.

\textsuperscript{104} These include: Colorado Mesa University; Colorado State University, Pueblo; Metropolitan State College Of Denver; Regis University; University Of Colorado At Colorado Springs; University Of Colorado Denver; University Of Northern Colorado
\textsuperscript{105} Board of Nursing (unknown). Frequently asked questions. Retrieved from colorado.gov
Measuring the actions completed in a medical visit is one way to compare NPs and physicians. Using this comparison NPs and physicians provide the same level of care. Lenz et al compared NPs and physicians in their care for patients with diabetes. The actions performed by both providers were similar in terms of patient assessment, questioning about behavior, examining the patient for physical symptoms, and performing diagnostic testing. Differences between the two types of providers were found when it came to education, with NPs providing patient education twice as frequently as physicians (84.9% of the time vs. 42.4%).

Another study used the completion of recommended health maintenance activities as a tool of comparison. The activities recorded included blood tests, breast and rectal exams, pap smears, and vaccines. Patients who saw NPs were significantly more likely to have completed these health maintenance activities than patients who saw NP/physician teams or physicians exclusively. The only exception was in the rate of mammograms, which were consistent across all provider types. Regardless of the provider, the same patients getting the same treatment will lead to the same outcome.

Measuring health outcomes is another way to compare the quality of care provided by NPs and physicians. One study included a two-part process to make this comparison. Patients without a regular primary care provider were randomly selected to receive care from either a NP or physician, and the health of the groups was compared 6 months later. According to medical tests to measure diabetes and asthma, health status of patients did not differ depending on the source of care. In the area of high blood pressure, patients of NPs had better outcomes. Patient satisfaction surveys were administered and results indicated that after the initial appointment, there was no difference between provider types. At the 6 month point the only difference was a slightly higher score (4.22 v. 4.12 on a 0-5 scale) for physicians in the area of provider attributes (technical skill, time spent with patient, and personal manner). The number

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of times patients sought care was also similar. Additionally, the study was repeated after two years the initial findings were maintained.\textsuperscript{109} There were no significant differences in regards to overall satisfaction, healthcare utilization rates, self-reported health status, or test results for diabetes, asthma, or hypertension.

Another study comparing nurse practitioners to physicians focused on high blood pressure and obesity found similar results. Patients seeking treatment for hypertension were divided into two groups. Physicians treated one group, nurses the other. Patient in both groups missed appointments and quit treatment at the same rate. When evaluated in terms of obesity, most of the patients seen by nurse practitioners lost weight while most of the patients treated by physicians gained weight. After one year of treatment NP patients had lower rates of hypertension and patients who were instructed to manage their symptoms without medication continued treatment at higher rates when treated by NPs.\textsuperscript{110} In this study outcomes for nurse practitioners were better than outcomes from physicians. More recent follow-up studies confirm equal quality in terms of hypertension treatment outcomes.\textsuperscript{111}

Meta-analysis type research further supports the parity between NPs and physicians. A comprehensive review of 34 individual studies by Horrocks, Anderson and Salisbury showed that patients who received care from NPs had no difference in health status, that NPs provided higher quality visits that were more informational for clients, offered more advice, and included more comprehensive record completion. Patient satisfaction was also higher for NP visits in all studies in which it was measured.\textsuperscript{112} Similar results were found by follow up studies in 2004,\textsuperscript{113} and a 2005 study found NP outcomes similar


to physician care in “[treating] asthma, cervical cancer screening, childhood immunizations, depression, diabetes, hypertension, mammography screening, and smoking cessation.”\(^\text{114}\)

Even doctors’ groups who generally oppose the use of independent NPs for primary care concede the point that quality and outcomes for NPs and physicians are similar. The only critique or caveat is that NPs might get similar results because they spend more time with patients. Even in this regard it is difficult to see how more provider-client contact could be construed as a drawback.

**Policy Option Three**

*Increased admission for nurse practitioner school students from rural areas who also intend to practice primary care*

There is a smaller body of academic literature related to nurse practitioners, particularly when investigating efforts to increase the number of NPs practicing in rural areas. In one survey of mid-level health professionals, the category in which the researchers placed NPs, six factors were highlighted as influencing their decision to practice in rural areas: Serving health needs in the community, financial aid obligations/loan forgiveness, Multiculturalism (many cultures existing in one community), desire to work in a certain size/population of community, desire to return to hometown, and participation in a rural training program.\(^\text{115}\)

Studies of general registered nurses practicing in rural areas found they often have family ties to the areas in which the work, indicating that pre-existing ties to rural communities impact a nurse’s likelihood to practice there.\(^\text{116}\) This relationship was larger for rural nurses than urban nurses. Similarly, another study indicated geographic issues were most strongly linked to rural practice, such as desire for small community, little need for cultural recreation activities, and a belief that nursing is a good financial

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opportunity.Individuals with rural backgrounds are more likely to fit this profile. The authors also pointed out that, because there are frequently fewer occupational opportunities in rural areas, the benefit of adequate income through nursing employment can be used as a tool to attract rural residents to nursing professions, including nurse practitioners.

Because research links nurses with rural background to future practice in rural areas, the third policy option is to increase the number of nurse practitioner students who have a rural upbringing. Essentially, this is the same approach as the first policy option described, but utilizes NPs instead of physicians. Also, because there are six schools in Colorado with NP training programs the efforts would include all these institutions with the goal of adding 3-4 rural students to the incoming class at each institution. The result would be an additional 18-24 future nurse practitioners who have an increased likelihood to practice in rural Colorado communities.

Estimating the rate at which NP students from rural areas would choose to practice in rural areas is difficult. One study that did focus on nurse practitioner practice location found that including specific recruitment and admissions efforts according to student background was a necessary component to increase the rate of graduates who practiced in underserved areas. Unfortunately, the study did not isolate the magnitude of the relationship. Because no studies were found demonstrating the size of relationship between rural upbringing and rural practice by NPs, rates for physicians will be used as a proxy. For physicians, rural upbringing and an interest in rural practice was correlated with a 3.5 times greater likelihood of rural primary care practice. Currently, 15.5\% of NPs provide primary care in rural areas. A 3.5 times greater likelihood means that approximately 54\% of NP students from a rural area

118 Ibid.
121 17.8\% practice in rural areas(a) and 87.2 provide primary care (b) [Footnote continued on the next page]
with an interest in rural practice would end up practicing rural primary care. If 20 more applicants with these characteristics were accepted to NP programs it would represent an annual addition of 7 NP providing primary care in rural areas.  

Seven additional NPs means care for about 13,000 more rural Coloradans.

*Strengths and Weaknesses*

The benefits of this nurse practitioner admissions approach are similar to the admissions initiative for medical school students described earlier. The cost of changing admissions policies to accept more students from rural areas is very minimal because the changes can be incorporated into current admissions department activities. These nurse practitioners will also have the advantage of better understanding the culture and needs of the rural communities they will be serving as PCPs.

The drawbacks and potential hurdles to this approach are also similar to the weaknesses of the admissions approach for physicians. These include the controversy surrounding affirmative action type admissions criteria, and the lower academic attainment of students from rural areas, particularly in the key subjects of math and science that would prepare them for study in masters or doctorate level nursing programs.

*Nurse Practitioners: General Strengths and Weaknesses*

*Strengths*

In addition to providing comparable care, NPs represent an opportunity for decreased cost. The most direct reason is that NPs provide the same level of care but receive lower reimbursement rates. For

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122 54% of 20 (=10.8) minus the 15.5% of 20 (=3.1) who would have already practiced primary care equals 7.7 rounded down to 7.


MD panel 1,700 vs. NP 1400 (82% productivity) but other research says 2,300/per MD 82% of 2,300=1,894 times 11 = 20,835
example, when NPs bill Medicare for services provided they receive 80-85% of the physician rate. This is reflective of NPs’ less extensive training process and their status as relative newcomers to the field of independent medical practice. Moreover, there are fewer malpractice lawsuits against NPs and they often work as part of more efficient team-based medical practices. These factors both create indirect savings that can be passed on to patients and the healthcare system as a whole.

Another benefit to using NPs is the time it takes for them to go from the beginning of training to independent practice. The education process is usually two years from the beginning courses to seeing patients. After about one additional year of practice, they are able to prescribe medications under supervision of a qualified preceptor. One year later they have the opportunity to begin practicing independently. This is an almost two year advantage when compared to physicians who generally complete 4 years of training prior to beginning to care for patients as a resident (they do have prescriptive authority as residents), then at least 3 years of supervision before independent practice. This difference represents entering direct care a year sooner and independent practice three years earlier, than physicians.

Current practice patterns of NPs also mean they are well positioned to help alleviate primary care shortages in rural areas. One is that more NPs already practice in rural areas. In Colorado 11% of NPs practice in rural areas compared to the 9% national rate for physicians. When it comes to primary care, the difference is even more pronounced. Seventy-one percent of NPs practice primary care compared to the 32% national rate at which physicians practice primary care. Some nurse practitioner advocates have also encouraged a focus on NPs as a means to increase access for government health insurance such as Medicaid. They assert that NPs accept this form of insurance at a higher rate, but recent national research questions this belief. It is unclear how NPs will respond to new reimbursement rate increases for

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127 Ibid.
primary care services that are only being given to physicians.\textsuperscript{129} It is possible that they begin accepting government health insurance less frequently as a result. Nurse practitioners currently practicing in Colorado also report that one of the challenges they face is getting private insurance companies to reimburse them for care unless they are working with a physician.\textsuperscript{130} If private insurance companies begin reimbursing nurse practitioners more frequently they could become less reliant on patients with government healthcare as a source of business and stop accepting these clients as frequently. This uncertainty creates both opportunity and uncertainty for nurse practitioners and any nurse practitioner focused policy.

Another benefit of focusing on NPs is that the universities providing nurse practitioner training are more dispersed throughout Colorado. Locations include Pueblo, Greeley, and Grand Junction. The variance in location, and the availability of some online instruction, means rural students do not have to move to Denver to attend classes. Additionally, the clinical portion of NP education is less extensive and less formal than the physician residency process which enables nurse practitioners in training to develop individualized and geographically diverse training locations. Having nurse practitioner programs located in areas outside of the Front Range helps eliminate the physical and cultural barriers to forming the partnerships with existing rural providers which are necessary for hands-on training experiences. This is beneficial because rural training is also a factor associated with rural practice for NPs.\textsuperscript{131} One potential drawback to the geographic dispersion of NP programs is that they could already be meeting the demand for training new NPs. However, the addition of a NP program at Mesa State, the additional doctor of nurse practice programs at other Colorado universities, and younger average age of NPs compared to

\textsuperscript{129}Colman, K. (2013). With expansion looming, less than half of physicians accept medicaid. Retrieved from www.healthpocket.com
other nurses in Colorado indicate otherwise.\textsuperscript{132} If the demand for NP training had been met, these new programs would not have been created.

The overall status of the nursing profession should also be considered. Like PCPs there is an ongoing shortage of registered nurses in the U.S. The shortage is related to increasing demand from an aging population, an aging nurse workforce approaching retirement, and a shortage of nurses who are willing and qualified (a master’s degree is generally required) to teach new nurses.\textsuperscript{133} For example, only about 36\% of graduating nurses have bachelor’s degrees. The rest are trained through associate’s degree programs and hospital based training programs.\textsuperscript{134} These forms of nurse training have increased the number of nurses, but mean that many nurses must first get a bachelor’s degree before starting a master’s level program and acquiring the qualifications to be a nurse educator. The result is a nursing education system that denies admission to thousands of qualified applicants every year due to a shortage of faculty.\textsuperscript{135} Efforts to increase the number and diversity of nurses who are qualified to train other nurses have the potential to make a positive impact in a related healthcare workforce issue. It also means any effort to increase the number or diversity of NPs could be hampered by an inability find qualified nursing faculty, particularly at institutions in more rural areas.

\textbf{Weaknesses}

There are also aspects of the current nurse workforce that could negatively impact the effectiveness a policy approach focusing on nurse practitioners. One is the education level of current nurses. A bachelor’s degree is generally necessary to be accepted into a nurse practitioner training program. According to the 2008 National Sample Survey of Registered Nurses, only 34 percent of the current nursing population holds a bachelor’s of nursing, whereas the remainder were educated though associate’s degree programs (45\%) and hospital based diploma programs (20\%). Furthermore, nurses

\textsuperscript{134} Ibid.
\textsuperscript{135} Ibid.
from rural areas tend to have lower levels of academic achievement compared to their urban counterparts.\textsuperscript{136} This limits the number of people who are from a rural area, are qualified nurses, and are interested in becoming a nurse practitioner. It also means many of these practicing nurses would have to leave or add to current career responsibilities. The fact that nurses tend to be female, over 80\textsuperscript{137} of nurses are white females, also means time taken for motherhood can lessen the number of current nurses willing, or able, to devote the necessary time to obtaining an advanced nursing degree. Some institutions have programs specifically designed for nurses with associates degrees or nursing certificates to work towards a NP credential. These programs would be an ideal place to increase the number of rural matriculants to overcome the demographic characteristic of having lower levels of academic attainment.

Similarly, NPs tend to start practicing at a later age, and as a result, have shorter careers. Currently, 39\% of Colorado NPs are over the age of 55\textsuperscript{138} compared to the 33\% national rate for physicians.\textsuperscript{139} This older age and shorter career means closing the supply gap for primary care practitioners using NPs requires younger professionals or a greater number of professionals.

The final challenge to NPs as a remedy to primary care shortages is the opposition of physician groups to NP independent practice. The American College of Physicians (ACP), American Academy of Family Physicians (AAFP), and American Medical Association (AMA) all oppose independent practice for NPs.\textsuperscript{140} When the Institute of Medicine released a report supporting the increase independence of NPs in 2010, the AMA immediately expressed its opposition. It cited the public’s expectation to see a physician when seeking care and the more schooling and supervised experience physicians receive.\textsuperscript{141} In 2012 AAFP released a comprehensive report agreeing with the medical policy-making communities’

\textsuperscript{137} Ibid.
\textsuperscript{140} American Medical Directors Association (unknown). Nonphysician providers - Relevant position statements. Retrieved from https://amda.com/advocacy/Society.cfm?printPage=1&
concern regarding primary care shortages. However, they again highlighted the difference in education level of physicians, and instead advocated for a team-based, physician-led approach to primary care. As discussed earlier, this approach increases capacity by utilizing non-physician providers, including NPs, who provide direct care but are supervised by physicians.\textsuperscript{142} In some ways these physician groups exaggerate the difference in training experience between NPs and MDs. They neglect to consider the 3,600 hours of supervised practice NPs must complete in Colorado before being able to prescribe drugs and practice independently. However, physicians do require at least one more year of academic study. Also, using the lowest training estimates for physicians and the highest for NPs (which includes the 3,600 of supervised clinical time), physicians complete about 11,400 more hours of clinical training.\textsuperscript{143} It is clear that the education process to train a primary care physician is much more extensive than the process for training a nurse practitioner. Outcomes research for common conditions indicates little difference, but physicians should be better prepared to provide care for more complex or uncommon medical situations.

In an ideal health system extensively trained physicians would provide primary care in all rural areas. However, the reality is that physicians are not choosing primary care or rural practice at the rate needed to keep up with current demand. Nurse practitioners are willing to practice in rural areas, their shorter training program means policy efforts can make a quicker impact, and outcomes research indicates that in the majority of primary care situations they provide the same level of care as physicians.

**Cost-Benefit Analysis**

This memorandum uses a cost-benefit analysis (CBA) as a tool to calculate and compare the impact of each policy option in monetary terms. The section that follows is a summary of the findings of the complete CBA. A comprehensive list of calculations and their descriptions can be found in Appendix A. Because none of the options analyzed have immediate beneficial effects, all are considered at years


\textsuperscript{143} Ibid. Education and Training Only clinical hours and residency hours were used. Lecture and study hours were excluded.
one, three, five and ten. All values have been converted to 2014 dollars and present value calculations use a 7% social discount rate.

The problem addressed by this memorandum and the policy options proposed focus on rural areas in Colorado. The list of stakeholders in the preceding issue analysis included urban patients, students, and communities. These urban groups are considered for the political and cultural context of the issue, but stakeholders for the CBA are limited to rural groups and entities directly responsible for financing or implementing policies.

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Status Quo</th>
<th>Physician Admissions</th>
<th>Rural Residencies</th>
<th>Nurse Practitioner Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Patients</td>
<td>Lives Saved</td>
<td>Lives Saved</td>
<td>Lives Saved</td>
<td>Lives Saved</td>
</tr>
<tr>
<td>Schools</td>
<td>Admissions Changes</td>
<td>Rural Track</td>
<td>Residency Program</td>
<td>Admissions Changes</td>
</tr>
<tr>
<td>Funders (ex. tax dollars and non-profit funds)</td>
<td>Rural Track, Colorado Health Service Corps</td>
<td>Rural Track</td>
<td>Residency Program</td>
<td></td>
</tr>
<tr>
<td>Rural Communities</td>
<td>Wages from PCPs</td>
<td>Wages from PCPs</td>
<td>Wages from PCPs and Residency Program Staff</td>
<td>Wages from PCPs</td>
</tr>
</tbody>
</table>

The CBA will briefly describe each policy option in terms of stakeholders affected, how they are affected, and the associated net present values (NPV). Rural patients are the most important stakeholder group that is included in all policy options and the status quo. Measuring the impact is also the most complex. Calculating the benefits to this group involved taking the value of a statistical life and multiplying it by the number of lives saved per primary care physician. It should also be noted that the status quo is included separately in the CBA. The status quo clearly has a beneficial effect on the number of rural primary care providers, but the shortage persists. Therefore, all policy options have been developed to add to current efforts, and assume that the status quo will continue.
Status Quo

The status quo policy efforts analyzed in this cost-benefit analysis are the Colorado Health Service Corps student loan forgiveness program and the Rural Track program at the University of Colorado School of Medicine (more detailed descriptions of these programs can be found on pages 12 and 17 respectively). These are the current approaches that are explicitly focused on encouraging current students and recent graduates to practice primary care in rural Colorado. Costs are currently covered by a combination of non-profit organizations and tax dollars. The programs result in additional primary care providers through current program participants and alumni who continue to practice primary care in rural areas. Benefits are monetized through the value of lives saved by these rural practitioners and the economic impact of their wages in the rural communities where they practice.

<table>
<thead>
<tr>
<th>Status Quo Monetary Values</th>
<th>Year 1</th>
<th>Year 3</th>
<th>Year 5</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Cost (annual)</td>
<td>-$6,400,000</td>
<td>-$6,409,600</td>
<td>-$6,419,430</td>
<td>-$6,429,497</td>
</tr>
<tr>
<td>Real Benefit (annual)</td>
<td>$302,588,550</td>
<td>$437,072,350</td>
<td>$571,556,150</td>
<td>$907,765,650</td>
</tr>
<tr>
<td>Net Value (annual)</td>
<td>$296,188,550</td>
<td>$430,652,920</td>
<td>$497,884,753</td>
<td>$565,116,345</td>
</tr>
<tr>
<td>Cumulative Net Present Value</td>
<td>$296,188,550</td>
<td>$1,011,983,143</td>
<td>$1,849,529,960</td>
<td>$4,219,724,897</td>
</tr>
</tbody>
</table>

The table demonstrates how the cost of the program is consistent at $6.4 million annually. However, the benefits grow every year as program participants enter the workforce. For example, in year one there is 18 physicians practicing in rural areas to fulfill their 3 year commitment. In year two 4 physicians have completed their requirement and chosen to practice in a rural area. With 18 program participants and 4 alumni the total number of physicians practicing in a rural area as a result of the policy is 22. The next year the cumulative result is 26 and the pattern continues annually. Benefits measured by value of a statistical life saved and the wages associated with primary care providers increase accordingly.
Physician Admissions

The physician admissions policy option involves using the admissions process to increase the number of medical school students in Colorado who have a rural background and an interest in primary care. Implementing this policy option requires the modification of admissions policies and the expansion of the Rural Track program at the University of Colorado School of Medicine. Changes to the admissions program can be incorporated within the current admissions activities and represent zero cost increase.

The only actual costs associated with this approach come from the addition to the Rural Track program.

<table>
<thead>
<tr>
<th>Physician Admissions Monetary Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
</tr>
<tr>
<td><strong>Year 5</strong></td>
</tr>
<tr>
<td><strong>Year 10</strong></td>
</tr>
<tr>
<td><strong>Real Cost (annual)</strong></td>
</tr>
<tr>
<td>-$60,000</td>
</tr>
<tr>
<td>-$188,744</td>
</tr>
<tr>
<td>-$257,698</td>
</tr>
<tr>
<td>-$263,883</td>
</tr>
<tr>
<td><strong>Real Benefit (annual)</strong></td>
</tr>
<tr>
<td>$0</td>
</tr>
<tr>
<td>$0</td>
</tr>
<tr>
<td>$0</td>
</tr>
<tr>
<td>$222,138,696</td>
</tr>
<tr>
<td><strong>Net Value (annual)</strong></td>
</tr>
<tr>
<td>-$60,000</td>
</tr>
<tr>
<td>-$188,744</td>
</tr>
<tr>
<td>-$263,883</td>
</tr>
<tr>
<td>$221,841,590</td>
</tr>
<tr>
<td><strong>Cumulative Net Present Value</strong></td>
</tr>
<tr>
<td>-$60,000</td>
</tr>
<tr>
<td>-$339,697</td>
</tr>
<tr>
<td>-$751,371</td>
</tr>
<tr>
<td>$251,496,835</td>
</tr>
</tbody>
</table>

The length of time it takes to complete medical school and residency training is seven years.

The result is that this policy option’s benefits are not present prior to year eight. Again, benefits grow as physicians enter the workforce each year.

Rural Residencies

Calculating the value of the policy to create new residency programs in rural areas is the most complex option considered. Costs include staff, physical space, and equipment. Benefits come from the actual residency program via wages paid to the program staff and the benefits of care provided by residents. The other source of benefits is the physicians who graduate from the residency program and decide to practice in rural Colorado. These benefits are also the result of wages created and care provided.
Due to the complexity of creating new residency programs costs and benefits are not realized immediately. Similar to other policy options, the residency program gradually builds to full capacity. Residents begin matriculating in year three, and the program reaches full capacity in year five. Once the program reaches full capacity the annual costs and benefits directly related to the program remain consistent. Year six is the first year when program participants are practicing in rural areas - their numbers and associated benefits continue to increase annually.

**Nurse Practitioner Admissions**

The nurse practitioner admissions policy option utilizes the admissions policies at Colorado nurse practitioner training programs to increase the number of students with rural backgrounds. Costs associated with this approach would be related to changing the admissions policies. However, changes can be incorporated into current admissions department activities without any additional cost.
Because nurse practitioner training programs take two years to complete, benefits associated with this policy option are realized in year three. Benefits are monetized through the value of lives saved by these rural practitioners and the economic impact of their wages in the rural communities where they practice. This is essentially the same approach as the physician admissions policy option but utilizing nurse practitioners. However, the monetary values associated with the program differ because there is no rural track associated with the NP approach, NPs generally see fewer patients, and they earn less income. These differences result in decreases to the cost of the NP policy option, decreases to the per practitioner benefit for rural patients, and decreases to the per practitioner benefit for rural communities.

**Net Present Value Comparison**

The utility of a cost-benefit analysis is that it allows the side-by-side comparison of multiple policy options. In this case the CBA clearly shows that all policy options, including the status quo, have a long-term net present value that is positive. The status quo is already in place, but the economic benefit of the status quo provides justification to continue the program. However, because a primary care shortage for rural areas persists, additional efforts are needed. The physician admissions policy option has a negative NPV for the first number of years due to the seven year period it takes for an incoming
medical school student to complete medical school and residency training. The rural residencies policy option shows a modest positive net present value in years three and five before increasing substantially by year ten. This is related to a combination of factors including the time and cost of starting a new residency program, and the program’s gradual progression to full capacity with completely trained physicians participating in the workforce. The nurse practitioner policy option has drastically larger net present value in all years. This is a direct consequence of the shorter training period of nurse practitioners. The benefits of changing the admissions criteria to accept more NP students from rural areas are measured in year three which is five years sooner than the similar approach applied to medical schools. The larger proportion of nurse practitioners who practice primary care and the zero cost associated with the policy option contributed to sizeable difference in benefits. From a strict cost-benefit perspective, the nurse practitioner policy option is the recommended course of action.

Sensitivity Analysis: The Social Discount Rate

The social discount rate (SDR) involves a judgment regarding the value placed on current financial resources compared to future financial resources. The decision is generally based on the cost of capital and the preference of the entity commissioning the cost-benefit analysis. The 7% social discount rate used in this CBA is the rate recommended by the United States Office of Management and Budget. However, using alternative discount rates is a way to prioritize current or future benefits. A discount rate of 10% was the rate used by the Office of Management and Budget prior to the switch to its current 7% rate. This higher rate is used as one alternate for the sensitivity analysis and prioritizes current resources. Boardman et al also points out that more accurately basing the discount rate on the cost of capital would move the discount rate to 4.5 percent. This lower rate effectively prioritizes future financial value.

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145 Ibid.
146 Ibid.
### Sensitivity Analysis One: Net Present Value with Alternate Social Discount Rates (SDR)

<table>
<thead>
<tr>
<th>Policy</th>
<th>Year 1</th>
<th>Year 3</th>
<th>Year 5</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Present Value 4.5% SDR</strong></td>
<td><strong>Status Quo</strong></td>
<td><strong>Physician Admissions</strong></td>
<td>$296,188,550</td>
<td>$1,038,348,455</td>
</tr>
<tr>
<td></td>
<td><strong>Rural Residencies</strong></td>
<td>$-60,000</td>
<td>$-339,664</td>
<td>$-751,230</td>
</tr>
<tr>
<td></td>
<td><strong>Nurse Practitioner Admissions</strong></td>
<td>$0</td>
<td>$2,401,086</td>
<td>$15,880,948</td>
</tr>
<tr>
<td><strong>Net Present Value 7% SDR</strong> (original)</td>
<td><strong>Status Quo</strong></td>
<td><strong>Physician Admissions</strong></td>
<td>$296,188,550</td>
<td>$1,012,009,086</td>
</tr>
<tr>
<td></td>
<td><strong>Rural Residencies</strong></td>
<td>$-60,000</td>
<td>$-329,369</td>
<td>$-708,375</td>
</tr>
<tr>
<td></td>
<td><strong>Nurse Practitioner Admissions</strong></td>
<td>$0</td>
<td>$49,286,102</td>
<td>$279,011,852</td>
</tr>
<tr>
<td><strong>Net Present Value 10% SDR</strong></td>
<td><strong>Status Quo</strong></td>
<td><strong>Physician Admissions</strong></td>
<td>$296,188,550</td>
<td>$982,507,430</td>
</tr>
<tr>
<td></td>
<td><strong>Rural Residencies</strong></td>
<td>$-60,000</td>
<td>$-317,851</td>
<td>$-662,090</td>
</tr>
<tr>
<td></td>
<td><strong>Nurse Practitioner Admissions</strong></td>
<td>$0</td>
<td>$2,160,835</td>
<td>$13,372,746</td>
</tr>
<tr>
<td></td>
<td><strong>Additions</strong></td>
<td>$0</td>
<td>$44,480,707</td>
<td>$235,637,467</td>
</tr>
</tbody>
</table>

The sensitivity analysis using alternative social discount rates results in alternative net present values. The 4.5% discount rate creates net present values that are larger than those in the original analysis, reflecting a greater emphasis on future value. The 10% discount rate creates net present values that are smaller than those in the original analysis, reflecting a greater emphasis on current value. What the sensitivity analysis doesn’t change is the comparison between the policy options presented. The nurse
practitioner option creates a substantially greater monetary benefit regardless of which social discount rate is used.

### Sensitivity Analysis: Program Expansion

As policy makers see that admitting more nurse practitioner students from rural backgrounds is successfully decreasing the shortage of rural primary care providers, they might decide to expand the initiative. An additional sensitivity analysis measures the impact of this change. Policy makers would need to allow the two years for students to complete NP school before the policy’s benefits are realized and three years to evaluate the success. Therefore, the decision to expand the initiative would take place at the end of year five. Allowing for the increased number of students to complete their NP training program would also take two years. The benefits of the expanded initiative would begin in year eight.

The original NP admissions policy option increased the number of students with rural backgrounds by 20 students. The capacity to expand the initiative is not infinite because nurse practitioner programs are relatively small and the number of qualified applicants is somewhat limited. A realistic expansion would be to admit 10 more students for a total of 30. This would represent an annual increase of 3 nurse practitioners in rural Colorado. The benefits related to these additional rural primary care providers begin in year eight and accrue accordingly. By the end of year ten there would be 9 additional rural PCPs and over $77,000,000 in additional net present value.

| Sensitivity Analysis Two: Comparison Between Original and Expanded NP Admissions Policy |
|-------------------------------------------------|----------|----------|
| **Number of Rural PCPs Added Annually**         | Original | Expanded |
|                                                 | 7        | 10       |
| **Year Benefits Begin to Accru**                | 3        | 8        |
| **Cumulative Number of New Rural PCPs At Year Ten** | 56       | 65       |
| **Cumulative Net Present Value After Year Ten** | $1,223,731,238 | $1,301,209,991 |

147 54% of 10 (=5.4) minus the 15.5% of 10 (=1.6) who would have already practiced primary care equals 3.8, rounded down to 3.
Assumptions

This analysis addresses topic of residency programs as if it is possible to strictly create programs focusing entirely on primary care. However, since there are also documented shortages of specialty care in rural areas, it is more likely, if not preferable, that the creation of rural residency programs would include components that prepare students for specialty practice as well. Many program components allow or require residents to attend specific training activities that may only be available in different locations. This analysis also assumes that the physical distance from other medical facilities and teaching resources can be overcome through the use of technology to eliminate the need for students to physically attend some training activities.

Another assumption is that Colorado schools educate most of the individuals who practice medicine in the state. Most of the institutions that offer NP programs cater more toward local communities and the state’s medical schools attract in-state students. Still, many people are educated elsewhere but practice medicine after moving to Colorado. Whether a benefit in the form of more potential PCPs, or a drawback by allowing less control/influence in rural PCP practice, it adds a level of complexity to provider recruitment that is only minimally addressed by this piece. Another assumption is that there are a finite number of admissions slots available in these programs. While not within the scope of this analysis, creation of additional training programs or increasing the capacity of existing programs would increase the number of providers but would not take admission slots away from urban students.

Finally, the discussion treats all rural areas of Colorado the same. In reality Colorado’s unique geography means this is not true. The Eastern Plains and Rocky Mountain regions have different economic, cultural, and geographic challenges. In the Colorado Health Institute’s survey of rural providers and what they considered important when choosing to practice rural areas, the most common response (70%) was the availability of “recreation/leisure activities.” It is likely the majority of these

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responses were in reference to the outdoor activities, such as hiking and skiing, in the state’s mountain areas. Recruiting health professionals to practice in the plains clearly has some different challenges.

Other Notes and Limitations

Physician assistants are another potential provider category in which policy efforts to increase the number of PCPs in rural Colorado could be implemented. This level of practitioner works under the supervision of a doctor and was developed to increase the number of PCPs. However, by definition, they have less autonomy, and they have specialized at rates similar to doctors. As a result, they were not comprehensively addressed.

It is also important to remember that the systems addressed in this work are complex, and policy efforts are not enacted in isolation. High school graduation rates affect number of acceptable NP or medical school applicants years later. Current efforts can also have unintended consequences. One example is the aforementioned multiple entry model for nurse practice which was created to increase the number of nurses, but has actually decreased the number of nurses with bachelor's degrees who are qualified to enter NP programs. It can be difficult to measure the impacts of specific initiatives for all stakeholders who could be impacted, and completely understanding the complex relationships between multiple factors is nearly impossible. This complexity also means that much of the research available regarding primary care and its impact on health is based association rather than the preferred causal relationship.

Recommendation

*Increased admission for nurse practitioner school applicants from rural areas who also intend to practice primary care is the policy recommendation.*

All the policy options considered result in more primary care providers in rural areas as well as the associated benefits of lives saved and positive economic impact. Because nurse practitioners and

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physicians provide similar quality primary care, differences between policy options are assessed through how well policy options prepare practitioners for rural practice, the cost of implementation, the political feasibility of implementation, and most importantly, the number of rural primary care providers created.

In regards to how well PCPs would be prepared for practice in rural areas, firsthand experience is important. Rural residency programs clearly provide the most authentic rural training experience. The location of NP programs throughout the state increases also students’ opportunities to familiarize themselves with diverse practice locations. The physician admissions policy option results in physicians who have familiarity with rural areas, but offers the least guarantee that these physicians would have formal rural training.

From a strict cost perspective, the physician and NP admission changes are less expensive. For nurse practitioners there is no cost associated with changes to admissions policies. For physicians the only cost is expanding the Rural Track at the University of Colorado School of Medicine. The rural residency policy option has significant costs, about $1.5 million annually, related to the creation, maintenance and staffing of the new program.

In terms of political feasibility the nurse practitioner admissions policy option is also the preferred approach. First, the absence of associated cost makes it more publicly palatable than spending the money necessary to create a new residency program. Secondly, making changes to nursing programs is less likely to initiate public controversy than making changes to medical schools. The program requirements of medical schools have remained relatively unchanged for decades and are similar at most institutions across the country. The admissions process is also very competitive and affirmative action type changes are controversial. These factors mean opposition from alumni, current students, and urban applicants make changes to the process less politically feasible.

The most important aspect to evaluate when comparing policy options is the number of rural PCPs created. Differences occur between the policy options in terms of magnitude of these benefits and the timeframe in which they are realized. When analyzing the number of PCPs added to rural
communities each year, the physician admissions approach (8/year) and nurse practitioner approach (7/year) are clearly more effective than the rural residency approach (3/year).

However, a change in the admissions policy impacts the workforce only after the students admitted under the new policy have completed their training. There is a significant difference between when those annual increases in providers are realized. Physicians have a seven year training process, but for nurse practitioners it is only two. This five year time difference means the nurse practitioner admissions policy option has the overall greatest impact on the number of rural PCPs despite creating one fewer rural PCP per year. In year ten there would be 56 rural NPs compared to 24 rural physicians. Unsurprisingly, the cost-benefit analysis reflects these differences and also indicates that the NP admissions policy is the most beneficial from an economic standpoint.

The nurse practitioner affirmative action admissions policy for applicants with rural backgrounds is the recommended policy. Nurse practitioners provide quality care, implementing the policy is inexpensive, it creates the largest number of rural PCPs who have exposure to rural practice, and the effects are realized more quickly than other policy options.

On a final note, it should be known that none of the policy options are mutually exclusive to each other, or to the current efforts to increase the number primary care providers. On the contrary, implementing multiple policy efforts simultaneously is likely to enhance the effectiveness of all programs by increasing issue awareness and making primary care practice in rural areas a more attractive opportunity.
Issues Raised

The current shortage of primary care providers in rural areas and efforts to mitigate the shortage allude to two issues that will likely become more visible in the future. The first is the general decline and future viability of rural communities throughout the United States. Advances in farming efficiency have decreased the manpower needed to cultivate the land, people are increasingly choosing to live in urban areas, and aging demographic trends indicate a decreasing rural population. How society and the medical community respond to this shift is important, but still unclear.

Secondly, the focus on nurse practitioners raises the question whether medical doctors will continue to provide primary care or if other practitioners will completely usurp their role. If physicians are choosing specialty practice over primary care at increasing rates, but nurse practitioners, physician assistants, and lower level providers working in teams are willing and able to provide necessary care, why don’t we allow this shift to play out? In some ways the physician-supervised, team-based approach is an embodiment of this potential shift, but physicians’ groups’ resistance to NP independent practice demonstrates an unwillingness to continue the shift. Unfortunately this issue is generally neglected in the academic literature - another indicator of the field’s discomfort with the idea. It is difficult to assess why the issue hasn’t been discussed, but differences between nurses, physicians and their education programs might play a role. The first years of medical school have a focus on science education and research while NP programs have a more clinical, hands-on focus (Nurses are required to receive science training when getting their initial nurse certification). The higher number of academic journals written by, and for, physicians could be a result of this difference. Also, because physicians have been the traditional providers of primary care, and the authors of academic research, they have been less willing to consider new provider roles. Little change has been seen in this area because society as a whole is clearly comfortable with primary care being provided by physicians, just like it has been done for centuries. Lastly, a feminist look at gender roles and power might conclude that in a male dominated society, a
profession composed mostly of women such as nurse practitioners has not been allowed, or taken, the opportunity to increase the legitimacy of their profession through research and increased independence.

The primary care shortage in rural Colorado is an independent problem. However, it also belies the state’s need to address demographic shifts in rural communities and developments within the broader healthcare workforce.
Appendix A: Cost-Benefit Analysis Calculations and Matrix

**Benefit to Rural Patients** (benefits of primary care measured in per patient mortality rates)

Aldy and Viscusi estimate the value of a statistical life (VSL) at $6.38 million in 2014 dollars.\(^{150}\) Shi et al found that one more primary care physician per 10,000 people saved about 14 lives per 100,000 people so 1 physician represents 1.4 saved lives. Therefore, for each additional physician results in $8.93 million in benefit (6.38x1.4=8.93).

Nurse Practitioners see about 82% of the number of patients of physicians.\(^{151}\) Assuming that lives saved is a function of patients seen each additional nurse practitioners represents 1.148 lives saved (.82x1.4=1.148) and $7.32 million in benefit (1.148x6.38=7.) per nurse practitioner.

Residents also provide care. However, because current physicians devote time to instructing residents the net result is about 200 more visits annually.\(^{152}\) This is the equivalent of 9% of the care provided by a full-time physician. Therefore, residents represent .126 lives saved (1.4x.09=.126) and $0.8 million in benefit (.126x6.38=.8) per resident.

**Impact of Rural Track Curriculum at Medical Schools (Status Quo)**

Research found that by themselves medical school curriculum changes such as the University of Colorado’s Rural Track have no positive impact on students’ decision to practice in rural areas.\(^{153}\) Practice and residency locations of recent Rural Track graduates support these findings - few graduates

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have gone on to residencies in rural areas\textsuperscript{154} or to actually practice in rural areas.\textsuperscript{155} The benefits of these programs are seen when combined with other efforts to increase the number of students who are from rural areas and who have an expressed interest in rural primary care. When combined with these programs rural focused curriculum increases the number of rural providers by maintaining student interest and preparing students for rural practice.\textsuperscript{156} As a result the cost is included in the status quo calculations, but the program doesn’t change the number of physicians practicing in rural Colorado. Furthermore, it is assumed that some students who participate in the Colorado Health Service Corps are graduates from the Rural Track. Rocky Vista University is not included in the calculation because it already includes a rural curriculum for all students.

**Impact of Colorado Health Services Corps (Status Quo)**

Research shows that approximately 30\% percent of participants of student loan forgiveness programs in rural areas continue to practice in rural areas after they have fulfilled their required service responsibilities.\textsuperscript{157} Records from the Colorado Health Service Corps show about 28 awards go to primary care providers (physicians, nurse practitioners, and physician assistants) each year who practice in rural counties. With a three year commitment and 30\% retention rate that means each year the program adds 36 rural PCPs. Half of these are physicians and the other half are nurse practitioners and physician assistants. Each year there are 14 physicians participating in the program and 4 “alumni” who continue to practice in rural areas. Similarly, there are 14 NP/PAs participating and 4 alumni who continue to

practice in rural areas. Physician assistants and nurse practitioners are treated the same for the purposes of this cost benefit analysis.

**Cost of Adding To the Rural Track at the University of Colorado School of Medicine**

The cost estimate is provided in the University of Colorado School of Medicine Rural Track report. It states that the existing program costs $400,000 cost for 60 students and a $480,000 cost for 80 students (this is also the amount used for the status quo). Therefore, the cost is $4,000/student. For the medical school admissions policy option, 15 more rural track participants per year builds up to a total of 60 after four years and a total annual cost of $240,000. The numbers have also been adjusted for inflation using the 10 year average CPI which is 2.4 percent.

**Cost of Colorado Health Service Corps**

The program makes up the majority of the cost of the current efforts to increase the number of rural practitioners and the status quo. The latest quarterly releases about the program report about $1.5 million in awards. The annual cost is $6 million (1.5 x 4 = 6).

**Positive Economic Impact of Employed PCPs**

National Center for Rural Works concluded that one primary care physician working in an individual clinic directly generates economic impact via in salary, and benefits for his/herself and their

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associated staff including a nurse, medical technician and receptionist.\textsuperscript{162} Most recent U.S. Bureau of Labor Statistics estimates for these professions are $180,850 for Physicians, $67,930 for nurses, $43,930 for medical technicians and $27,050 for receptionists.\textsuperscript{163}

Nurse Practitioners earned $91,450, or $89,400 less than physicians.\textsuperscript{164} Assuming the wages associated with support staff are the same, physicians contribute $319,760 in wages to the local economy and nurse practitioners $230,360. Converted to 2014 dollars this is $325,779 and $234,696 respectively.

The Social Discount Rate and Present Value

The net present value was calculated using the 7\% social discount rate recommended by United States Office of Management and Budget\textsuperscript{165} and the formula $PV = \frac{V}{(1 + r)^t}$.

Sensitivity Analysis: Alternate Social Discount Rates and Present Value

The sensitivity analysis consisted of using the alternate social discount rates of 10 percent and 4.5 percent. The formula $PV = \frac{V}{(1 + r)^t}$ was used to calculate the present value.

Impact of Medical School Admissions

Medical school students with rural background and an interest in primary care go on to practice rural primary care 36\% of the time compared to the standard rate 7\% rate for all physicians.\textsuperscript{166} This represents an increase of 29 percentage points. Therefore, if 30 additional students with a rural


\textsuperscript{164} Ibid


\textsuperscript{166} Rabinowitz HK, Diamond JJ, Markham FW, & Paynter NP. (2001). Critical factors for designing programs to increase the supply and retention of rural primary care physicians. \textit{JAMA}, 286(9), 1041–1048. doi:10.1001/jama.286.9.1041
background and an interest in primary care were admitted to medical school programs in Colorado, it would lead to 8 additional rural primary care practitioners \((0.29 \times 30 = 8.7\) rounded down to 8 people).

Benefits begin in year eight for the Medical School Admissions policy option because completing both medical school and residency training takes seven years.

**Costs of Changing Program Admissions Policies**

Two policy options require schools to change their admissions policies to identify students with rural backgrounds and consider the background in the admissions criteria. Making these changes is within the normal scope of annual changes to applications and admissions criteria\(^{167,168}\). The cost to these changes is zero.

Also, changing admissions criteria for medical training programs to increase the number of students with rural upbringing does not immediately impact the number of rural practitioners. Most results can only be seen after these students have graduated and begun medical practice. For NPs that means a three year lapse between starting a training program and practicing in the community. For physicians the time lapse is seven years to include medical school and a 3 year residency program.

**Impact of Rural Residency Programs**

Physicians who complete their residencies in rural areas continue to practice in rural areas about 75 percent of the time.\(^{169}\) Residency programs take three years to complete. A new residency program with 12 total 12 residents in rural areas, results in an annual increase of 4 primary care physicians, 3 of whom choose to practice in rural areas \((4 \times 0.75 = 3)\). Residents also provide care and are included in the calculations in regards to benefits to patients.

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A new residency program takes at least two years to set up. In year three the program includes practicing residents, and it reaches full capacity at year five. In year six some of the program participants are now full-time practicing physicians. Benefits and costs accrue according to this schedule for the Rural Residencies policy option.

Cost of Starting and Running a Rural Residency Program

Cost estimates are based on estimates from the University of Georgia’s attempts to create new residency programs. The program(s) build up to full capacity/staff, and some administrative costs are present before residents begin to participate.

Benefit of Residency Programs For Rural Communities

The National Center for Rural Health Works also describes the potential economic impact of rural residency programs in rural regions. In their 2007 analysis of the impact of rural residency, the community total employment of the rural residency program with 12 residents directly contributed $803,500 to the local economy via salaries and benefits. This is equal to $66,958 per resident in 2008 and $72,747 in 2014 dollars.

Impact of Nurse Practitioner Admissions

Using physician rates as a proxy due to lack of formal study, nurse practitioners are 3.5 times more likely to practice rural primary care if they have a rural background and interest in primary care.

---


upon entering nurse practitioner training programs. Currently 15.5% of all nurse practitioners provide primary care in rural areas, therefore 54% of nurse practitioner students with a rural background and an interest in primary care will go on to be rural primary care providers (15.5 x 3.5 = 54.25). This represents an increase of about 39 percentage points. Therefore, if 20 more applicants with these characteristics are accepted to NP programs it would represent an annual increase of 7 NPs providing primary care in rural areas (20 x .39 = 7.8 rounded down to 7 people).

Because it takes two years to complete NP training, these benefits begin in year three for the Nurse Practitioner Admissions policy option.

For the additional sensitivity analysis described on page 45 ten additional students with rural backgrounds are admitted to NP programs. The result is an annual addition of three NPs practicing in rural areas (10 x .39 = 3.9 rounded down to 3 people). Again, this increase would be realized in year eight because there is a two year delay before benefits can be realized due to the time it takes NPs to complete school.

Other Notes

- Urban residents are included as a stakeholder in the issue analysis. However they are not included in the cost benefit section because urban residents currently have much better access to primary care providers. For example, the resident to primary care physician ratio in urban Denver County is 1,348:1 while the ratio in nearby rural counties is 5,636 to one.

---

174 17.8% practice in rural areas(a) and 87.2 provide primary care (b)
174(a) American Academy of Nurse practitioners (2010) 2009-10 AANP National NP sample survey:
- Students from rural and urban communities are also considered in the issue analysis but not in the CBA. Currently there are a limited number of admissions slots in NP and MD/DO training programs. When all of these slots are filled the economic impact for students is consistent. Controversy related to affirmative action for rural students is a valid qualitative discussion, but it is outside the scope of the cost benefit analysis.

- It's also important to remember that current PCPs are retiring. As a result some of the additional PCPs in rural areas are replacing current practitioners.
## Status Quo CBA Matrix

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
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<th>Year 10</th>
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<td>$747,500,000</td>
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<td>Schools</td>
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<tr>
<td>Cost of changing admissions criteria</td>
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<tr>
<td>Other funders such as govs and non-profits</td>
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</tr>
<tr>
<td>Cost of adding to the rural track at University of Colorado School of Medicine with inflation</td>
<td>$-400,000</td>
<td>$-409,600</td>
<td>$-419,430</td>
<td>$-429,497</td>
<td>$-439,805</td>
<td>$-450,369</td>
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<td>Year 5 NPV</td>
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### Physician Admissions CBA Matrix

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<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
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<tbody>
<tr>
<td><strong>Rural patients</strong></td>
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<tr>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
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<td>0</td>
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<td>16</td>
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<td><strong>Schools</strong></td>
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<tr>
<td>Cost of changing admissions criteria</td>
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<tr>
<td><strong>Other funders such as govt and non-profits</strong></td>
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</tr>
<tr>
<td>Cost of adding to the rural track at University of Colorado School of Medicine (with inflation)</td>
<td>-$60,000</td>
<td>-$122,880</td>
<td>-$188,744</td>
<td>-$257,698</td>
<td>-$263,883</td>
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<td>cost of starting and running a residency program</td>
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<tr>
<td>Cost of Colorado Health Service Corps</td>
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<td><strong>Rural Communities</strong></td>
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<tr>
<td>Positive economic impacts of employed physicians in wages created</td>
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<td>Positive economic impacts of employed NPs (and PAs for status quo)</td>
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<td>Positive economic impacts of Residency Programs</td>
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<td>-$263,883</td>
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<td>$120,667,126</td>
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**Total MD Admissions**: $441,966,680

| Net Present Value (10%)            |        |        |        |        |        |        |        |        |        |         |

| Net Present Value (4.5%)           |        |        |        |        |        |        |        |        |        |         |
| Year 3 NPV                        | -$60,000 | -$60,000 | -$60,000 | -$60,000 | -$60,000 | -$60,000 | -$60,000 | -$60,000 | -$60,000 | -$60,000 |
| Year 10 Total NPV: MD             | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 | $149,278,168 |

| Net Present Value (7%)             |        |        |        |        |        |        |        |        |        |         |
| Year 5 NPV                        | -$797,529 | -$797,529 | -$797,529 | -$797,529 | -$797,529 | -$797,529 | -$797,529 | -$797,529 | -$797,529 | -$797,529 |
### Rural Residencies CBA Matrix

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<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural patients</strong></td>
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<tr>
<td>Benefits of primary care</td>
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<td>$6,400,000</td>
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<tr>
<td>Cost of changing admissions criteria</td>
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**Total Rural Residencies**
- Year 3 NPV: $2,287,244
- Year 5 NPV: $14,668,808
- Year 10 Total NPV: Rural: $489,913,091

**Net Present Value (10%) SDR**
- Year 3 NPV: $2,160,835
- Year 5 NPV: $13,372,746
- Year 10 Total NPV: Rural: $243,567,217

**Net Present Value (4.5%) SDR**
- Year 3 NPV: $2,491,086
- Year 5 NPV: $15,880,948
- Year 10 Total NPV: Rural: $353,822,526
### Nurse Practitioner Admissions CBA Matrix

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<th>Year 1</th>
<th>Year 2</th>
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<td>Positive economic impacts of employed physicians in wages created</td>
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Board of Nursing (unknown). Frequently asked questions. Retrieved from colorado.gov


Colin Schneider. Director of Admissions, University of Denver Graduate School of Social Work Personal Communication (2014).


Education and Training Only clinical hours and residency hours were used. Lecture and study hours were excluded.


Health Resources and Service Administration (2014). Teaching Health Center Graduate Medical Education. Retrieved from bhpr.hrsa.gov/grants/teachinghealthcenters/


MD panel 1,700 vs. NP 1400 (82% productivity) but other research says 2,300/per MD 82% of 2,300=1,894 times 11 = 20,835


National Health Service Corps (unknown) Who and where we serve. Retrieved from nhsc.hrsa.gov


Regents of the University of Colorado (2014). Rural Track FAQ. Retrieved from www.ucdenver.edu


Rural designation was taken from the Office of Management and Budget (Cited in Colorado Rural Health Center) cross referenced with the Health Resource and Services Administration’s HPSA database (http://hpsafind.hrsa.gov/)


