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Primary Care in Southern Illinois and Western Kentucky

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HONORS THESIS

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Primary Care in Southern Illinois and Western Kentucky

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Primary Care in Southern Illinois and Western Kentucky

Submitted in partial fulfillment
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for the Murray State University Honors Diploma

Matthew J. Crabtree

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Abstract

There is a major physician shortage occurring across the United States as of 2023 and it is expected to get worse over the next five to ten years. A significant portion of the shortage is predicted to consist of primary care physicians in rural areas. Data on factors that affect primary care visits like rurality, household income, health insurance coverage, non-communicable disease, and primary care physician prevalence were analyzed from the regions of Southern Illinois and Western Kentucky. Health coverage was found to be average to above average in the two regions. However, almost all counties included in the study were found to be significantly rural, have lower than average median income, higher mortality rates of non-communicable disease, and severely low rates of primary care physicians. It was also found that a majority of the counties had either stagnant or decreasing rates of primary care physicians. 74.3% of the counties were found to have significantly lower primary care physician rates than the calculated absolute minimum rate of 60.7 primary care physicians per 100,000 people. In trends from data of medical school matriculant rates and residential program rates, it was found that the number of rural medical students going into primary care has dropped significantly in recent years. Based on the data trends of factors that impact primary care, it is clear that the state of primary care in Southern Illinois and Western Kentucky is worsening and requires significant intervention.

Keywords: Primary care, rural medicine, mental health, quality health care, rural physicians

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Introduction

Primary Care used to be the main discipline of medicine up until World War Two. Following this war, the rise in urbanization resulted in the diminishing of primary care practices (Robinson et al., 2021). By the 1980's, primary care consisted mostly of small, independent practices that focused on the doctor-patient relationship and access to care (Robinson et al., 2021). However, the primary care field has changed drastically in the past 40 years as transparency and productivity have become the main focus of many practices. Practice size has grown and, in many cases, has integrated into larger healthcare systems. This change has put a large strain on the primary care system today. There are high levels of clinician burnout, distress, and disconnect among physicians and patients (Robinson et al., 2021). Primary care is the main field of practice needed in rural areas, "About 20 percent of Americans live in rural areas, but barely one-tenth of physicians practice there. The federal government projects a shortage of over 20,000 primary care physicians in rural areas by 2025" (Nielsen et al., 2017)). This projection has made rural physicians one of the leading issues focused on by medical schools in the United States in recent years. A large number of medical schools have even initiated specialized programs that are designed to generate rural physicians in an accelerated manner. However, even with these efforts, residential applications for Family Medicine and Pediatrics have fallen 7.4% and 6.5% respectively within the past three years (AAMC). This is in part because out of the top 29 fields a physician can enter, pediatrics placed 29/29 and family medicine placed 27/29 in income (NSHSS). Besides being the lowest income, these fields are required in rural areas where most people are not interested in practicing. This combination of factors, amongst others, has led to a drastic shortage of primary care physicians in some areas. Primary Care includes General Family Medicine, General Practice, General Internal Medicine, and General Pediatrics. This

study aims to research the shortage, necessity, and trends of primary care physicians in Southern Illinois and Western Kentucky. Data from these two regions will be analyzed on the basis of rurality, median income, health coverage rates, mortality of non-communicable diseases, and primary care physician rates. The specific counties included are Alexander, Edwards, Franklin, Gallatin, Hamilton, Hardin, Jackson, Jefferson, Johnson, Massac, Perry, Pope, Pulaski, Randolph, Saline, Union, Wabash, Washington, Wayne, White, and Williamson from Southern Illinois and the counties of Ballard, Caldwell, Calloway, Carlisle, Christian, Crittenden, Fulton, Graves, Henderson, Hickman, Hopkins, Livingston, Lyon, Marshall, McCracken, Trigg, Union, and Webster in Western Kentucky.

Methodology

Gathering data in rural areas involves many complications such as low funding, low interest, and large coverage areas. However, the bulk of the data being analyzed in this research is census data that was collected in the recent censuses of 2020 and 2010. Census data is very useful when needing to compare a specific region to a state or the country as a whole. The census provides an equal outreach to all Americans. This is beneficial because having a representative population in data plays a vital role in capturing the larger picture accurately: surveying the entire population insures the most accurate data of that population. Data analyzed that was acquired from the census include household income, health insurance rates, and rural/urban classification. According to the US Census Bureau, the data is considered administrative data, consisting of censuses, surveys, and other primary sources from governments and businesses (US Census). The Institute for Health Metrics and Evaluation (IHME), which is an independent global health research center at the University of Washington, provided mortality rates of non-communicable diseases. IHME collects data from 200+ countries and has 8,000+ global collaborators. The data can be found in the Global Health Data Exchange (GHDX). The mortality rates of non-communicable diseases are calculated from multiple studies and surveys included in this database. The Area Health Resource Files (HRSA) provided essential data on physician prevalence rates and trends. According to HRSA, their data includes “county, state, and national-level files in eight broad areas: Health Care Professions, Health Facilities, Population Characteristics, Economics, Health Professions Training, Hospital Utilization, Hospital Expenditures, and Environment. The AHRF data are obtained from more than 60 sources.”

Specific Issues

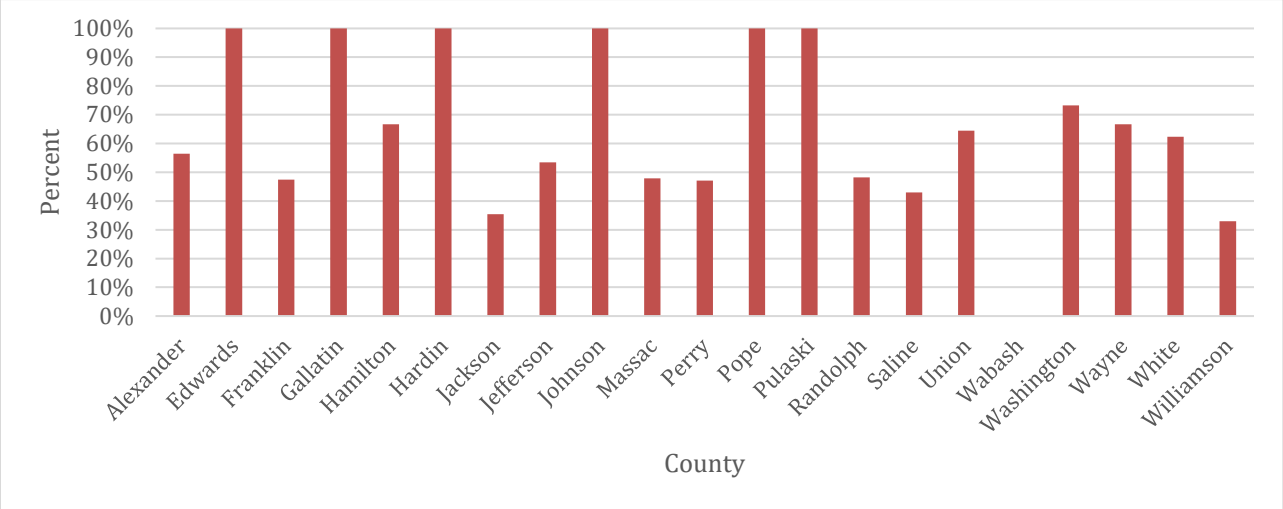
Many variables impact the status of primary care in a region. In this study, the focus will be on factors that impact primary care such as rural health, rural wealth and health coverage rates, and access to primary care physicians. Data from Western Kentucky and Southern Illinois being analyzed include rates of rurality, median income, health coverage rates, mortality of non-communicable diseases, and rates of primary care physicians. This data will signify the status of rural health, rural wealth and health coverage, and access to primary care in these regions.

Rural Health

Overall, health in rural areas tends to be far worse than the national average. It has been discovered that people in rural areas experience significant risk factors at a higher rate for health disparities such as isolation, low-economic status, risky behaviors, and limited access to primary care (RHIH). Southern Illinois and Western Kentucky are primarily rural with small urban centers scattered throughout. Based on US census data, in the included Southern Illinois counties, 13 out of the 21 counties are a majority rural, 7 out of 21 counties were between 33% and 50% rural, and six out of the 21 counties are 100% rural with no classified urban centers (Figure 1.1). Western Kentucky sits very similarly to Southern Illinois in rural rates. 12 out of the 18 counties included from Western Kentucky are majority rural, two counties are between 33% and 50% rural, and two are below 33% rural. It is important to note that five of the 18 counties are 100% rural and have no urban centers at all (Figure 1.2).

Figure 1.1

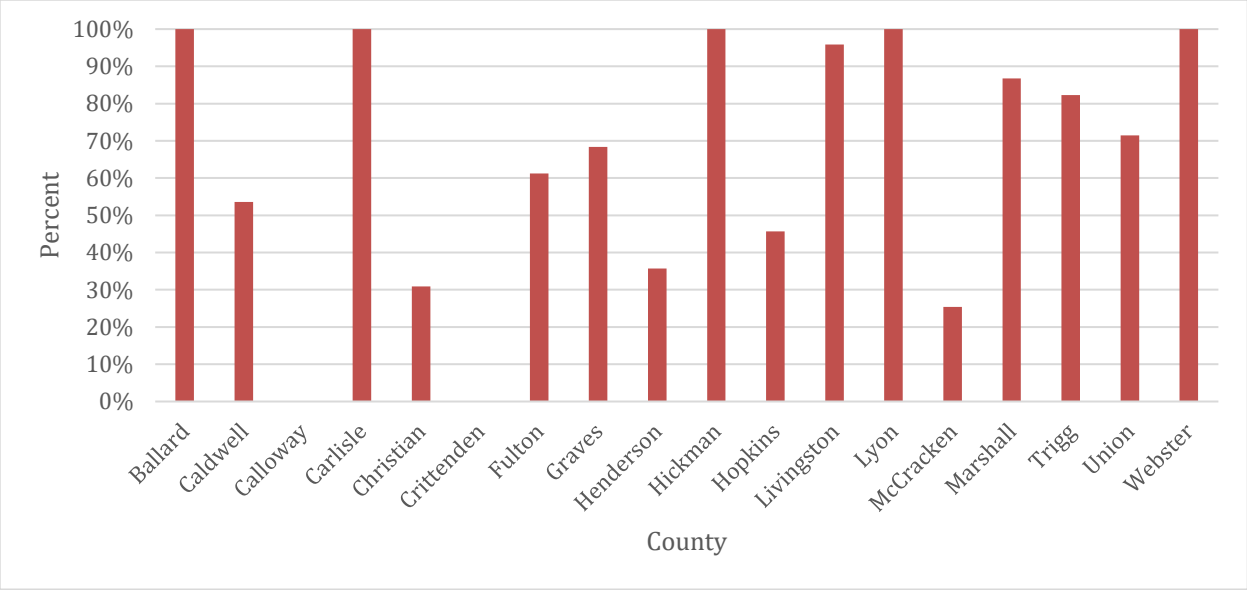
Southern Illinois Percent Rural 2010



Note. There was no census data for Wabash county based on rural and urban population. Data for urban and rural areas was collected in the 2010 US Census.

Figure 1.2

Western Kentucky Percent Rural 2010



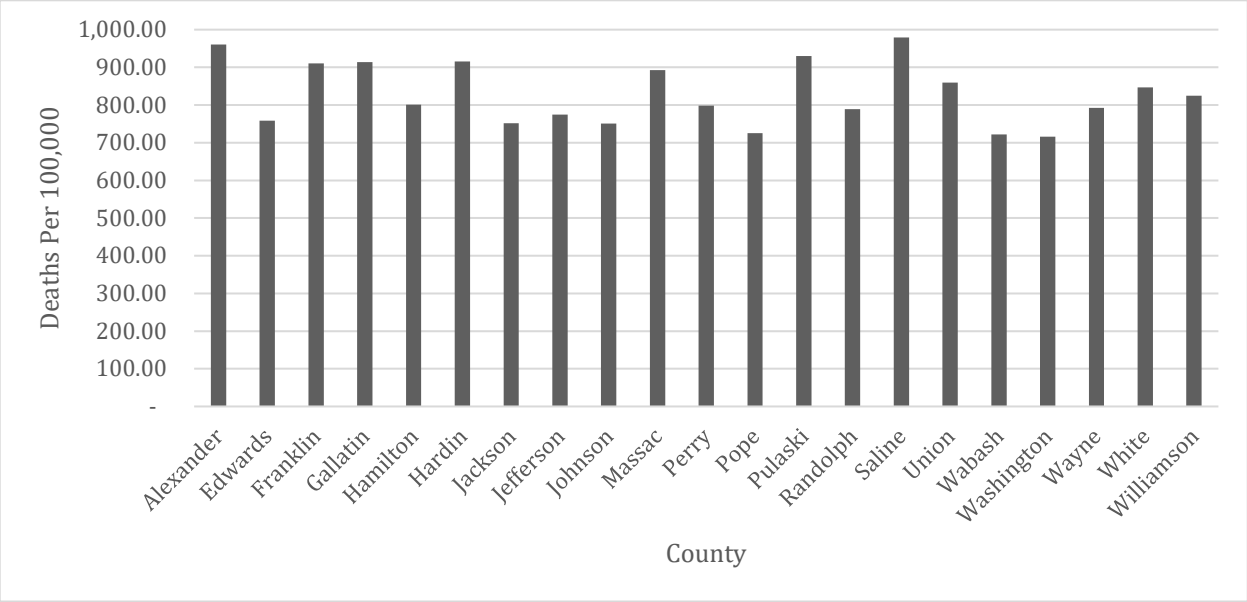
Note. There was no census data for Calloway and Crittenden counties based on rural and urban population. Data for urban and rural areas was collected in the 2010 US Census.

With a significant portion of these regions rural, risk factors that promote health disparity are expected to be seen. In rural areas nationally, mortality rates for non-communicable diseases (cancer, cardiovascular disease, cerebrovascular disease, chronic respiratory disease, pneumoconiosis, mental and substance abuse disorders, and self-harm and interpersonal violence) have dropped at a significantly slower rate than in urban areas. Based on data from 2014, the all-cause mortality rate in the United States reached an all-time low of 724.6 per 100,000 people. However, there was a wide gap in rates depending on the area. Urban areas had a rate of 704.3 per 100,000 while rural areas had a rate of 830.5 per 100,000 and the gap is growing. This supports that rural areas are older, poorer, and sicker than urban areas (Garcia et al., 2017). Higher mortality rates than the national average would be expected in Southern Illinois and Western Kentucky based on the previous claims of rural health disparity. Data from The Institute for Health Metrics and Evaluation (IHME) supports just that. Data collected from 2021 showed that the US average mortality rate for non-communicable diseases was 701.96 per 100,000 people within a margin of error of 0.3%. Data from Illinois was not significantly different from the US average with a value of 707.8 per 100,000 with a margin of error of 0.6%. However, data from 21 counties in Southern Illinois showed different results. 16 of the 21 counties included in the study were found to be significantly higher in mortality rates of non-communicable diseases. Five of the 21 counties were not statistically significantly different from the US or Illinois average mortality rates per 100,000 people (Figure 2.1) Western Kentucky, unfortunately, is in a very similar situation to Southern Illinois. The Kentucky rate of non-communicable disease mortality is significantly higher than the US average. The state of Kentucky's rate of mortality for non-communicable diseases is at 864.74 per 100,000 people with a margin of error of 0.7%. This places the state of Kentucky 45th out of all 50 states, only

trailing Mississippi, Alabama, Oklahoma, and West Virginia. In agreement, the 18 counties in Western Kentucky trend similarly to the state average. 12 of the 18 counties included in the study are not statistically significantly different from the state average, however, all 18 counties are significantly above average in the rate of mortality in non-communicable diseases compared to the United States average. Unfortunately, six of the 18 counties in Western Kentucky were found to be significantly above the state average placing them as some of the highest rates of mortality in the nation (Figure 2.2).

Figure 2.1

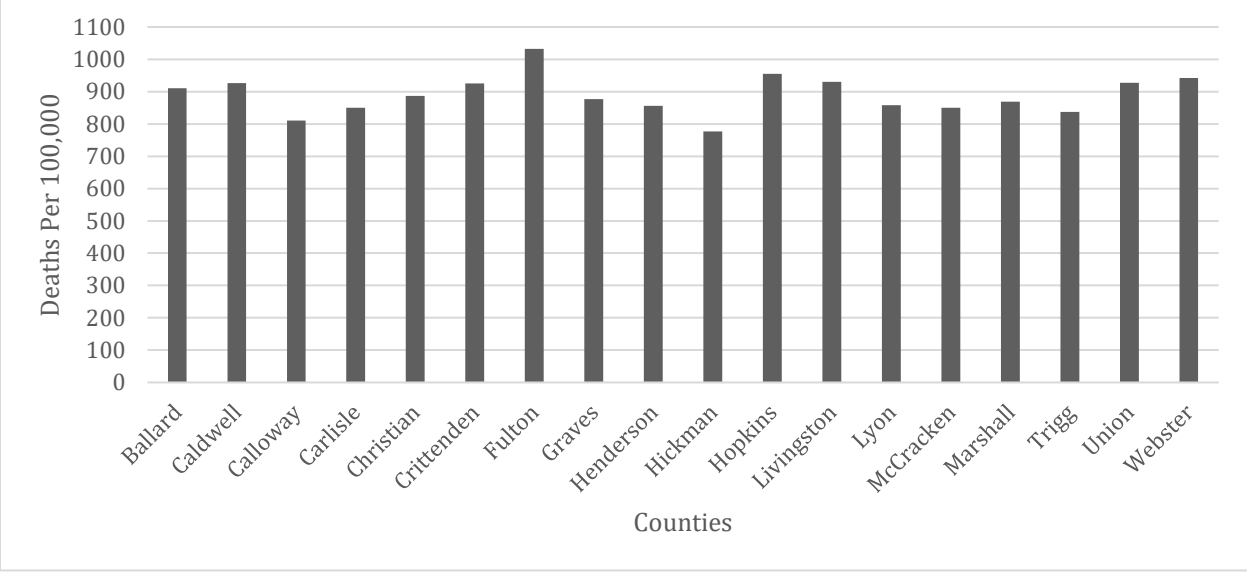
Southern Illinois Non-Communicable Disease Death Rate



Note. Edwards, Johnson, Pope, Wabash, and Washington counties were not found to be significantly different from the Illinois or US average non-communicable disease mortality rate.

Figure 2.2

Western Kentucky Non-Communicable Disease Death Rate



Note. Caldwell, Fulton, Hopkins, Livingston, Union, and Webster county mortality rates for non-communicable diseases were significantly higher than the Kentucky state average. All 18 counties were significantly higher than the United States average.

People with non-communicable diseases are dependent on primary care physicians for recognizing the issue or providing long-term care, the World Health Organization mentions that people with noncommunicable diseases require long-term care that is patient-centered and community-based. Such healthcare can only be delivered through primary care (WHO).

Southern Illinois and Western Kentucky not only have worse physical health, but declining mental health as well. The CDC recently discovered that rural areas not only have higher rates of non-communicable diseases but higher rates of mental disorder challenges (CDC, 2017). This is on top of an ever-increasing mental health crisis occurring in the world, "there has been a 13% rise in mental health conditions and substance use disorders in the last decade" (WHO, 2017). These findings together show that rural health is becoming increasingly detached from the overall improvement of health in the United States. With rural areas physically and mentally unhealthier than the national average, there must be an established priority for rural physicians. Primary care physicians are especially needed for care and recognition of non-communicable diseases and are necessary for the improvement of the already out-of-control mortality rates in Southern Illinois and Western Kentucky.

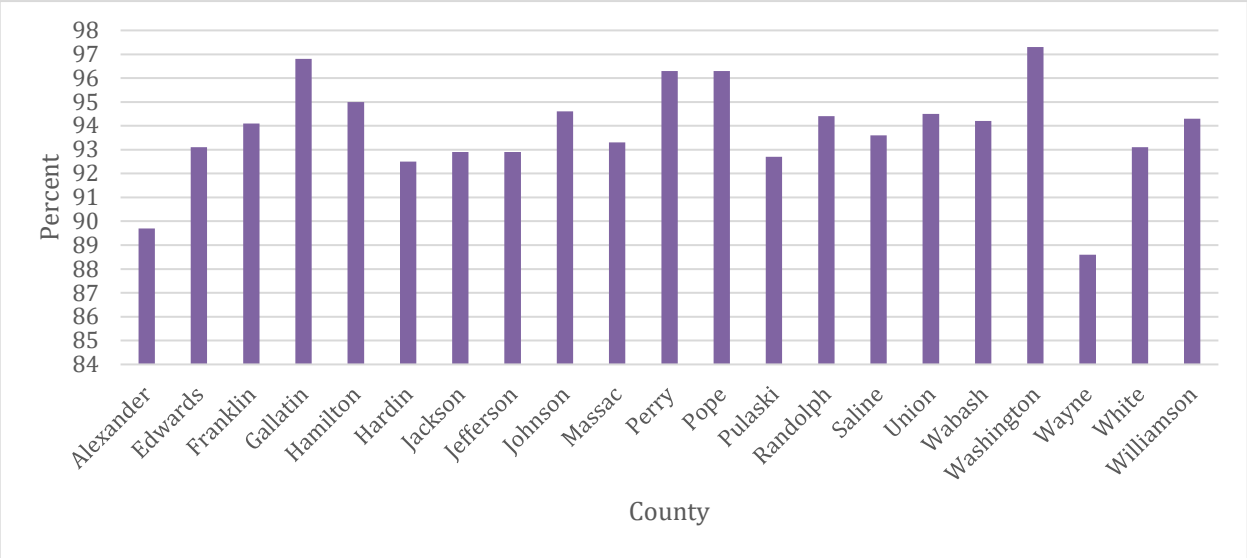
Rural Health Coverage and Wealth

One of the major influences on rural health seems to be the wealth and health insurance coverage of the population. In a study done on a lower economic population, health insurance coverage and consistency were found to be significant factor in doctor's visits, "Overall, we find that study participants with health insurance coverage are more likely to have had recent diagnostic tests for diabetes and cardiovascular disease than those participants who were uninsured. We also find that having a regular health care provider mediates the effect of insurance coverage, especially where the participant knows their doctor well enough to report

their name" (Smith et al., 2017). Data on health insurance rates was collected by the US census. Surprisingly, Southern Illinois had either average or higher than average coverage rates. 13 of the 21 Southern Illinois counties were found to have significantly higher insured rates with health insurance. The other eight counties were average to the United States average of 91.4% (Figure 3.1). Western Kentucky, fortunately, sees similar figures. Out of all 18 Western Kentucky counties included in the study, eight were significantly above average in health insurance coverage. Ten out of 18 counties were statistically similar to the United States average (Figure 3.2).

Figure 3.1

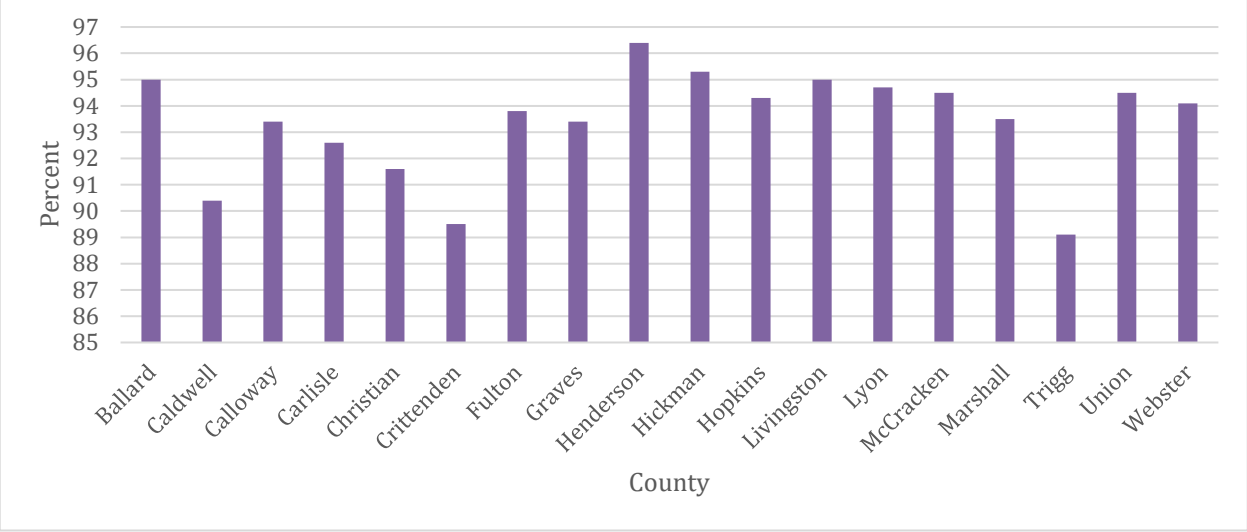
Southern Illinois Percent Insured with Health Insurance



Note. Franklin, Gallatin, Hamilton, Jackson, Jefferson, Johnson, Perry, Pope, Randolph, Union, Wabash, Washington, and Williamson were the 13 counties with higher insured rates than the Unites States average.

Figure 3.2

Western Kentucky Percent Insured with Health Insurance

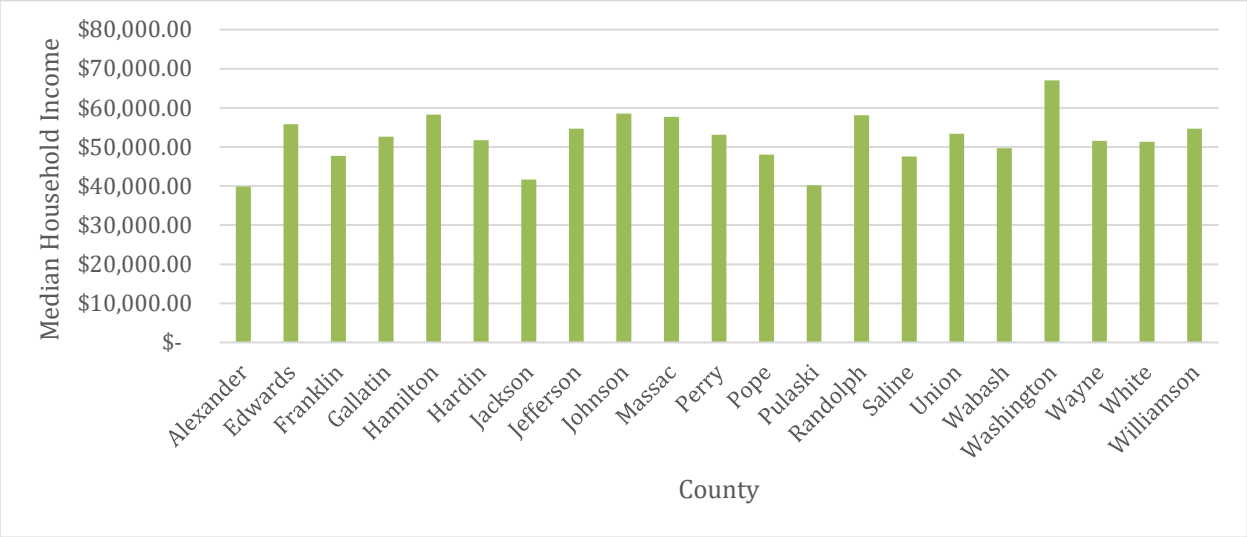


Note. Ballard, Henderson, Hickman, Hopkins, Livingston, McCracken, Union, and Webster counties were all found to have significantly higher rates of health coverage than the United States average. The other ten counties were not found to be significantly different than the United States average.

Low income also appears to influence the rate of physician visits. In an interview study, the general theme amongst low-income interviewers was that health is typically overruled by other factors. Many times, low-income patients gave priority to housing and food before doctor's visits (Commonwealth Fund, 2017). This claim was found to be statistically significant in a separate study conducted on poverty and rurality in relation to missed doctor's appointments. The study looked at factors such as poverty and rurality and their impact on missed doctor's appointments. The results were not surprising as it was found that economic and family factors often take precedence over doctor's appointments (Chapman et al., 2022). Low income, unfortunately, is a common theme in Southern Illinois and Western Kentucky. The median United States household income in 2021 was $70,784. 20 out of 21 Southern Illinois counties were found to have median household incomes significantly lower than the United States average. Only one of the 21 counties was within the margin of error to be considered statistically similar to the United States average (Figure 4.1). Western Kentucky data shows similar results amongst median household income. Based on 2021 United States census data, all 18 of the Western Kentucky counties included in the study were found to have a significantly lower median household income than the United States average (see figure 4.2).

Figure 4.1

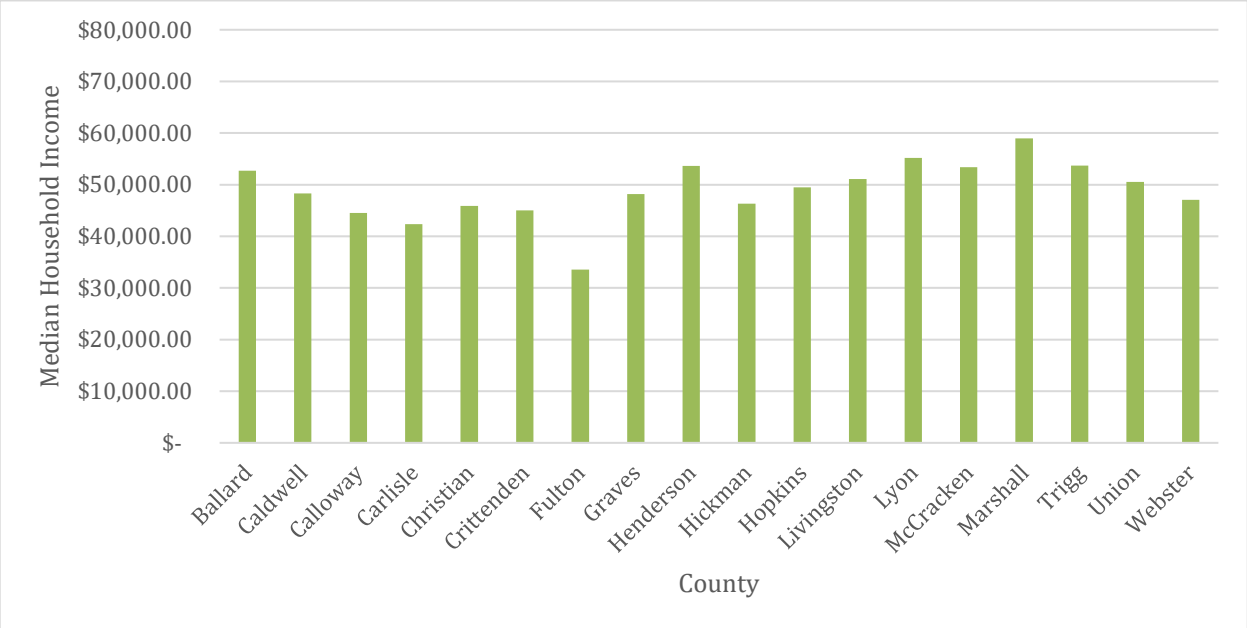
Southern Illinois Median Household Income 2021



Note. Washington county is the only county in Southern Illinois to not be statistically significantly below the United States average.

Figure 4.2

Western Kentucky Median Household Income 2021



Note. Fulton and Carlisle counties' household incomes were within the margin of error to be statistically equivalent to half of the United States average for median household income.

Income and health insurance coverage play key roles in doctor's visits. Fortunately, Southern Illinois and Western Kentucky have average to above-average coverage rates for health insurance, however, a majority of both regions suffer from significantly lower median household income which will affect the rate of primary care visits.

Shortage of Rural Physicians

Primary care physicians are described as physicians "who provides definitive care to the undifferentiated patient at the point of first contact and takes continuing responsibility for providing the patient's comprehensive care" (Murray et al., 2007). Many primary care physicians work a typical work week Monday through Friday 8 am to 5 pm which yields about 260 working days in a given year. Given that primary care physicians see an average of 20.2 patients per day (Rajaee, 2023), the number of patients a primary care physician can see in a year is about 5,252. This would require about 19 physicians for a population of 100,000 people yearly. However, this only accounts for annual visits; the average amount of primary care visits per patient is 3.19 per year (Murray et al., 2007). This yields a maximum number of patients a primary care physician can see at 1,647 per year. This puts the absolute minimum primary care physician rate at 60.7 per 100,000 people. Many medical schools have recognized that physician prevalence in rural communities is extremely low and, in many cases, non-existent. Even though the problem is recognized, rural physician rates are not growing fast enough. A great predictor of rural physician rates is rural medical student rates. In general, rural backgrounds in medical school students are shown to predict rural physicians. (Shipman et al., 2019). However, the number of applicants and matriculants from rural backgrounds for medical schools in the United States have both dropped significantly. In a recent study, it was found f that between 2002 and 2019, rural applicant rates dropped 18%. In the same time, urban applicants increased 59% (Shipman et al.,

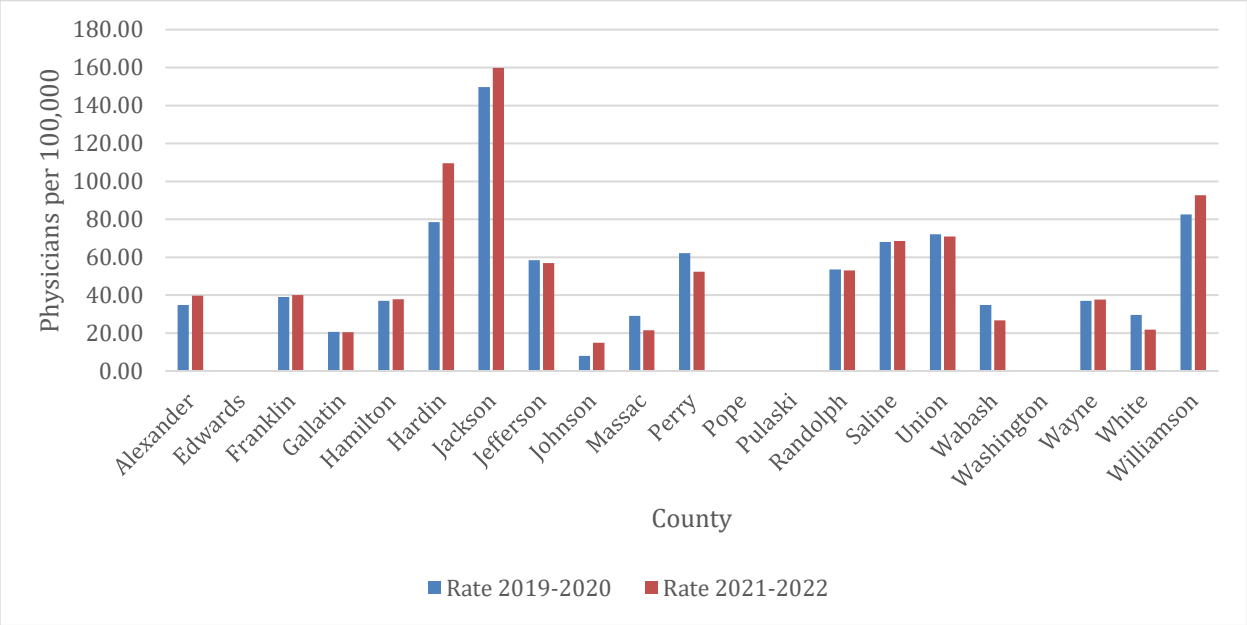
2019). Not only have rural applicants declined by 18% but matriculants from rural backgrounds have declined by 28% which means there is a growing gap between rural applications and medical school priorities (Shipman et al., 2019). Even though rural medicine is considered by many medical schools as one of their top priorities, the shortage of rural physicians is only getting worse. Underrepresentation in medicine has been a problem for decades that medical schools have been trying to fix, however, students from rural backgrounds are becoming increasingly underrepresented. Four times the number of rural medical students would be required to be proportional to rural representation in the US population (Shipman et al., 2019). Since there is a delay in the production of rural physicians after medical school acceptance, based on this data, it can be hypothesized that rural primary care physician rates will decrease over the next few years.

Physician shortages in rural areas of the US are persistent and growing and the shortage is another factor contributing to rural-urban health disparities and the growing gap in life expectancy (Shipman et al., 2019). Southern Illinois and Western Kentucky primary care physician rates reflect this trend Based on data collected by the Area Health Resource Files (AHRF, 2021), the United States average primary care physician rate was 85 per 100,000 people. Southern Illinois saw significantly lower rates in 2021-2022. Out of the 21 Southern Illinois counties included in the study, 18 were found to have significantly lower primary care physician rates than the United States average. 14 of those 18 were found to be below the calculated absolute minimum of 60.7. Four counties had no primary care physicians at all. Two out of the 21 were found to have significantly higher rates and one was found to have an average rate of primary care physicians (Figure 5.1). Western Kentucky sees the same issues with a majority of its counties. In 2021-2022, out of the 18 counties included in the study, 16 were found to have

significantly lower primary care physician rates compared to the United States average. 15 of those 16 were below the absolute minimum of 60.7. Six of those 18 counties either have one or no primary care physicians at all. One county was found to be average in comparison to the United States average, and another county was found to be significantly above average (Figure 5.2). As shown in figures 5.1 and 5.2, rates have been calculated in 2019-2020 and in 2021-2022. With public emphasis on raising rural physician rates, it would be expected to see the rates of primary care physicians increase over this time. Unfortunately, the overall trend has not improved. In Southern Illinois, five of the 21 counties did increase their primary care physician rate, but three of those five were in the counties that were already average or above average. Eight of the 21 counties held steady over the three years (less than a 5% change) and the other eight dropped significantly or did not have any primary care physicians. Western Kentucky saw a similar change in rates from 2019/2020 to 2021/2022. Out of the 18 counties included in the study, only three improved in their rates of primary care physicians, eight did not significantly change, and seven either remained at zero or decreased significantly (Figure 5.3).

Figure 5.1

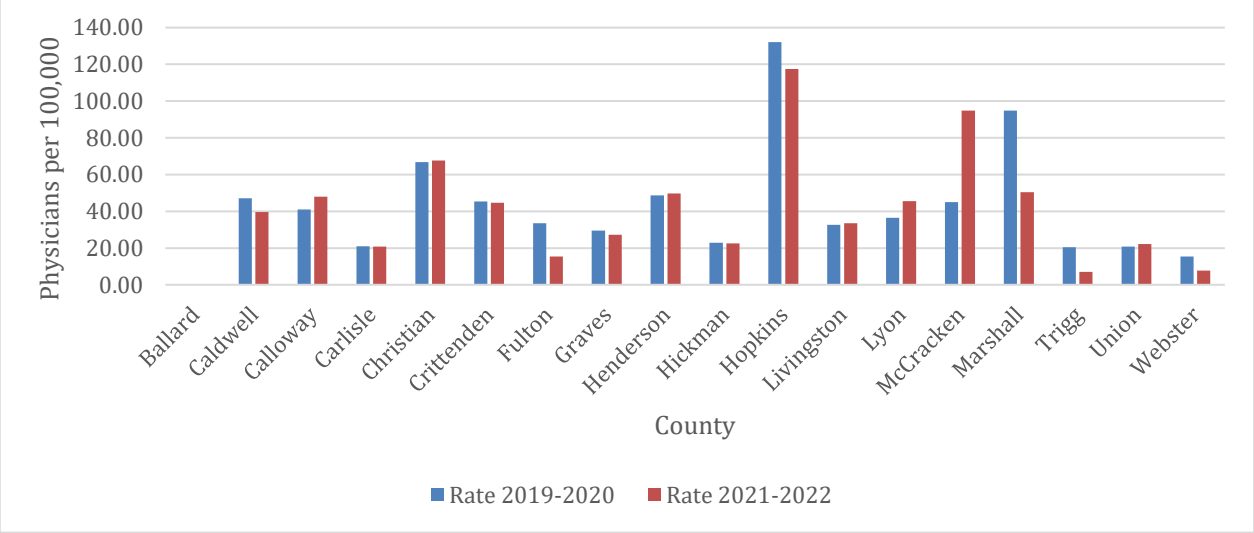
Southern Illinois Primary Care Physicians per 100,000 people



Note. Edwards, Pope, Pulaski, and Washington counties all lack any primary care physicians giving a rate of 0%. Excluding the counties with 0 primary care physicians, Alexander, Franklin, Gallatin, Hamilton, Jefferson, Johnson, Massac, Perry, Randolph, Wabash, Wayne, and White all fall below the minimum calculated primary care physician rate of 60.7.

Figure 5.2

Western Kentucky Primary Care Physicians per 100,000 people



Note. Ballard County has 0 primary care physicians. Caldwell, Calloway, Carlisle, Crittenden, Fulton, Graves, Henderson, Hickman, Livingston, Lyon, Marshall, Trigg, Union, and Webster counties all have rates lower than the calculated minimum rate of 60.7.

Figure 5.3

Southern Illinois and Western Kentucky Primary Care Physician Rate Change 2019-2022

Southern Illinois Counties	Percent change	Western Kentucky Counties	Percent change
Alexander	15%	Ballard	N/A
Edwards	N/A	Caldwell	-16%
Franklin	3%	Calloway	17%
Gallatin	-1%	Carlisle	-1%
Hamilton	3%	Christian	2%
Hardin	40%	Crittenden	-2%
Jackson	7%	Fulton	-54%
Jefferson	-2%	Graves	-7%
Johnson	85%	Henderson	2%
Massac	-26%	Hickman	-1%
Perry	-16%	Hopkins	-11%
Pope	N/A	Livingston	3%
Pulaski	N/A	Lyon	24%
Randolph	-1%	McCracken	111%
Saline	1%	Marshall	-47%
Union	-2%	Trigg	-66%
Wabash	-23%	Union	6%
Washington	N/A	Webster	-50%
Wayne	2%		
White	-26%		
Williamson	12%		

Note. Edwards, Pope, Pulaski, and Washington in SI and Ballard in WK were not applicable as they were at a rate of zero and remained at a rate of zero.

Primary care physician rates are not improving for the majority of Southern Illinois and Western Kentucky. This is an extremely dangerous trend as the rates of primary care are already significantly lower than the minimum calculated primary care physician rate and the United States average rate. This likelihood of decline in primary care is detrimental for areas like Southern Illinois and Western Kentucky.

Key Themes

Southern Illinois and Western Kentucky, unfortunately, have many key factors for a healthy primary care system missing from their regions. They are first burdened by the many complications of rural medicine. Factors that can play a role in rural health include access to care, isolation, socioeconomic status, and health insurance coverage. Rural areas also tend to have higher rates of non-communicable disease mortality than average which should be the main targets for physicians in the United States. This already gives a major reason for medical schools to focus on improvement in these areas. The regions overall, also have significantly lower median household income than the United States average. When a population has less income, they are less likely to see a physician. If a population is less likely to see a physician, they are more likely to die from something preventable because the doctor wasn't given the chance to catch it. This is another reason why primary care should be considered a priority in these areas. However, one of the positives about these two regions is that they have average or above-average health insurance coverage. This is extremely good news because if something medically serious happens to the majority of the population, they will have some health coverage for their bill. However, health insurance coverage doesn't help when there little to no primary care access. Southern Illinois and Western Kentucky have absurdly low rates of primary care physicians who play essential roles in improving overall health. Primary care physicians are the first line of defense for almost any issue. They can cover and take care of a broad range of issues or send the patient to a specialist if needed. The relationship that develops between a patient and their primary care physician over time also increases comfort and accuracy. The longer a primary care physician sees a patient, the more comfortable the patient is. Comfortable patients are more likely to go in if something is wrong or to reach out to the doctor. Accuracy also increases with

the more background and history a physician has. This allows the physician to catch something abnormal with the patient even if the patient doesn't explicitly say it. Not only are primary care rates extremely low, but most counties have seen the rates get worse in the past three years. Primary care physicians are becoming less and less accessible. This leads to growth in health disparity and unfortunately, these two regions are unequipped to deal with the worsening situation. Prioritizing rural applicants in medical schools is one known way of increasing rural physicians, however, rural medical school applicants and matriculants have decreased significantly. Primary care in Southern Illinois and Western Kentucky, in almost every way, is declining.

Conclusion

A healthy primary care system has many key components that come together. This includes a health-aware population that is comfortable seeing a physician. Southern Illinois and Western Kentucky, in part, have populations that are rural and unhealthier than the United States average. Even though overall health trends have increased, Southern Illinois and Western Kentucky are growing in health disparity which can be improved by primary care physicians. The wealth of the two regions is, overall, significantly lower than the United States average which discourages physician visits. The more primary care physicians a region has, the more affordable the price will be due to competition. The overall health coverage of Southern Illinois and Western Kentucky is actually average or above average which means more of the cost of primary care visits will be covered. This will encourage primary care visits once there is access to a primary care physician. Most importantly, primary care physician rates are decreasing or remaining steady for people in Southern Illinois and Western Kentucky. Both regions already have significantly low rates of primary care, and improvement is necessary for the physical and mental well-being of the future populations in these two regions. Almost every component of a healthy primary care system is lacking in Southern Illinois and Western Kentucky. Due to decreasing primary care physician rates, decreasing rural matriculants in medical schools, below-average median income, and increasing health disparity, primary care in Southern Illinois and Western Kentucky is declining and needs serious intervention.

Recommendations

Establishing a healthy primary care system in Southern Illinois and Western Kentucky is going to be an extremely complicated process as there are many factors playing a role. For example, improving socioeconomic status in these populations would be extremely beneficial for growth of primary care, but is unlikely to change drastically over the next ten years or so. The improvement of primary care needs to start now and unfortunately, low income is going to be a consistent problem for the foreseeable future. Even though these populations have high rates of health insurance coverage, improvements in coverage rates and affordability will always be helpful. However, the main priority for Southern Illinois and Western Kentucky is to improve primary care physician rates. Other factors like income and insurance don't matter if there aren't physicians to see. Encouraging students from areas like Southern Illinois and Western Kentucky to pursue medicine is likely to help. Medical students from rural areas are likely to return to those areas. We can increase student interest by state and federal grants that target students in pre-medical tracts. Even grants that aid in establishing primary care practices would be extremely beneficial. However, one of the most obvious solutions is to include rural areas like Southern Illinois and Western Kentucky as underrepresented in medicine. Underrepresentation in medicine (URM) has been a problem in the United States for its entire history and should be continued as the main priority. For example, African Americans make up approximately only 5.7% of the physician workforce while accounting for 12% of the US population (Howard, 2023). Similarly, rural areas account for 20% of the US population but only have 11% of the physicians (Jaret, 2020). Encouraging and supporting potential physicians from underrepresented backgrounds is the most efficient way to promote the necessary growth and diversification of healthcare in this country.

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Appendices

Appendix A. Rural/Urban Raw Data

Southern Illinois Counties	Total Population	Rural	Percent Rural
Alexander	4,006	2,259	56%
Edwards	3,187	3,187	100%
Franklin	18,525	8,776	47%
Gallatin	2,746	2,746	100%
Hamilton	4,104	2,737	67%
Hardin	2,488	2,488	100%
Jackson	28,578	10,107	35%
Jefferson	16,954	9,061	53%
Johnson	5,598	5,598	100%
Massac	7,113	3,406	48%
Perry	9,426	4,435	47%
Pope	2,491	2,491	100%
Pulaski	3,155	3,155	100%
Randolph	13,707	6,605	48%
Saline	11,697	5,028	43%
Union	7,924	5,109	64%
Wabash	N/A	N/A	N/A
Washington	6,534	4,787	73%
Wayne	7,975	5,321	67%
White	7,181	4,477	62%
Williamson	30,359	10,007	33%

Western Kentucky Counties	Total Population	Rural	Percent Rural
Ballard	3,885	3,885	100%
Caldwell	6,292	3,372	54%
Calloway	N/A	N/A	N/A
Carlisle	2,441	2,441	100%
Christian	29,459	9,094	31%
Crittenden	N/A	N/A	N/A
Fulton	3,372	2,064	61%
Graves	16,777	11,471	68%
Henderson	20,320	7,255	36%
Hickman	2,342	2,342	100%
Hopkins	21,180	9,673	46%
Livingston	4,824	4,624	96%
Lyon	4,791	4,791	100%

McCracken	31,079	7,886	25%
Marshall	15,748	13,658	87%
Trigg	7,810	6,424	82%
Union	6,141	4,386	71%
Webster	5,936	5,936	100%

Appendix B. Non-Communicable Disease Mortality Raw Data

Southern Illinois Counties	Mortality per 100,000	Illinois Average	US Average
Alexander	960.33	707.80	701.96
Edwards	758.28		
Franklin	910.24		
Gallatin	914.17		
Hamilton	800.91		
Hardin	915.51		
Jackson	751.57		
Jefferson	774.83		
Johnson	750.51		
Massac	892.21		
Perry	798.08		
Pope	725.58		
Pulaski	930.08		
Randolph	788.94		
Saline	979.31		
Union	859.69		
Wabash	721.73		
Washington	715.55		
Wayne	792.36		
White	846.81		
Williamson	824.99		

Western Kentucky Counties	Mortality per 100,000	Kentucky Average	US Average
Ballard	909.98	864.74	701.96
Caldwell	925.85		
Calloway	810.15		
Carlisle	849.86		
Christian	886.75		
Crittenden	925.29		
Fulton	1032.34		
Graves	876.33		

Henderson	855.92		
Hickman	776.77		
Hopkins	955.37		
Livingston	930.43		
Lyon	858.27		
McCracken	850.33		
Marshall	868.67		
Trigg	837.17		
Union	926.89		
Webster	942.32		

Appendix C. Health Insurance Coverage Raw Data

Southern Illinois Counties	Percent insured	Margin of error	US Average
Alexander	89.7	2.9	91.4
Edwards	93.1	1.9	
Franklin	94.1	0.8	
Gallatin	96.8	1.3	
Hamilton	95	1.8	
Hardin	92.5	2.6	
Jackson	92.9	0.8	
Jefferson	92.9	0.8	
Johnson	94.6	1.7	
Massac	93.3	2.1	
Perry	96.3	0.9	
Pope	96.3	1.8	
Pulaski	92.7	2.7	
Randolph	94.4	1.1	
Saline	93.6	1.4	
Union	94.5	1.8	
Wabash	94.2	1.8	
Washington	97.3	0.7	
Wayne	88.6	3	
White	93.1	2.5	
Williamson	94.3	0.8	

Western Kentucky Counties	Percent Insured	Margin of error	US Average
Ballard	95	1.5	91.4
Caldwell	90.4	2.8	
Calloway	93.4	1.3	

Carlisle	92.6	2.4	
Christian	91.6	1.4	
Crittenden	89.5	2.8	
Fulton	93.8	2.7	
Graves	93.4	1.4	
Henderson	96.4	0.8	
Hickman	95.3	2.4	
Hopkins	94.3	1.3	
Livingston	95	1.9	
Lyon	94.7	2	
McCracken	94.5	1	
Marshall	93.5	2.4	
Trigg	89.1	4.2	
Union	94.5	1.5	
Webster	94.1	1.7	

Appendix D. Median Household Income Raw Data

Southern Illinois Counties	Median Household income	Margin of error	Percent Error	US Average
Alexander	$ 39,871.00	6285	15.8%	$ 70,784.00
Edwards	$ 55,833.00	3213	5.8%	
Franklin	$ 47,751.00	2423	5.1%	
Gallatin	$ 52,597.00	6821	13.0%	
Hamilton	$ 58,306.00	4100	7.0%	
Hardin	$ 51,738.00	6139	11.9%	
Jackson	$ 41,699.00	2816	6.8%	
Jefferson	$ 54,692.00	2216	4.1%	
Johnson	$ 58,502.00	3438	5.9%	
Massac	$ 57,658.00	3061	5.3%	
Perry	$ 53,108.00	3201	6.0%	
Pope	$ 48,013.00	6253	13.0%	
Pulaski	$ 40,197.00	6646	16.5%	
Randolph	$ 58,093.00	3885	6.7%	
Saline	$ 47,541.00	3053	6.4%	
Union	$ 53,363.00	3730	7.0%	
Wabash	$ 49,680.00	5670	11.4%	

Washington	$	67,030.00	4267	6.4%	
Wayne	$	51,540.00	4237	8.2%	
White	$	51,351.00	4238	8.3%	
Williamson	$	54,682.00	2819	5.2%	

Western Kentucky Counties	Median Household income	Margin of error	Percent Error	US Average
Ballard	$ 52,695.00	8321	15.8%	$ 70,784.00
Caldwell	$ 48,280.00	5065	10.5%	
Calloway	$ 44,534.00	3886	8.7%	
Carlisle	$ 42,386.00	6332	14.9%	
Christian	$ 45,913.00	3281	7.1%	
Crittenden	$ 45,000.00	10418	23.2%	
Fulton	$ 33,567.00	3246	9.7%	
Graves	$ 48,187.00	3110	6.5%	
Henderson	$ 53,635.00	1892	3.5%	
Hickman	$ 46,321.00	8687	18.8%	
Hopkins	$ 49,495.00	2850	5.8%	
Livingston	$ 51,081.00	9910	19.4%	
Lyon	$ 55,203.00	6119	11.1%	
McCracken	$ 53,366.00	2519	4.7%	
Marshall	$ 58,989.00	7339	12.4%	
Trigg	$ 53,693.00	3326	6.2%	
Union	$ 50,533.00	5129	10.1%	
Webster	$ 47,051.00	4229	9.0%	

Appendix E. Primary Care Physician Raw Data

Southern Illinois Counties	21/22 M.D., Primary Care (County Level File)	21/22 Population, All (County Level File)	Rate 2019-2020	Rate 2021-2022	US Average	Illinois Average
Alexander	2	5030	34.72	39.76	85	91.28
Edwards	0	6075	0.00	0.00		
Franklin	15	37442	38.99	40.06		
Gallatin	1	4903	20.71	20.40		
Hamilton	3	7911	36.96	37.92		
Hardin	4	3650	78.51	109.59		
Jackson	84	52565	149.78	159.80		

Jefferson	21	36877	58.38	56.95		
Johnson	2	13463	8.05	14.86		
Massac	3	13960	29.04	21.49		
Perry	11	20985	62.15	52.42		
Pope	0	3779	0.00	0.00		
Pulaski	0	5065	0.00	0.00		
Randolph	16	30142	53.49	53.08		
Saline	16	23320	68.11	68.61		
Union	12	16923	72.06	70.91		
Wabash	3	11202	34.72	26.78		
Washington	0	13655	0.00	0.00		
Wayne	6	15963	37.00	37.59		
White	3	13784	29.55	21.76		
Williamson	62	66879	82.59	92.70		

Western Kentucky Counties	21/22 M.D., Primary Care (County Level File)	21/22 Population, All (County Level File)	Rate 2019-2020	Rate 2021-2022	US Average	Kentucky Average
Ballard	0	7695	0.00	0.00	85	71.45
Caldwell	5	12624	47.07	39.61		
Calloway	18	37560	41.02	47.92		
Carlisle	1	4791	21.01	20.87		
Christian	49	72357	66.70	67.72		
Crittenden	4	8947	45.42	44.71		
Fulton	1	6512	33.51	15.36		
Graves	10	36615	29.52	27.31		
Henderson	22	44329	48.66	49.63		
Hickman	1	4424	22.83	22.60		
Hopkins	53	45138	132.03	117.42		
Livingston	3	8959	32.63	33.49		
Lyon	4	8803	36.54	45.44		
McCracken	64	67454	45.02	94.88		
Marshall	16	31748	94.78	50.40		
Trigg	1	14192	20.48	7.05		
Union	3	13544	20.86	22.15		
Webster	1	12813	15.45	7.80		