Rural & Underserved Health Research Center

Highlights

University of Kentucky

Healthy Kentucky Research Bldg.
760 Press Avenue, Suite 360
Lexington, KY 40536

EXECUTIVE SUMMARY

What is the Rural and Underserved Health Research Center?

The Rural and Underserved Health Research Center (RUHRC) is 1 of 9 rural health research centers funded by the Federal Office of Rural Health Policy, Health Resources & Services Administration, U.S. Department of Health and Human Services. It was funded through a 4-year, $2.8 million grant in 2016 and received renewal funding in 2020. We will apply again for renewal funding in 2024.

What are our objectives?

To inform health policy makers, health system managers, and providers about key population health problems and health care barriers facing rural America, especially areas that are highly impoverished and underserved, such as the Appalachian region of Kentucky.

What do we do?

We conduct timely, policy-relevant research that identifies ways to better organize, finance, and deliver health care in rural areas. To do this, we analyze Medicaid, Medicare, and private insurance claims; electronic health records; and survey data to produce user-friendly reports and visualizations that can be accessed at https://ruhrc.uky.edu. Our reports and policy briefs are widely disseminated across U.S. governmental offices and agencies (including CMS, CDC, HRSA, and NIH) and have been downloaded more than 18,000 times. Major research themes include:

- Trends in rural substance use, treatment availability, and treatment use
- Prevalence of depression, severe mental illness, and suicide among rural residents
- Role of primary care providers in rural health care delivery
- Rural cancer prevention services and barriers to follow-up care among cancer survivors

Who are we?

Our team includes faculty members from across UK, including the Colleges of Nursing, Medicine, Pharmacy, Public Health, and Communication as well as the American Board of Family Medicine, which is headquartered in Lexington.

Our Director is Ty Borders, PhD, a professor in the College of Nursing and Director of the campus-wide Center for Health Services Research. He also is Editor of *The Journal of Rural Health*, which ranks 6th among 88 health services and policy journals and is the official scholarly publication of the 22,000-member National Rural Health Association.

Our Deputy Director, Jeff Talbert, PhD, is a Professor, Director of the Institute for Biomedical Informatics, and Division Chief for Biomedical Informatics in the College of Medicine. Dr. Talbert also holds leadership positions with the Center for Clinical and Translational Science, Kentucky HEALing Communities project, and Kentucky Cabinet for Health and Family Services.

WHO ELSE IS PART OF OUR RESEARCH TEAM?

University of Kentucky Faculty and Staff

Chris Delcher, PhD, Associate Prof. and Director, Institute for Pharmaceutical Outcomes and Policy

Lindsey Hammerslag, Research Assistant Professor, Division of Biomedical Informatics

Trish Rippetoe Freeman, RPh, PhD, Associate Professor, Pharmacy Practice and Science

Joe Benitez, PhD, Assistant Professor and Health Economist, College of Public Health

Al Cross, Director of the Institute for Rural Journalism and Community Issues

Amanda Thaxton Wiggins, PhD, Biostatistician, College of Nursing

Katie Youngen, MPH, Research Program Manager, Rural and Underserved Health Research Center

Julia Cecil, MBA, MA, Assistant Director, Rural and Underserved Health Research Center

External Investigators

Lars Peterson, MD, PhD, Senior Physician Scientist, American Board of Family Medicine

Ahmed Arif, PhD, Professor, Public Health Sciences, University of North Carolina at Charlotte

Hefei Wen, PhD, Assistant Professor, College of Medicine, Harvard University

External Advisory Group Members

Andrew Bazemore, MD, Senior V.P. of Research and Policy, American Board of Family Medicine

Veronica Judy-Cecil, JD, BS, Senior Dep. Commissioner, Kentucky Department for Medicaid Services

Mary Charlton, PhD, Associate Professor, College of Public Health, University of Iowa

Gilbert Liu, MD, Medical Director, The Ohio Colleges of Medicine Government Resource Center

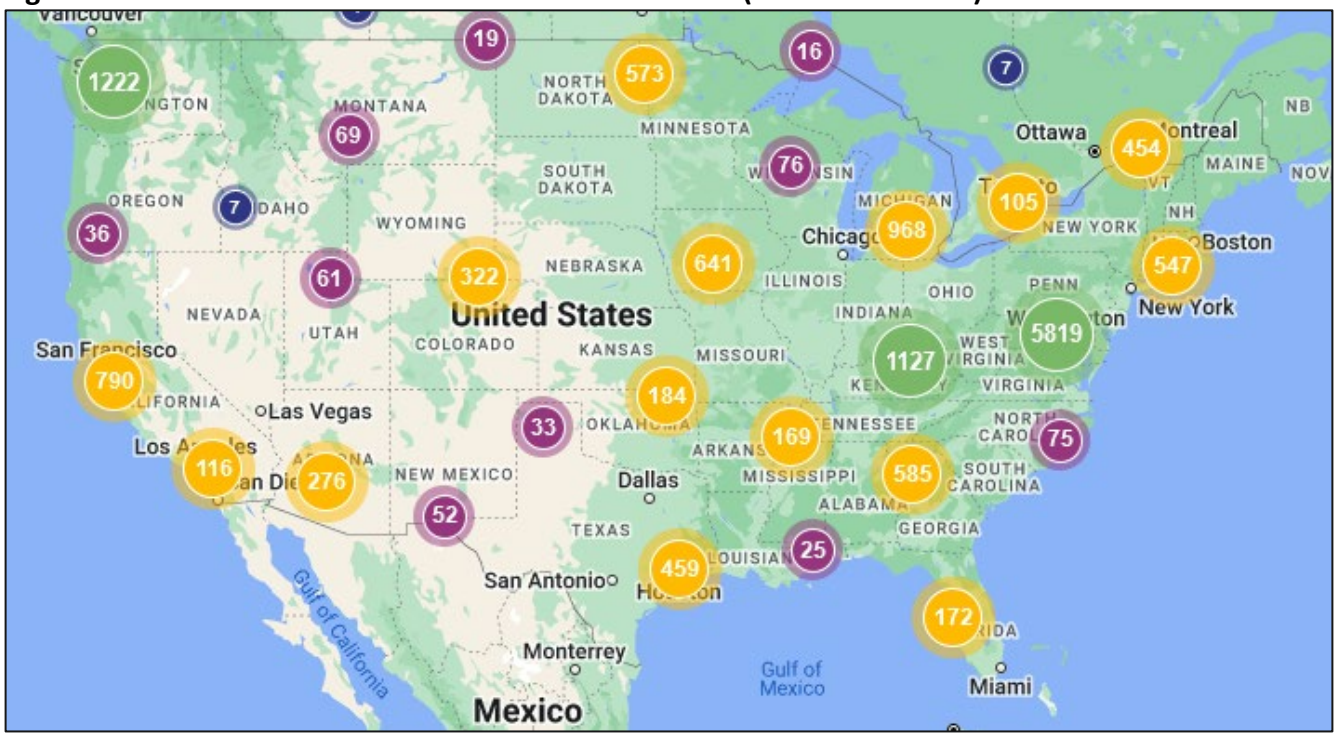
Alan Morgan, MPA, CEO of the National Rural Health Association (NRHA)

Tim Putnam, DHA, MBA, FACHE, former CEO of Margaret Mary Health, Batesville, Indiana

DISSEMINATION AND REACH OF OUR WORK

All of our center's research products may be accessed through our website at https://ruhrc.uky.edu. Every report is housed on the UKnowledge platform, a digital collection of unique scholarship created by the University of Kentucky (UK). As shown in Figure 1 below, our policy briefs have been downloaded by institutions across the U.S. **Since October 2017, the 23 reports produced by our Center have been downloaded more than 18,000 times worldwide**.

Figure 1. U.S. locations where briefs were downloaded (number of times)



Project abstracts are summarized by major topic in the following pages. Full reports or articles may be found at https://ruhrc.uky.edu/publications/.

PROJECT ABSTRACTS

Rural Substance Use and Treatment

The Impact of Medicaid Expansion on Rural/Urban Variations in Access to Substance Use Treatment. This project provided estimates of the prevalence of illicit drug and opioid use disorders among non-metropolitan adults 18-64 years of age. Prevalence rates did not decline from 2011-2013 to 2014-2015 despite the implementation of major substance use treatment policies. Of particular concern, heroin use disorder prevalence increased in recent years

Predictors of Buprenorphine Prescribing by Family Physicians in Rural Areas Nationally. Only a small percentage of people who need treatment for opioid use disorder (OUD) receive it, including buprenorphine. This project examined differences in rates of prescribing buprenorphine and intentions to prescribe buprenorphine between early and mid- to late-career family physicians (FPs), based on a survey of physicians taking a certification examination. The project also looked at the association between practice characteristics and the likelihood that a FP will prescribe buprenorphine, based on a survey of physicians seeking board certification in family medicine. We found large increases in both intention and actual prescribing of buprenorphine by early career FPs, but flat rates among mid- to late-career FPs. Our results suggest that residency programs are likely responding to the opioid crisis by preparing FPs to treat OUD.

Risky Substance Use among Adolescents and Adults in Non-Metropolitan and Metropolitan Counties. This study used nationally representative survey data to identify differences in past 30-day and past year risky substance use among adolescents 12 to 17 years of age residing in metropolitan and nonmetropolitan counties. The same data were used to identify differences in risky substance use among adults. Specifically, we compared consumption of alcohol, tobacco, and other illicit substances. Non-metropolitan adults and adolescents had significantly higher prevalence rates of tobacco use than metropolitan adults and adolescents. The rates of past year alcohol use were high among both non-metropolitan and metropolitan adolescents, while adults in metropolitan areas were more likely to report past 30-day binge drinking. Overall illicit drug use was significantly less prevalent among non-metropolitan adults than metropolitan adults and was similar among non-metropolitan and metropolitan adolescents. However, past year methamphetamine use was higher among non-metropolitan adolescents and adults versus metropolitan adolescents and adults.

Rural Variation in Access to Naloxone for Opioid Overdose Prevention. Naloxone is an opioid overdose reversal medication. Medicare beneficiaries benefit from access to naloxone as they have high rates of high-dose prescription opioids. This study examined trends in Medicare-paid naloxone dispensing rates in non-metropolitan versus metropolitan areas from 2014-2018. We found that Medicare pays for the largest share (> 30%) of naloxone dispensed from retail pharmacies in non-metropolitan areas. However, from 2017-2018 dispensing growth in non-metropolitan areas slowed

considerably compared to metropolitan areas (42% vs. 121%, respectively). As of 2018, the rate of naloxone dispensing to Medicare enrollees in metropolitan areas was approximately double that in non-metropolitan areas (4.9 vs. 2.9 per 1,000 enrollees, respectively).

Rural Access to Opioid Treatment Program (OTP) Clinics and Certified Community Behavioral Health Clinics (CCBHC). Access to Medications for Opioid Use Disorder (MOUD) offer the greatest potential to impact the OUD crisis. The growth of CCBHCs enhances access to medication by also offering comprehensive behavioral and physical health care. These additional services have the potential to improve treatment outcomes. This project identified all CCBHCs and OTP Clinics in the U.S. and then presented the number of rural and urban clinics in each state as frequency tables and map visualizations.

Risky Behaviors and Overdose Deaths Related to Illicit Drug Use. Using the National Survey on Drug Use and Health, this study will investigate rural vs. urban variations in treatment utilization for alcohol use disorder (AUD) and, separately, drug use disorder (DUD). It will yield prevalence estimates of any treatment receipt and sources of treatment among persons with past year AUD and DUD as well as the receipt of medication therapy among those treatable with medications.

Risky Substance Use among Rural and Urban Adults: An Update. Very little research has examined rural vs. urban differences in substance misuse and treatment access nationally. Using public and nationally representative data from the NSDUH, this project will 1) Estimate and compare alcohol use and binge drinking and 2) Estimate and compare drug use (marijuana, other illicit drugs, and non-medical use of other drugs) between non-metropolitan and metropolitan adults.

Rural Mental Health and Treatment

Mental Health Treatment Access: How do Mental Health Treatment Use and Unmet Treatment Need Vary among Rural and Urban Adults Nationally? This study estimated and compared the prevalence of past year depression, receipt of treatment for depression, and sources of treatment for depression between non-metropolitan and metropolitan adults. We found that 7.8% of non-metropolitan and 7.1% of metropolitan adults had past year major depression. Treatment receipt (seeing a health professional or using prescription medication for depressive feelings) was similar among non-metropolitan (68.0%) and metropolitan (64.6%) adults. A closer examination of the type and source of treatment revealed that rates of seeing a health professional were similar among non-metropolitan (60.8%) and metropolitan (58.4%) adults, but rates of using prescription medication for depressive feelings were higher among non-metropolitan (58.2%) than metropolitan (48.6%) adults. Also, rates of visiting a general practice/family doctor were higher among non-metropolitan (43.7%) than metropolitan (34.5%) adults.

Substance Use, Depression, and Suicide: What are the Individual and Policy-Modifiable Correlates amongst Metropolitan and Non-Metropolitan Adults? Suicide is among the leading causes of death in the U.S. and rates in non-metropolitan counties have historically exceeded those in metropolitan counties. This study examined the prevalence of suicidal thoughts, plans, and attempts by year (2010-2016) and county type (non-metropolitan, small metropolitan, and large metropolitan). This study revealed that mean prevalence rates for suicidal thoughts, plans, and attempts were significantly higher ($P < .05$) among residents of non-metropolitan than large metropolitan counties, and the adjusted odds of suicidal thoughts, plans, and attempts did not improve significantly from 2010 to 2016 among residents of any county type. Our findings suggest that suicide prevention interventions should be further targeted toward non-metropolitan counties. However, new interventions may need to be specifically developed to meet the unique needs of residents in non-metropolitan counties.

Longitudinal Trends in Community Mental Health Center and Federally Qualified Health Center Supply in Non-Metropolitan and Metropolitan Counties. This study shows how the supply of community mental health centers (CMHCs) and community health centers (CHCs) delivering mental health services changed from 2000 to 2019. While the supply of CHCs offering mental health services increased, the supply of CMHCs decreased. Growth in CHCs offering mental health services was pronounced in both non-metro and metro counties, although it was faster in metro counties.

Serious Mental Illness and Access to Care among Rural and Urban Adults. Little recent research has compared the prevalence of serious mental illness (SMI) and mental health treatment utilization among non-metropolitan and metropolitan adults. This project estimated and compared the prevalence of mental health treatment utilization and reasons for not seeking mental health treatment among adults with SMI residing in non-metropolitan and metropolitan counties nationally. We found that past year prevalence of serious mental illness (SMI) was significantly higher among non-metropolitan than metropolitan (5.90% vs. 5.18%, $P < .03$) adults. Further, only 67.58% of non-metropolitan and 64.29% of metropolitan adults with SMI received any mental health (MH) treatment in the past year. Additional analyses revealed the following treatment differences: a higher percentage of non-metropolitan than metropolitan adults with SMI received only medication for MH treatment (24.50% vs. 18.53%, $P < .02$); a higher percentage of metropolitan than non-metropolitan adults with SMI received inpatient, outpatient, and medication (5.42% vs. 2.63%, $P < .02$); and a significantly higher percentage of non-metropolitan than metropolitan adults with SMI reported that they did not seek mental health treatment because they had no transportation or treatment was inconvenient (11.57% vs. 6.87%, $P < .03$).

Rural and Urban Differences in Access to Psychiatric Partial Hospitalization Programs. Partial psychiatric hospitalization programs (PPHPs) are intended to reduce or avoid inpatient stays by providing intensive psychiatric services in outpatient settings. We provided national estimates of PPHP availability among non-metropolitan and metropolitan hospitals and described the hospital

characteristics associated with the provision of PPHPs. This study revealed that a significantly smaller proportion of non-metropolitan than metropolitan hospitals offer PPHPs (11.4% of non-metropolitan compared to 38.7% of metropolitan hospitals). Regardless of location, hospitals that offer PPHPs have higher patient volumes and more beds than hospitals that offer PPHPs through affiliated providers or do not offer PPHPs at all.

Primary Care and Preventive Services

Variation in Scope of Practice and Medical Services Available at Family Physician Practices within Rural Areas. While the scope of practice of family physicians has been shrinking, they still practice broadly, often due to fewer health care resources in rural areas. Using data from family physicians seeking continued board certification in 2014 and 2015, we found that a high percentage of rural family physicians provide nearly every clinical service queried. We also found that rural family physicians in patient-centered medical home (PCMH) practices generally provide more services than those in non-PCMH practices.

Rural and Urban Variation in Family Physicians' Demographics and Practices. Little is known about racial and ethnic distribution of family physicians (FPs) according to rurality. Racial/ethnic concordance of clinicians and patients may improve health outcomes by increasing access to care for underserved populations. Our objective was to determine the distribution of FPs in rural areas by race/ethnicity and also discover whether rural minority FPs were more likely to be in underserved rural areas. We found that the family physician workforce is becoming more racially diverse; however, non-metropolitan family physicians are not. Using data from over 24,000 family physicians who either registered to continue their American Board of Family Medicine (ABFM) certification or completed the graduate survey from 2017 to 2019, we found that early career family physicians are more diverse than later career physicians (66.9% vs. 72.8% White; 58.3% vs. 44.0% female) but, in both groups, the percentage of White non-metropolitan family physicians was even higher (82.7% to 90.5%). Also, minority non-metropolitan family physicians, particularly Black and Native American/Alaska Native physicians, are more likely to practice in persistent poverty counties. The lack of resources in these counties may make delivering health care harder.

Disparities in Screening, Prevention, and Management of Cardiovascular Disease in Rural and Urban Primary Care. Rates of preventive screening remain low in the U.S. as compared to recommendations, despite a strong scientific basis for their beneficial impact on health. Levels of adherence to preventive guidelines are even lower in African Americans and other racial/ethnic minority populations, socioeconomically disadvantaged populations, and underserved rural populations. This project used a large national primary care registry to compare cardiovascular disease (CVD) screening, prevention, and management quality measures between rural and urban

primary care practices. It also assessed for disparities by patient composition (race/ethnicity, insurance) of the practice.

Medicare Beneficiaries' Access to Preventive Services: Diabetes Self-Management Training (DSMT), Medical Nutrition Therapy (MNT), and Health and Behavior Assessment and Intervention (HBAI). This study investigated geographic disparities and the availability of DSMT, MNT, and HBAI services in rural and urban areas by examining fee-for-service Medicare beneficiaries in 2012-2016. In 2016, rural county residents represented 21.8% of the fee-for-service (FFS) Medicare population, but only 1.6% of rural FFS beneficiaries lived in a county with local utilization of HBAI services. Utilization of HBAI services in 2016 occurred in 19 (9.7%) rural counties and 176 (90.3%) urban counties, and the average utilization rate of HBAI services was higher in rural counties than urban counties (0.7% vs. 0.4%). Rural FFS Medicare beneficiaries in 2016 represented 21.7% of the population diagnosed with diabetes, but only 2.7% of the population utilizing DSMT. Utilization of DSMT services in 2016 occurred in 76 rural counties and 309 urban counties, and the average utilization rate of DSMT services was greater in rural counties than urban counties (5.5% vs. 2.5%). In 2016, 21.8% of the FFS Medicare population resided in a rural county, but only 3.7% of enrollees residing in a county with utilization of MNT services were rural county residents. Utilization of MNT services in 2016 occurred in 92 rural counties and 388 urban counties, and the average utilization rate of MNT services was greater in rural counties than urban counties (3.1% vs. 1.9%).

Diabetes Management in Urban and Rural Areas of the U.S. This study used recent claims data, from services received between 2018 and 2020, to examine the prevalence of diabetes and to determine if patients with diabetes are more or less likely to receive annual hemoglobin A1c (HbA1c) screening. It also examined the association between receipt of HbA1c testing in 2019 and diabetes-related health outcomes in 2020. We found that enrollees living in non-metropolitan areas had 22% higher likelihood of having diabetes, even after controlling for factors like age and region. The prevalence of diabetes in 2019-2020 was 7.9% in non-metropolitan areas and 6.2% in metropolitan areas. Annual hemoglobin A1c (HbA1c) testing occurred for 85.1% of non-metropolitan and 85.7% of metropolitan enrollees with diabetes. After controlling for other factors, we found significantly lower testing for those in non-metropolitan areas. For diabetic enrollees, having an HbA1c test in 2019 was associated with an 8% decrease in the likelihood of non-cardiovascular complications related to diabetes and a 6% decrease in the likelihood of inpatient diabetes care in 2020.

Barriers and Disparities Associated with Pneumococcal Immunization among Rural Elderly Adults. Using 2014 Medicare data, we found a significant disparity in pneumococcal vaccine service delivery to fee-for-service Medicare beneficiaries. Although primary care providers delivered the majority of pneumococcal vaccines to this population, pharmacy providers delivered a significantly greater proportion of vaccines in rural versus urban counties. In an updated analysis using 2015 Medicare data, we found that delivery of pneumococcal vaccines to fee-for-service Medicare beneficiaries

increased 380% from 2014-2015 as a result of uptake of the PCV13 vaccine. However, a significant rural-urban disparity remained.

Black Lung Disease, Occupational Health, Injury

Lung Diseases among Coal Miners. Miners risk developing coal workers' pneumoconiosis (CWP, also known as black lung disease) and other pneumoconiosis like silicosis and asbestosis. This study determined, mapped, and analyzed the spatial patterns of health care utilization among Medicare beneficiaries with CWP and other related pneumoconiosis using the Medicare beneficiaries Limited Data Set from 2011-2014.

The Association of Occupation with Mental Illnesses and Death by Suicide. Research into elevated psychological distress among workers in certain occupations is limited. This project examined suicide mortality among agricultural workers, comparing rural and urban residents using pooled data from the Mortality-Linked National Health Interview Survey, 1986–2014. The study also reviewed relevant research to identify occupations with low and high risks of mental health problems in the United States. Adjusted odds of developing distress were 20% higher among workers in high-risk occupations versus those in low-risk occupations, and time spent in a high-risk occupation increased distress.

Unintentional Injury in Metropolitan and Nonmetropolitan Settings by Race or Ethnicity. Unintentional injury is the third leading cause of death. We examined the rate of fatal and nonfatal injuries in nonmetropolitan and metropolitan areas, with a focus on the effects of race/ethnicity. Nonmetropolitan residents are more likely than metropolitan residents to suffer a fatal unintentional injury, though we found no difference in the rates of nonfatal unintentional injury emergency department visits.

Social Determinants of Health

Rural Family Physicians' Ability to Address Patients' Social Determinants of Health Needs. Rural populations fare worse than their metropolitan counterparts in social determinants of health including access to services, economic opportunity, intimate partner violence, life expectancy, and poverty. Very little research exists to describe the ability of rural primary care physicians to address patients' non-medical social determinants of health needs. This project made use of a unique dataset collected among family physicians nationally in 2017 through 2019.

Review of Current Research on Rural/Urban Differences in Social Determinants of Health. Social determinants of health are social, economic, and community variables that influence health outcomes. This project synthesized the extant literature on rural/urban differences in the social determinants of health, culminating in a comprehensive report that includes a summary of information gaps and further research needs.

Health Care Financing

Changes in Access to Care During the Public Health Emergency: Examining Rural-Urban Disparities by Insurance Type. Using the Behavioral Risk Factor Surveillance System data, this study will compare key access to care indicators among adult beneficiaries residing in rural and urban areas before and after the Public Health Emergency by types of health insurance. We will explore state-level policy variations, such as the Affordable Care Act (ACA) Medicaid expansion and COVID-19-related Medicaid coverage for uninsured adults.

Impact of High Deductible Health Plans on Rural Populations. Using data from Merative MarketScan insurance claims, this study will investigate utilization, spending, and care patterns of rural members enrolled in high deductible health plans (HDHP) compared to traditional plans. Trends in health outcomes before and after HDHP growth will be assessed to inform policy design tailored to rural residents.

Evaluating the Impact of Inflation Reduction Act Provisions on Medicare Advantage Prescription Drug Costs. Using Merative MarketScan data, this study will evaluate changes in the affordability of prescription drugs for urban and rural Medicare beneficiaries before and after the recent Inflation Reduction Act (IRA). The primary outcome will be an assessment of whether the IRA succeeded in reducing costs and identifying any remaining health disparities.

Hospital Closures and Hospital Pricing

Exploring the Impact of Rural Hospital Closures on Use of Emergency Medical Services. This project explored how a local hospital closure changes patient time in an ambulance for 9-1-1 calls. Access to emergency department services in communities, especially rural communities, persists as a priority for the Medicare program. We found when hospitals close, rural patients requiring ambulance services are disproportionately affected.

Third Party Negotiated Pricing in Rural and Urban Hospitals. Very little research has examined how pricing differs between rural and urban hospitals across an array of procedures, from inexpensive routine procedures to more lucrative surgical procedures. This project provides insight into the impact of insurer reimbursement rates on the financial health and stability of rural hospital networks, an issue that impacts local and state policy makers. It also provides valuable information for members of rural communities about the impact of living in a rural area on pricing for medical services. The study used third party negotiated pricing information to compare prices in urban and rural hospitals, across a variety of common services. Because there has been poor compliance with the Centers for Medicare & Medicaid Services (CMS) requirement to publish third party negotiated pricing, we also examined if the availability of this information differs for rural and urban hospitals.

Cancer Prevention and Survivorship Care

Rural and Urban Primary Care Physicians' Colorectal Screening Performance. This project sought to further understand the roles of primary care physicians in assuring that their patients receive recommended colorectal cancer screenings, especially considering that primary care physicians (particularly family physicians) are the predominant clinicians in rural America. Family physicians can provide endoscopy services themselves as opposed to referring patients to other specialists, such as gastroenterologists, but these numbers are low (<5% overall). Our prior research found that the percentage of rural family physicians doing colonoscopy (6% to 4%) and endoscopy (6% to 3%) both declined from 2014 to 2016, further threatening rural access to screening. We profiled and compared rural vs. urban differences in colorectal screening performance among primary care physicians nationally, using data from the American Board of Family Medicine's PRIME Registry. This registry captures electronic health record data from more than 2500 clinicians in approximately 800 practices located in 47 states caring for 5.4 million patients. PRIME practices are disproportionately rural, small, and independent compared to all US primary care practices.

Rural/Urban Variations in Cancer Screening During the COVID-19 Pandemic. Using the National Cancer Institute Health Information National Trends Survey, we examined how the COVID-19 pandemic disrupted the receipt of recommended screenings for common cancers. Findings from this project will inform policy makers about potential widening of rural/urban disparities in the receipt of cancer preventive services and the potential need to target these services toward rural residents.

Rural/Urban and Racial/Ethnic Inequities in Patient-Reported Health Care Access and Quality among Medicare Beneficiaries with Lung or Colorectal Cancer. Incidence and mortality for colorectal and lung cancer are higher in rural versus urban residents, but many rural cancer patients lack accessible, high-quality care. This study sought to 1) Identify rural/urban inequities in Medicare cancer patient-reported health care access and quality and 2) Determine if rural racial/ethnic minority patients have worse health care access and quality than rural White patients. The goal was to provide timely information about rural/urban and racial/ethnic inequities in health care experiences among Medicare beneficiaries with cancer. The findings may be applied by CMS and other federal policy makers to incentivize improvements in health care delivery and thereby reduce rural/urban and racial/ethnic inequities in cancer care among Medicare beneficiaries.

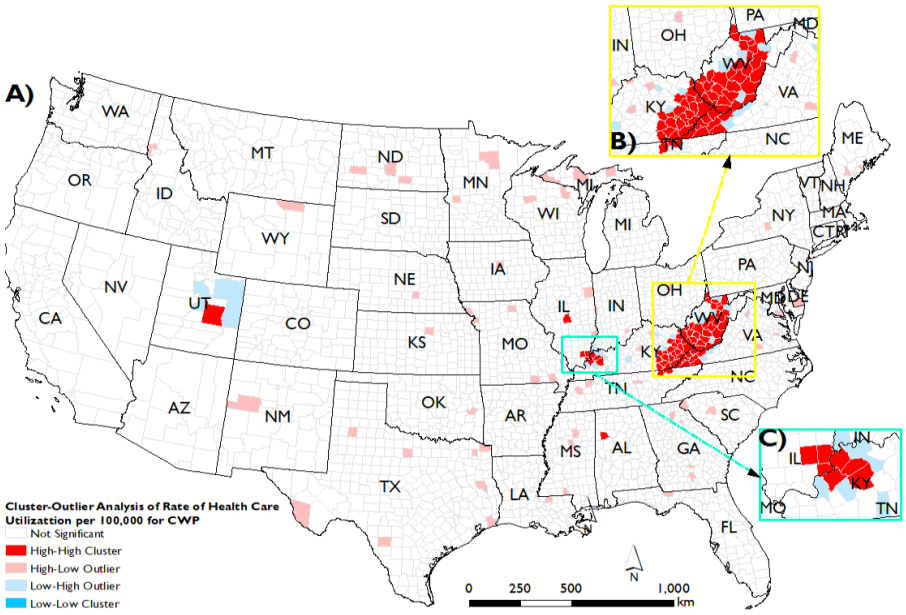
Rural and Urban Cancer Survivors' Follow-Up Care Experiences. After completing treatment, cancer survivors require follow-up services for surveillance of cancer recurrence, detection of new cancers, continued care management, and the monitoring of late or long-term treatment side effects. This project examined rural vs. urban differences in cancer survivors' follow-up care experiences by conducting analyses of the 2017 Medical Expenditure Panel Survey (MEPS), which included a cancer survivorship module. Our aims were to 1) provide nationally representative estimates and

compare/contrast the prevalence of rural and urban cancer survivors' follow-up care experiences, 2) understand how having a regular PCP is associated with cancer survivors' follow-up care experiences and if this association is stronger among rural than urban cancer survivors, and 3) determine if racial/ethnic differences in cancer survivors' follow-up care experiences vary by rural/urban residence. We also sought to identify other correlates of discussions about cancer survivorship care with health care professionals. We found that approximately 64% of urban and 62% of rural survivors discussed in detail with a health care professional the need for follow-up care. Lower percentages discussed lifestyle and health recommendations (38% urban, 33% rural), emotional/social needs (29% urban, 22% rural), long-term side effects (44% urban, 40% rural), and treatments received (46% urban, 38% rural). Non-Hispanic White ethnicity and time since treatment were associated with lower odds of discussing at least two dimensions of survivorship care.

INTERACTIVE, USER-FRIENDLY VISUALIZATIONS

For several of our projects, we have created interactive, user-friendly visualizations describing the locations of health services or rates of diseases at the county level. Figure 2 shows the annual rate of health care utilization for black lung disease for each county in Kentucky. Interactive maps for black lung disease may be found at https://ruhrc.uky.edu/infographics/#infographic-type-1

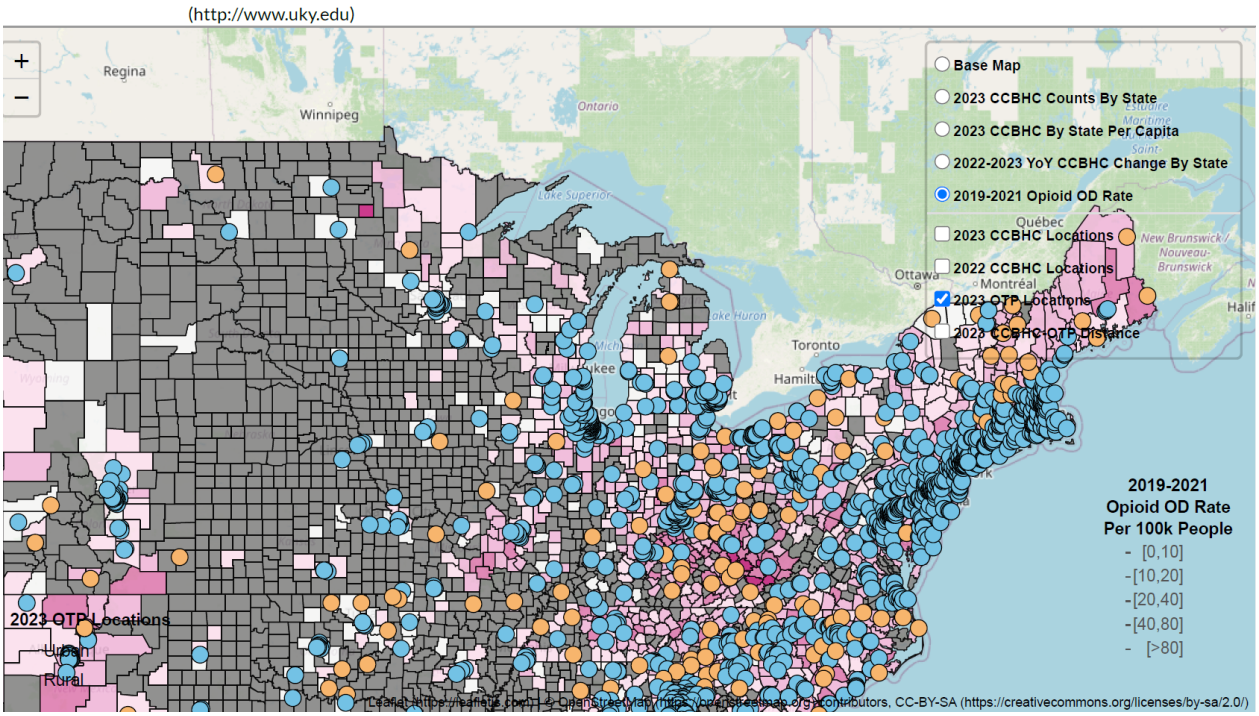
Figure 2. Spatial clustering analysis of 4-year rate of health care utilization for Medicare Beneficiaries with black lung disease. A) Overview in the U.S., B) Insert map showing an area in central Appalachia, C) Counties bordering Illinois and West Kentucky with high-high clusters.



Citation for Map. Arif AA, Owusu C, Paul R, Blanchette CM, Patel RP, Borders TF. *Spatial Analysis of Health Care Utilization among Medicare Beneficiaries with Coal Workers' Pneumoconiosis and Other Related Pneumoconiosis.* Lexington, KY: Rural and Underserved Health Research Center.

Figure 3 shows rates of opioid overdose and the locations of opioid treatment programs across the U.S. Interactive maps related to this figure may be found at https://ruhrc.uky.edu/ccbhc-report/.

Figure 3. Rates of opioid overdose and the locations of opioid treatment programs.



CONTRIBUTIONS TO THE ACADEMIC LITERATURE

In addition to reports, we have published numerous articles in the academic literature (see Table).

Table 1. JOURNAL MANUSCRIPTS

Manuscript	Year Funded	Open Access?
Peterson LE, Nasim U, Madabhushi V. Declining Endoscopic Care by Family Physicians in Both Rural and Urban Areas. *The Journal of the American Board of Family Medicine*. 2019;32(4):460-461; DOI: 10.3122/jabfm.2019.04.190064. https://www.jabfm.org/content/32/4/460	2016	Yes
Chaudhary S, Davis A, Troske K, Troske S. Hospital Closures and Short-Run Change in Ambulance Call Times. IZA Discussion Paper No. 12797. Bonn, Germany: IZA – Institute of Labor Economics; November 2019. https://ssrn.com/abstract=3495774 or http://dx.doi.org/10.2139/ssrn.3495774	2016	Yes
Arif A, Adeyemi O. The Prevalence of Chronic Diseases among Current and Ex-Miners in the United States. *Journal of Occupational and Environmental Medicine*. December 31, 2019; DOI: 10.1097/JOM.0000000000001809	2017	No
Peterson LE, Morgan ZJ, Borders TF. Practice Predictors of Buprenorphine Prescribing by Family Physicians. *The Journal of the American Board of Family Medicine*. 2020;33(1):118-123; DOI: 10.3122/jabfm.2020.01.190235. https://www.jabfm.org/content/33/1/118.long	2017	Yes
Peterson LE, Morgan ZJ, Eden AR. Early-Career and Graduating Physicians More Likely to Prescribe Buprenorphine. *The Journal of the American Board of Family Medicine*. 2020;33(1):7-8; DOI: 10.3122/jabfm.2020.01.190230. https://www.jabfm.org/content/33/1/7	2017	Yes
Arif AA, Paul R, Delmelle E, Owusu C, Adeyemi O. Estimating the prevalence and spatial clusters of coal workers' pneumoconiosis cases using Medicare claims data, 2011-2014. *American Journal of Industrial Medicine*. 2020;1-6. https://doi.org/10.1002/ajim.23104	2017	No
Arif AA, Adeyemi O. Mortality among workers employed in the mining industry in the United States: A 29-year analysis of the National Health Interview Survey—Linked Mortality File, 1986-2014. *American Journal of Industrial Medicine*. 2020;1-8. https://doi.org/10.1002/ajim.23160	2017	No
Nasim U, Morgan ZJ, Peterson LE. The Declining Scope of Practice of Family Physicians Is Limited to Urban Areas. *The Journal of Rural Health*. 2021;37(4):734-744. DOI: 10.1111/jrh.12540	2017	No
Paul R, Adeyemi O, Arif AA. Estimating mortality from coal workers' pneumoconiosis among Medicare beneficiaries with pneumoconiosis using binary regressions for spatially sparse data. *American Journal of Industrial Medicine*. 2022;1-6. DOI:10.1002/ajim.23330	2017	Yes

Arif AA, Adeyemi O, Laditka SB, Laditka JN, Borders T. Suicide mortality rates in farm-related occupations and the agriculture industry in the United States. *American Journal of Industrial Medicine*. 2021;1-9. https://doi.org/10.1002/ajim.23287	2018	No
Laditka JN, Laditka SB, Arif AA, Adeyemi OJ. Psychological distress is more common in some occupations and increases with job tenure: a thirty-seven year panel study in the United States. *BMC Psychology*. 2023;11, 95. https://doi.org/10.1186/s40359-023-01119-0	2018	Yes
Arif AA, Adeyemi O, Laditka SB, Laditka JN. Suicide Rates and Risks Across U.S. Industries: A 29-Year Population-Based Survey. *Archives of Suicide Research*. 2024; January 9. https://doi.org/10.1080/13811118.2023.2300324	2018	No
Cheng Y, Freeman PR, Slade E, Sohn M, Talbert JC, Delcher C. Medicaid expansion and access to naloxone in metropolitan and nonmetropolitan areas. *The Journal of Rural Health*. 2023;39(2):347-354. DOI:10.1111/jrh.12719.	2019	No
Borders TF, Morgan ZJ, Peterson LE. Colorectal Cancer Screening in Rural and Urban Primary Care Practices amid Implementation of the Medicare Access and CHIP Reauthorization Act. *Journal of Primary Care & Community Health*. 2023;14. https://doi.org/10.1177/21501319231177552	2019	Yes
Sand J, Morgan ZJ, Peterson LE. Addressing Social Determinants of Health in Family Medicine Practices. *Population Health Management*. 2024; 27(1):26-33. DOI: 10.1089/pop.2023.0014	2020	No
Borders TF, Hammerslag L. Satisfaction with Care among Cancer Survivors with Medicare Coverage: Are There Rural vs. Urban Inequities? *Journal of Primary Care & Community Health*. 2024	2020	Yes

EXAMPLES OF NARRATIVE SUCCESS STORIES

Of the top 5 selectable topics on the Rural Health Research Gateway, #3 is Mental and Behavioral Health and our Center has produced 25% of research on this topic since 2017. For the #5 topic, Substance Use and Treatment, we have produced 33% of the research on Gateway since 2017.

Three of our center's policy briefs were featured in Gateway's September 2022 Rural Mental Health recap (#2 of top 3 recaps for July 2022-June 2023) (https://www.ruralhealthresearch.org/recaps/15): "Major Depression, Treatment Receipt, and Treatment Sources Among Non-Metropolitan and Metropolitan Adults" (published June 2020), "Serious Mental Illness and Mental Health Treatment Utilization Among Adults Residing in Non-Metropolitan and Metropolitan Counties" (published February 2022), and "Suicidal Thoughts, Plans, and Attempts by Non-Metropolitan and Metropolitan Residence" (published May 2019). Gateway's Opioid Use recap of February 2022 (#3 of top 5 recaps for July-Dec 2022) included one of our journal articles, "Early-Career and Graduating Physicians More Likely to Prescribe Buprenorphine" (published January 2020) and one of our briefs, "Partial Psychiatric Hospitalization Program Availability in Nonmetropolitan and Metropolitan Hospitals Nationally" (published December 2019) (https://www.ruralhealthresearch.org/recaps/14).

Dr. Lars Peterson was interviewed about Rural Family Physicians Providing Prenatal Care. NPR in Kansas City podcast, July 25, 2022. https://www.kcur.org/news/2022-07-25/states-cracking-down-on-abortion-have-high-maternal-mortality-rates-and-gaps-in-rural-care.

Dr. Ty Borders was quoted in the article, "Health in Rural America: Connecting to Care," published in the NIH *News in Health* monthly newsletter, March 2022. https://newsinhealth.nih.gov/2022/03/health-rural-america.

Our online webinar for the Rural Health Research Gateway on November 9, 2021, "Family Physicians in Rural America: Training, Distribution, and Scope of Practice" (Patterson D, Peterson LE), was ranked #1 on Gateway for July-December 2021 with 144 attendees and 962 page views.

MEDIA DISSEMINATION

Selected Media Interviews and Op-Eds by Ty Borders (Center Director)

Op-Ed entitled "New ideas to deliver better health care to people in rural Kentucky" published in the *Louisville Courier Journal* on National Rural Health Day 2020 (see https://www.courier-journal.com/story/opinion/2020/11/19/national-rural-health-daydelivering-better-care-kentucky/6340905002/).

Op-Ed on COVID-19 in rural areas published in multiple newspapers across the Commonwealth of Kentucky, including *The State Journal* published in the capital city of Frankfort. (see https://www.state-journal.com/opinion/guest-columnists-protecting-rural-communities-against-covid-19-transmission-mortality/article_632d1aec-6c9c-11ea-8009-2fc76cadb768.html).

Numerous media interviews on COVID-19 in rural America, including the *Lexington Herald-Leader* and public radio (see https://www.kentucky.com/article241433896.html).

Live television interview about rural suicidal ideation research (see https://www.wkyt.com/content/news/UK-scientist-suicide-rates-higher-in-KY-rural-communities--512705361.html).

WORK WITH NEWS MEDIA

The University of Kentucky's Institute for Rural Journalism and Community Issues works with our Center to help disseminate our research applicable to Kentucky and the region. The Institute also provides perspective to our investigators about current issues relevant to a rural and underserved populace. The primary vehicles for this work are **The Rural Blog**, the institute's daily digest of events, trends, issues, ideas and journalism from and about rural America, which aggregates and curates rural health stories from other news outlets; and **Kentucky Health News**, which uses original reporting, curation and aggregation to cover health care and health in Kentucky. Stories about rural health research appear frequently in both publications, and especially newsworthy stories are posted on The Associated Press's StoryShare service. **The Rural Blog** has had about 967,000 page views in the last 12 months, or 2,650 per day. **Kentucky Health News** was conceived in 2010 as a way to get more news about health care and health into Kentucky's rural newspapers, which had little health news beyond press releases and "advertorial" articles, advertising masquerading as news. In the last 12 months, KHN has had 305,000 page views, and many newspapers regularly republish its articles and use them as sources for their own stories.