

The Role of Health Care Investment in the Future of Appalachian Kentucky

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Abstract

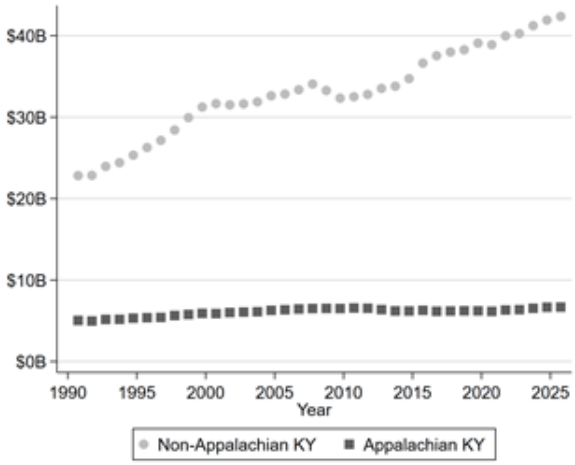
Appalachian Kentucky faces higher disease burdens than other regions of the state as well as relatively stagnant earnings. This report argues that greater investment in the health care sector could benefit the region along both health and economic dimensions. The literature on the relationship between income and health has established causal impacts from each to the other. Investments in health care can uniquely stimulate both sides of this interaction, resulting in a feedback loop that amplifies the initial effects.

Specific challenges facing Appalachian Kentucky include health care shortages, high rates of addiction and risky health behaviors, and disproportionate reliance on public insurance. Evidence shows that targeted investment in these areas can improve both economic conditions and population health. Existing strategies include improving care coordination, investing in prevention and early detection of behavior-related health conditions, expanding telehealth, developing workforce training programs, building and renovating facilities, attracting workers, and offering tax breaks. Improved measurement of the impacts of these interventions can help policymakers achieve the largest possible impact from scarce resources. Additionally, Appalachian Kentucky would benefit from more comprehensive strategies to incentivize physicians and other health care providers to work in the region, protect Medicaid, and preserve revenue from the 340B drug discounting program.

I. Introduction

Appalachian Kentucky tends to experience lower rates of employment, lower median income, and poorer health outcomes than the rest of the state and nation. Based on a June 2026 report from the Kentucky Center for Statistics, the unemployment rate across Appalachian counties was 6.6 percent – 22 percent higher than the rate of 5.4 percent in other parts of the state and 50 percent higher than the national rate of 4.4 percent (Kentucky Center for Statistics, 2026). The Appalachian Regional Commission (ARC) noted that in 2020 the median income in Appalachian Kentucky was 40 percent lower than the national median and 31 percent lower than the rest of Kentucky (ARC, 2020). Figure 1 shows that, although elsewhere in Kentucky there has been a strong upward trend in real earned wages, Appalachian Kentucky has seen substantially less growth.[1,2]

Figure 1. Annual Total Wages 1990–2025 in 1990 Dollars



[1] The figure displays total annual wages deflated into 1990 dollars. The data source for the CPI is https://download.bls.gov/pub/time.series/cu/ . The data in the figure imply that, from 1990 to 2025, the average annual growth in total wages was about 2.5 percent outside of Appalachian Kentucky, but just under 1 percent in Appalachian Kentucky. The state population grew from 3,686,892 in the 1990 census to an estimated 4,606,864 in 2025. The non-Appalachian population grew by approximately 0.9 percent per year on average from 1990 to 2025, while Kentucky's Appalachian population increased by about 0.2 percent per year on average.[1] These annual numbers suggest that changes in total wages earned were partly driven by population changes, but mostly by the contrast in how economic circumstances evolved in Appalachia compared to elsewhere in Kentucky.

[2] Data sources for population data: U.S. Census Bureau (2001, 2012, 2024, 2026).

This minimal economic growth may have played a key role in the relatively poor health outcomes in Appalachian Kentucky. Six counties in the area are among the 25 with the highest age-adjusted incidence rates for cancer in the U.S. (National Cancer Institute, n.d.). Two Appalachian Kentucky counties have the nation's highest rates of acute myocardial infarction deaths, with six others landing in the top 50 (Centers for Disease Control and Prevention [CDC], 2026). The region also experiences higher death rates, relative to the rest of the state and nation, from chronic obstructive pulmonary disease, stroke, and diabetes. Additionally, Appalachian Kentucky has relatively high rates of obesity, diabetes, infant mortality, low birth weight, teen births, smoking, and physical inactivity. Accordingly, Kentuckians in Appalachia are on disability at much higher rates than the rest of Kentucky and the U.S. (ARC, 2020).

This report argues that increased health care investment in Appalachian Kentucky could help to ameliorate these dual economic and health burdens. We begin by summarizing the literature on the relationship between income and health, which points towards causality in both directions, creating the potential for a feedback loop in which interventions that improve income or health ultimately affect both. This leads to the question of which specific types of health care investment can trigger that cycle. Motivated by Appalachian Kentucky's health care shortages, high rates of unhealthy behaviors, and heavy reliance on Medicaid, we discuss the evidence on the impact of new medical facilities and publicly financed insurance on income and health. We then discuss specific interventions already at work in Kentucky related to care coordination, prevention and early detection of lifestyle-related conditions, telehealth, workforce training, facility construction, attracting workers, and tax breaks. Measuring the impacts of these interventions and using the results to inform future investment decisions will be important moving forward. We close by discussing the need for comprehensive strategies to incentivize physicians and other health care providers to work

in the region, protect Medicaid, and preserve the 340B drug discounting program revenue that is vital to safety-net providers.

II. Theoretical Relationship between Income and Health

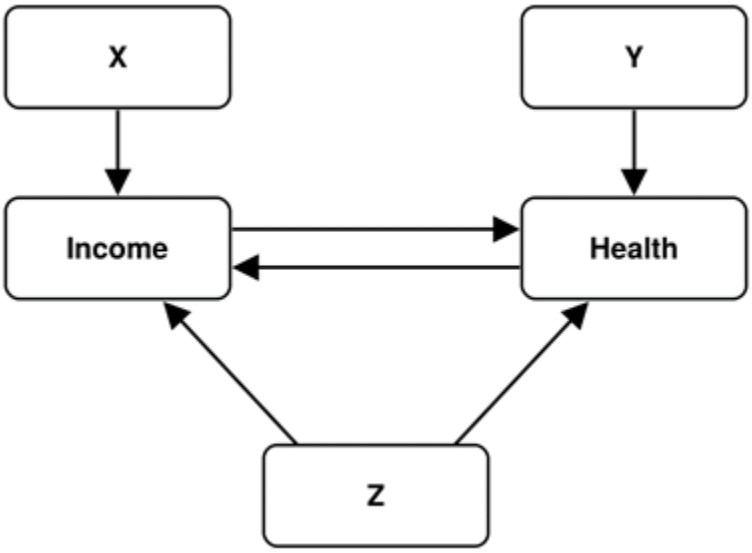
A lengthy scholarly literature documents a positive relationship between income and health. One well-known early example is Case et al. (2002), who show that this relationship begins in childhood and strengthens with age in the U.S. Cutler et al. (2011) review the literature, documenting that the positive relationship persists across numerous places and time periods. In a more recent notable paper, Chetty et al. (2016) use linked U.S. tax and death records and find a difference in life expectancy at age 40 between the top and bottom 1 percent of the income distribution of about 15 years for men and 10 for women.

Theoretically, this association could reflect a causal effect of income on health, a causal effect of health on income, other factors that influence both, or a combination of these. The idea of bi-directional causality dates back to Grossman's (1972) seminal economic model of health in which a higher stock of healthy days increases one's ability to earn income, which in turn enhances one's ability to invest in health capital. This in turn increases the future stock of healthy days, which enables further health investment, and so on in a perpetual feedback loop.

Figure 2 provides a simple model of this multifaceted relationship, with arrows showing the different directions of causality. X denotes factors that directly affect income but not health, such as cash transfers or stock dividends. Y denotes variables that directly affect health but not income, such as a sudden illness. Z represents factors that directly influence both income and health, such as education and conscientiousness. The important insight in the model is the role of indirect effects. Even though X does not directly affect health, it still indirectly affects health via income, which then further influences health, which then further influences income, and so on, until eventually a new equilibrium is reached. The reverse is true for Y. Z triggers what could be described as a "double

feedback loop" that combines the domino effects of both X and Y. In short, bi-directional causality implies that any intervention that impacts either income or health will also affect the other.

Figure 2. Model of Relationship between Income and Health



III. Effect of Income on Health

This section examines the evidence regarding the causal effect of income on health. The literature's approach to doing this is to leverage exogenous (good-as-random) sources of income that should be uncorrelated with unobserved determinants of health – i.e., X from Figure 2. The results depend on the specific health outcome, source of exogenous variation, country, and population. However, the preponderance of evidence points towards income causally improving health.

Several studies examine the impact of winning lottery prizes in either Sweden or the U.K., finding improved self-reported overall health (Lindahl, 2005), no evidence of a change in self-reported physical health (Apouey and Clark, 2015), either reduced mortality (Lindahl, 2005) or a null effect (Cesarini et al., 2016), either improved mental health (Apouey and Clark, 2015; Gardner and Oswald, 2007) or a null effect (Lindqvist et al., 2020), and a null effect on hospitalizations (Cesarini et al., 2016). Importantly, since most lottery prizes are relatively small, the null results

could reflect the amount being too modest to generate meaningful impacts. Associational studies often express the relationship in terms of $10,000 increments of income, and lottery prizes of this amount or greater are relatively rare in survey datasets.

U.S.-based studies use different sources of identification. Akee et al. (2010) study an Eastern Band of Cherokee casino that began paying unconditional per-capita dividends in 1996. Children in affected households had fewer behavioral and emotional problems, particularly among the poorest families. Evans and Garthwaite (2014) find that the 1993 Earned Income Tax Credit (EITC) expansion, which increased benefits the most for mothers with two or more children, improved those mothers' self-reported health while reducing inflammation and cardiovascular risk. Hoynes et al. (2015) show that EITC expansions increased birth weight and reduced the incidence of low birth weight among less-educated, single mothers. Aizer et al. (2016) compare sons of mothers who received Mothers' Pension payments (1911–1935) to sons of rejected applicants. Recipients' sons lived a year longer and had better nutrition in adolescence. On the other hand, in a study in which randomly chosen low-income adults were given $1,000 per month in unconditional cash for three years, Miller et al. (2024) report only a temporary reduction in stress and mental distress and no statistically detectable effects on physical health.

Cash transfers appear to lead to clearer health benefits in the developing world. Gertler (2004) finds that Mexico's Progresa conditional cash transfer reduced child illness and improved growth. Fernald et al. (2008) show that larger cumulative transfers led to larger increases in child height, cognition, and language. Haushofer and Shapiro (2016) find that unconditional GiveDirectly transfers in Kenya improved psychological well-being and food security, with little effect on cortisol or physical health measures.

Finally, two other studies leverage the expansion of the old-age pension to Black households in South Africa in the early 1990s. Duflo (2003) shows that pensions received by grandmothers (but

not grandfathers) increased the height and weight of granddaughters. Case (2004) finds improvements in the self-reported health of pension recipients and other household members.[3]

In short, the available evidence from studies using causal research designs to identify the effect of income on health is somewhat mixed. However, most of the ambiguity comes from the branch of the literature on lottery prizes in developed countries. Income more clearly improves health when the research design focuses on developing countries or low-income individuals in developed countries. This is consistent with the conclusions of a review article by Lleras-Muney et al. (2025). The authors point out that while health, in the form of life expectancy, increases with income, there is greater variation at lower levels of income. This variation means there can be meaningful differences in life expectancy within lower-income percentiles, indicating that poverty does not inescapably mean worse health. Lleras-Muney et al. (2025) therefore suggest that the health improvements from higher incomes exhibit diminishing returns; i.e., the greatest gains appear to be for those starting at lower incomes.

IV. Effect of Health on Income

Turning to the other direction of the bi-directional causality, the evidence that health causally affects income is strong and consistent across contexts. One strand of the literature examines impacts

[3] Other related studies are excluded from this discussion because they conflate income effects with other forces. For instance, Snyder and Evans (2006) examine the effect of the Social Security "notch" – which gave people born just before 1917 higher benefits than those born just after – on the mortality rate of U.S. seniors. The higher-income cohort had a *higher* mortality rate, but the authors provide evidence that this is not due to income itself, but instead to the lower-income cohort being more likely to stay connected to the labor force after retirement age, with the social engagement from part-time work having a protective effect. There is also a literature on the health effects of the minimum wage (e.g., Wehby et al., 2020), but this does not cleanly identify income effects because the minimum wage can increase income among some people while decreasing it among others (those who lose their jobs). Another literature documents that mortality rates rise during periods of low unemployment (Ruhm, 2000). However, the available evidence suggests that this is due to factors besides income, such as increased time for exercise (Ruhm, 2005), nursing home staffing tightening during booms (Stevens et al., 2015), and increased air pollution (Heutel and Ruhm, 2016). Additionally, Sullivan and von Wachter (2009) examine mass layoffs and find a 50 percent to 100 percent increase in mortality in the year after displacement and a 10 percent to 15 percent increase over the next 20 years. However, similarly to the unemployment rate literature, being laid off changes more than just income – it also frees up time that could be used in either health-enhancing or health-detracting ways. With that said, the apparent contradiction between Sullivan and von Wachter's (2009) result and the findings of Ruhm (2000, 2005) suggests that macroeconomic conditions matter even holding individual employment constant, which is consistent with the nursing home and pollution explanations.

of adult health shocks, the timing of which can be viewed as quasi-random. Smith (1999, 2004) shows that new diagnoses of serious illnesses led to sizeable declines in household income and wealth among near-retirement-age U.S. seniors, driven mostly by lost earnings rather than medical spending. In the Netherlands, García-Gómez et al. (2013) find that an acute hospital admission reduced the probability of employment by 7 percentage points and personal income by 5 percent after two years. Heinesen and Kolodziejczyk (2013) find that a new cancer diagnosis reduced employment in Denmark, with the effect being largest among less-educated workers. Dobkin et al. (2018) show that unplanned hospital admissions among 50-59-year-old U.S. adults lead to a persistent 20 percent decrease in earnings. Finally, Meyer and Mok (2019) document large, persistent declines in earnings and consumption following the onset of severe disability.

Other compelling evidence for a causal effect of health on income comes from early-life health shocks – a segment of the literature reviewed by Almond and Currie (2011). For instance, Miguel and Kremer (2004) randomize school-based deworming in Kenya, and Hamory et al. (2021) show that treated cohorts had higher wages twenty years later. Almond (2006) shows that those in utero during the 1918 influenza pandemic had lower income as adults than adjacent cohorts. In a study using differences in Norwegian twins for identification, Black et al. (2007) find that a 10 percent increase in birth weight raises subsequent adult earnings by about 1 percent. In a randomized experiment in Guatemala, boys who received a protein and energy supplement before age three earned substantially higher wages as adults (Hoddinott et al., 2008). Finally, Bleakley (2010) finds that childhood malaria eradication in the United States, Brazil, Colombia, and Mexico increased subsequent adult income.

V. Effect of Health Care Investment on Income

Having evaluated the evidence for two-way causality between income and health, the next two sections turn to discussions of how further health care investment in Appalachian Kentucky can

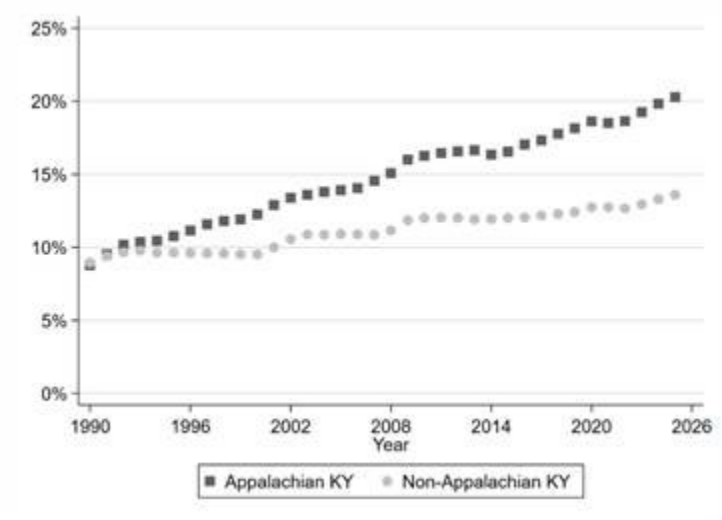
affect both, triggering the feedback loop in Figure 2. In other words, we argue that health care investment is a Z variable in the figure, directly affecting both income and health, in turn leading to indirect effects that amplify the initial improvements.

Health Care Providers and Facilities

Health care providers have a direct employment effect. Hospitals in Kentucky employ roughly 95,000 individuals (Kentucky Hospital Association, 2026), while nursing and residential care facilities employed over 45,000 as of December 2025 (U.S. Bureau of Labor Statistics, n.d.). Health care providers have grown as a key employer in Kentucky, accounting for an increasing share of employment and wages since 1990.

Figures 3 and 4 show changes in the health care and social assistance industry's share of total employment and wages in Appalachian and non-Appalachian Kentucky over the past 35 years.[4]

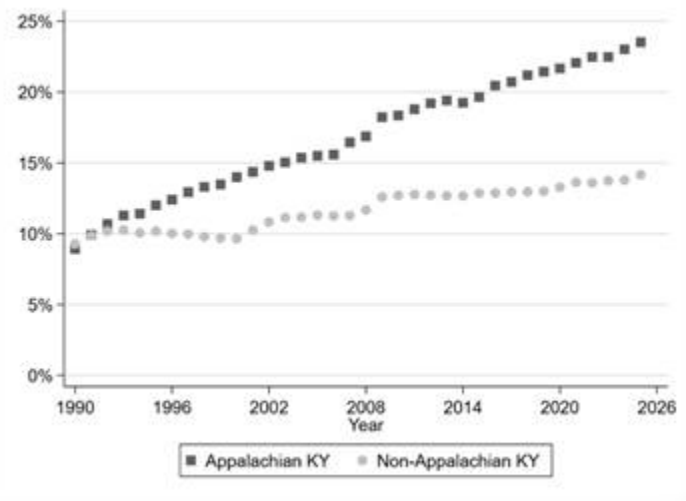
Figure 3. Share of Average Quarterly Employment in Health Care and Social Assistance[5]



[4] Data come from the Kentucky Center for Statistics. The county-level data used to assess employment for Appalachian Kentucky and non-Appalachian Kentucky suppress data from small counties with few employers or employees. However, total employment from these county-level counts provides 98-99 percent of state counts from 1990 through 2026.

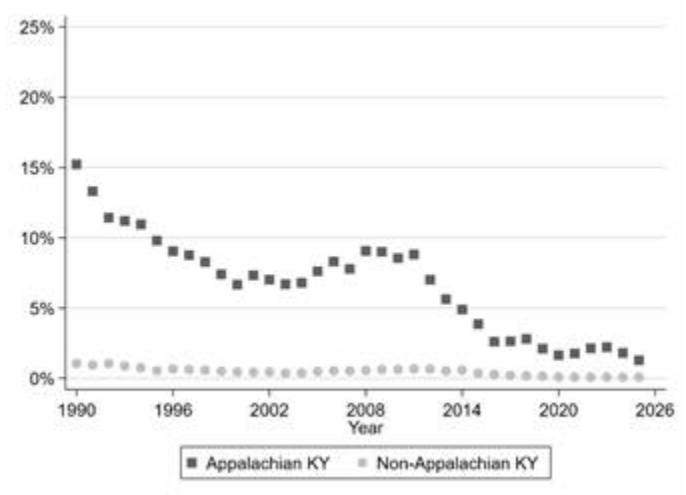
[5] Data source: see U.S. Bureau of Labor Statistics (n.d.).

Figure 4. Share of Total Annual Wages Earned in Health Care and Social Assistance



In 1990, health care and social assistance represented under 10 percent of employment and wages in both Appalachian and non-Appalachian Kentucky. The industry's average employment share has grown somewhat outside of Appalachian Kentucky since then – from 9 percent to 13.8 percent. However, within the Appalachian counties it has more than doubled – from 8.8 percent to 20.3 percent – while the share of annual wages earned increased from 8.9 percent up to 23.5 percent. This disproportionate change may have been partly driven by the steady decline in the share of wages earned from mining, quarrying, and oil/gas extraction. As shown in Figure 5, this fell from 15.2 percent in 1990 to barely over 1 percent in early 2026.

Figure 5. Share of Annual Wages Earned in Mining, Quarrying, and Oil/Gas Extraction



To illustrate how health care investment can increase employment and improve economic conditions, suppose that federal or state funding emerges for a new health care facility in an underserved area. Building it employs construction workers, electricians, plumbers, engineers, and project managers. Once it opens, it needs a large clinical workforce including physicians, nurses, medical assistants, pharmacy and lab technicians, and so on. Many of these roles only require a certificate or two-year college degree, meaning that local residents can realistically train for them. The facility also creates non-clinical jobs in areas that often need little formal training, including food service, security, patient transport, maintenance, billing and coding, information technology support, and administration. Finally, the paychecks of facility workers and purchasing requirements for its operations will boost other local businesses such as pharmacies, restaurants, child care providers, and medical suppliers. To illustrate the potential overall economic impact, a study of 91 critical access hospitals across 18 states found that, on average, they employed 127 people making a total of $6 million. Including secondary effects, the total impact rose to 170 jobs and $7.1 million in labor income, plus $1.8 million in taxable retail sales (Doeksen et al., 2016).

Cost of Care

Of course, health care facilities can only have these economic impacts if individuals in the local community are able to afford the services provided there. This points to another vital type of health care investment by federal and state governments: health insurance. Medicaid – which is jointly financed by federal and state governments – is particularly vital to Appalachian Kentucky, as it covers 41 percent of its residents compared to 21 percent nationally (Centers for Medicare & Medicaid Services [CMS], 2026b); Kentucky Cabinet for Health and Family Services, 2026). This high rate reflects a combination of the high poverty in the region and Kentucky's large expansion of Medicaid under the Affordable Care Act (Courtemanche et al., 2016).

The economic impact of public insurance in Appalachian Kentucky is enormous. In Appendix A, we estimate that Medicaid spending on residents in the region is $6.97 billion annually, while Medicare adds another $4.99 billion, for a total of $11.96 billion. However, not all of this money stays in the region, as residents often have to travel to larger cities to access certain specialized health care services. Appendix A estimates that $3.75 billion of the total amount leaks outside the region, sometimes out of state to West Virginia, Virginia, or Ohio. When we apply adjustments for relative cost/negotiated price differences in urban versus rural areas, we find that about $3.2 billion of this amount would have been received by Appalachian Kentucky providers if adequate services were available there, providing an enormous economic stimulus. Moreover, the $550 million savings would amount to approximately $360 million for Kentucky's Medicaid program and $190 million for the federal Medicare program. This points to the interactive effect of investment in facilities and health insurance: more investment in facilities that can meet local health care needs amplifies the effect of more investment in health insurance while likely also improving Medicaid budget efficiency in Appalachia, and vice versa. Residents would also be able to save time and transportation costs by obtaining care closer to home.

Additionally, the appendix estimates Medicare prescription drug bypass spending of $435 million. Roughly 47 percent of this we estimate to be from traveling to non-local pharmacies. This suggests about $204 million in forgone prescription drug revenues that could be meaningful for Appalachian safety-net providers participating in the 340B drug discount program, which mandates monetary transfers from drug manufacturers to participating providers, called covered entities, in the form of discounted drug purchases. These providers are typically hospitals and Federally Qualified Health Centers that serve a disproportionately high number of low-income patients.

In general, covered entities with in-house pharmacies or those that have contracted with outside pharmacies receive nearly the full insurance and copayment reimbursement for a 340B

covered prescription from their pharmacy – less a processing fee for contract pharmacies. They then can replace the drug at the 340B discount, gaining the difference between total reimbursement and the cost of replacement as increased net revenues. Such revenues help stabilize the finances of these providers, which frequently have narrow or negative operating margins (Courtemanche and Garuccio, 2026c). In some cases, where insurance reimbursements and copayments are tied to providers' costs, 340B savings are passed directly to patients through lower coinsurance payments, such as with Medicare beneficiaries and critical access hospitals (Han, 2023). By retaining such revenues, not only would local providers economically benefit, but so too would their communities, as increased revenues likely mean expanded and more stable employment and increased local economic activity.

VI. Causal Effect of Health Care Investment on Health

Whether and how much health care investment improves health likely depends on the extent to which the type of investment fulfills an unmet need in the community. Unique aspects of Appalachian Kentucky create opportunities for well-targeted investment to be particularly beneficial.

Health Care Providers

The first is a shortage of health care providers, which leads to problems accessing care that in turn create opportunities for investment in new facilities. In spite of the growth in the health care sector in Appalachia in recent decades, the region is still underserved relative to the rest of the state and country. Courtemanche and Garuccio (2026a) discuss this issue in detail, so we only briefly summarize it here. They outline several key health care professional shortages both in Appalachia and other rural areas. Hospitals that serve a large share of Medicaid and uninsured patients face considerable financial vulnerability, which can lead to service reductions and even outright closures. Additionally, physicians have increasingly left rural areas and been absorbed by health systems. This may be due to the financial strain and administrative burden of independent practice in areas where a

larger share of patients are either uninsured or publicly insured. The relative shortage of providers in rural/Appalachian areas extends to other providers such as dentists, mental health professionals, nurse practitioners, and audiologists (Feng et al., 2017). The constraint of provider availability in Appalachia could have a cascade effect from a lack of preventive care into the development of chronic conditions and late diagnosis of life-threatening conditions, thereby worsening outcomes.

An extensive literature spanning several decades documents that greater access to health care – particularly primary and emergency care – is associated with better population health. For instance, a review article by Starfield et al. (2005) concludes that health is better in areas with more primary care physicians, while a review by Chambers et al. (2020) finds that greater travel time or distance is associated with higher mortality for heart attack and trauma patients. However, associational studies are confounded by the fact that facilities tend to be built where demand and income are already changing.

Only a few studies use causal research designs to examine the effect of major new health care facilities on health. For example, Hollingsworth et al. (2024) study the Duke Endowment's early-20th-century hospital program in the Carolinas. This helped communities build and expand hospitals, acquire up-to-date medical technology, attract qualified staff, and improve management. The authors find that this support reduced infant mortality by 10 percent and mortality among 56-to-65-year-olds by 9 percent. Next, Bailey and Goodman-Bacon (2015) estimate the effect of the rollout of the first U.S. Community Health Centers and find that they lowered the mortality risk of those 50 and older by 7 percent to 13 percent among beneficiaries. Additionally, Pastrana et al. (2024) find that public hospital openings in Mexico reduced maternal mortality by 40 percent and neonatal mortality by 13 percent. These effects are driven by the first hospital to open in a municipality. In short, the existing evidence points to sizable health gains from new health care facilities where access was previously poor – as is the case in Appalachian Kentucky.

Risky Health Behaviors

Another unique aspect of Appalachia is its high rates of unhealthy behaviors. Women in Appalachian Kentucky smoke at 1.8 times the national rate and men at 1.6 times (Schoenberg et al., 2015). Across the Appalachian Region, 28.4 percent of adults are physically inactive, compared to 23.1 percent nationally, and fruit and vegetable intake is also well below the national average (Hoogland et al., 2019; Kentucky Department for Public Health, 2018). Accordingly, the obesity rate is almost four percentage points higher than the national average (Marshall et al., 2017). The gap is especially striking for drug overdoses. In 2015, the overdose death rate for working-age individuals in Appalachian Kentucky was 52.1 per 100,000, which is 29 percent higher than in non-Appalachian Kentucky and 142 percent higher than in the rest of the U.S. For opioids specifically, the overdose death rate was 133 percent higher than in the non-Appalachian U.S. (Meit et al., 2017). These high rates of risky behaviors create another opportunity for specific health care investments – such as in substance use disorder treatment facilities and health care professionals who specialize in nutrition and addiction – to have uniquely high returns.

Some evidence exists as to the effectiveness of substance use disorder treatment in Kentucky due to the Kentucky Treatment Outcome Study (KTOS), an ongoing system for tracking patients over time. According to the 2025 KTOS report, illicit drug use fell by 66 percent among those who participated in a follow-up interview a year after their intake into treatment. In an example of the feedback loop where a successful health intervention improves labor market outcomes, the same report found a 14 percentage point increase in self-reported full-time employment (Cole et al., 2025).

Cost of Care

Another unique aspect of Appalachian Kentucky is its disproportionate reliance on publicly financed health insurance, particularly Medicaid, as noted in Section V. The causal effect of Medicaid on health has been the subject of a vast literature. We discuss some of the most notable

studies here, referring interested readers to Sommers et al. (2017) for a more comprehensive review. Leveraging the staggered nature of Medicaid's original rollout in the 1960s and 1970s, Goodman-Bacon (2018) finds a reduction in nonwhite child mortality. Currie and Gruber (1996a, 1996b) focus on state-level eligibility expansions for pregnant women and children in the 1980s, finding that they reduced infant and child mortality. Wherry and Meyer (2016) document lower mortality among Black adults who were eligible for Medicaid as teens.

In 2008, Oregon used a lottery to randomly allocate a limited number of Medicaid slots to uninsured low-income adults. Finkelstein et al. (2012) show that receiving Medicaid in the lottery led to immediate improvements in self-reported health, some of which occurred even more quickly than changes in health care utilization – pointing to the possibility that simply having coverage lowered stress and improved mental health. Consistent with this, Baicker et al. (2013) find substantially reduced rates of depression but no discernible improvement in clinical measures of physical health. However, the null results were not precise enough to rule out meaningful effect sizes.

Other studies examine the effects of state expansions for adults in the 1990s and early 2000s. Sommers et al. (2012) find that Medicaid expansions in three states reduced adult mortality by 6 percent. Sommers (2017) shows that this reduction is concentrated among health-care-amenable causes of death such as HIV. Koumpias et al. (2024) examine a broader set of state expansions and find no evidence of reduced mortality, but they note that this could be due to insufficient statistical power.

The Patient Protection and Affordable Care Act's (ACA's) Medicaid expansion, which the Supreme Court made optional for states, created a large natural experiment that led to dozens of studies on various health-related outcomes. Given the large number of papers, there is naturally some disagreement in findings. However, a comprehensive review by Gruber and Sommers (2019)

characterizes the preponderance of evidence as favorable – particularly for outcomes measuring access to care, which should be predictive of long-term health improvements. Another comprehensive review by Soni et al. (2020) finds "encouraging evidence of improvements in health status, chronic disease, maternal and neonatal health, and mortality" (p. 371). A particularly influential study of mortality finds that the Medicaid expansion reduced mortality among near-elderly low-income adults by 9 percent (Miller et al., 2021).

The ACA also involved an expansion of subsidized private insurance, which is another way the federal government invests in health insurance. This has received less attention in the literature than the Medicaid expansion because there was no policy variation across states with which to identify causal effects. However, Courtemanche et al. (2018, 2019, 2020) developed an approach that leverages variation across local areas in pre-treatment uninsured rates. They find relatively quick improvements in access to care, with gains in self-assessed health measures emerging after five years.

There is relatively little causally interpretable evidence on the effect of Medicare on health, with two notable exceptions. Leveraging the sharp discontinuity in eligibility at age 65, Card et al. (2008, 2009) find that Medicare increases health care utilization and decreases mortality among severely ill patients admitted to a hospital through the emergency department.

In short, the results for Medicaid, the ACA, and Medicare collectively illustrate the potential for investments in health insurance to improve population health. The impacts would likely be especially strong in areas like Appalachian Kentucky where reliance on publicly financed insurance is high and baseline access is low. For example, Medicaid covers around 40 percent of births in the U.S., but in rural areas that share climbs to 47 percent (Ranji et al., 2025). However, obstetrics tends to be among the least profitable services rural hospitals provide and can often be eliminated when a hospital is attempting to salvage its financial position (Kozhimannil et al., 2022). O'Hanlon et al.

(2019) find that obstetrics is among the services commonly eliminated when a health system acquires a rural hospital. Other reductions included diagnostic imaging, primary care, and non-emergency outpatient visits.

VII. Specific Interventions

This section pivots from more general discussions of investment in medical facilities and health insurance to specific interventions already being deployed in Kentucky. First, the University of Kentucky's Markey Cancer Center began developing an affiliate network in 2006 that supports and improves cancer care among Kentucky hospitals. As of 2025, there are 20 affiliate hospitals in the network across the state, and 10 of these are in Appalachian counties (Markey Cancer Center, n.d.-b). Each member must be, or become, accredited by the Commission on Cancer, for which the Markey Cancer Center provides assistance (Markey Cancer Center, n.d.-a). Some benefits of affiliation include access to the Center's Molecular Tumor Board, a forum wherein clinicians can review cancer cases with other experts in order to evaluate and select patient-specific treatment options (Markey Cancer Center, n.d.-c).

Around 2014, the Markey Cancer Center sought to expand the use of low-dose computed tomography (CT) scans for early lung cancer detection. This is a relevant concern for a state whose former cash crop was tobacco and whose eastern residents historically relied on mining for income. In 2022, Kentucky tied with Mississippi for the fourth-highest smoking rate (17.4 percent) among U.S. states (American Lung Association, n.d.). Thus, early detection could save Kentuckians' lives and preserve their ability to support themselves. To that end, from 2019 to 2024, the Hazard affiliate in Perry County increased its low-dose CT scan screenings by nearly 150 percent (Alcorn, 2025). In a research letter, individuals affiliated with the Markey Cancer Center compare the self-reported receipt of annual lung cancer screenings using CT scans among those at higher risk of lung cancer in 2022 versus 2024. They find a statistically significant six-percentage-point increase in up-to-date

screenings nationally from 2022 to 2024. They also find an increase for Kentucky, though it is not statistically significant – perhaps because of the much smaller sample size in a single state (Burus et al., 2026). The expansion of early detection of cancer, a disease group that Kentuckians face more than those in most other states, could generate a considerable health improvement and improve Kentuckians' financial well-being by preserving their health and reducing medical expenses.

To illustrate some other recent health and economic investments in Appalachian Kentucky, Table 1 displays a list of 2024 Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) grants awarded by the ARC to projects based in Appalachian Kentucky. We only list the 2024 grants for the sake of illustration, but Appalachian Kentucky has benefited from 94 such grants since 2016 (ARC, 2026).

Table 1. 2024 ARC POWER Grants Awarded to Improve Appalachian Kentucky

Award Amount	Project Title	Recipient	Goal
$2,000,000	Appalachian Center for Preventive Medicine	University of Pikeville	Establish a clinical education and preventive-medicine platform, which will include interdisciplinary student rotations and expand preventive-care access.
$2,000,000	Career Pathfinder Network	Eastern Kentucky Concentrated Employment Program Inc.	Place career counselors in five school districts to provide career advising and help students acquire work experience, internships, and pre-apprenticeships.
$2,000,000	Southeastern Kentucky Workforce Reintegration Program	Volunteers of America Mid-States	Provide skills and job training for in-demand industries, offer career planning, assist in job placement and apprenticeship acquisition, and provide support services for unemployed and underemployed workers.
$1,907,500	Nicholas County JEDA Business Park Waterline	Nicholas County	Construct 7,500 feet of waterline to serve a 100-acre business park in Millersburg to attract biofuel companies.
$1,633,164	Pathways to Power: Lineman and CDL Training	Southeast Kentucky Community and Technical College	Establish two CDL and electrical-lineman training programs to help train students in four southeastern Kentucky counties.
$1,500,000	Southeast Transportation Center	KCEOC Community Action Partnership	Purchase and renovate a building and training equipment to use in Commercial Driver's License and Diesel Mechanics training at Southeast Kentucky Community and Technical College.

$1,499,740	Strengthening the Education-to-Career Pipeline for Eastern Kentucky Youth	Foundation of Appalachian Kentucky	Identify local career pathways and connect students with relevant work-based learning programs and career training curricula.
$400,000	Fueling Innovation, Revitalization, and Entrepreneurship	Big Sandy Area Development District	Strengthen entrepreneurship support in five eastern Kentucky counties through mentorship and technical assistance.
$50,000	Community Assessment Tool for a Just Transition	PLACE Initiative	Test and refine a tool for helping four eastern Kentucky counties transition away from a coal-powered economy to a more diverse economy.
$49,500	Connections to Care	LeadingAge Kentucky	Provide a needs assessment and feasibility report on broadband infrastructure in long-term care facilities in nine counties in Eastern Kentucky.
$40,000	Career Readiness/Internship Program Expansion	Saint Vincent's Mission, Inc.	Provide an evidence-based strategic plan to improve the existing Career Readiness/Internship program.

Aside from the ARC grants, the state itself has launched several initiatives, some supported by federal funds, to improve economic and health conditions in rural Kentucky. In December of 2025, Kentucky was awarded a $212.9 million federal grant to be issued over five years under the federal government's Rural Health Transformation Program (RHTP) (Office of the Governor, 2025). Kentucky will use the grant money in the following ways:

- "Local hub-and-spoke models focused initially on obesity and diabetes prevention and management, integrating nutrition, physical activity and digital self-management tools.
- Telehealth-enabled, community-based maternal care teams expanding prenatal and postpartum services in maternity care deserts and high-risk regions.
- Mobile crisis response, telepsychiatry and stabilization services connecting individuals to community-based behavioral health and recovery supports.
- Expanded dental hygiene training, externships and portable or tele-dental clinics to improve preventive oral health services.
- Enhanced pre-hospital care and trauma coordination through treat-in-place protocols, workforce training and improved data connectivity" (Office of the Governor, 2025).

Given Appalachian Kentucky's higher rates of chronic conditions, such as diabetes, and its limited access to dental care, the hope is that the use of targeted and digital resources can help alleviate some of these health burdens and expand access where it is most needed.

Other programs are aimed at economic development more generally, which should in turn improve health outcomes. The Kentucky Product Development Initiative (KPDI) provides financial support for Kentucky communities to help them improve their economic appeal. Funds are used to invest in potential building sites and upgrades of existing buildings that support and attract desirable employers to these areas. Eight of the twelve projects funded in February 2026 were in Appalachian counties, with total funding amounting to $13.5 million (Kentucky Cabinet for Economic Development, 2026a). A further $5.2 million was also approved for eight projects in July 2026, seven of which were in Appalachian counties (Kentucky Cabinet for Economic Development, 2026b). Other efforts to recruit jobs to Appalachian Kentucky include those of One East Kentucky, a non-profit organization that seeks to attract industries to nine Eastern Kentucky counties. Specific industry targets include aerospace; automotive; energy; food, beverage, and agriculture; health care; technology and call centers; and wood products (One East Kentucky, n.d.).

Recent legislative changes also aim to assist low-population/low-population-growth counties by providing added tax breaks to companies operating in "heritage" counties via the Kentucky Business Investment Program (KBIP). Heritage counties are determined based on county population levels and growth. Those that have a high enough combined score, meaning they rank low in both categories, qualify as heritage counties. Businesses can be granted increased tax credits under Kentucky House Bill 869, which was signed into law in April of 2026 (House Bill 869, 2026). In 2025, 17 counties qualified as heritage counties, nine of which were Appalachian (Kentucky Cabinet for Economic Development, 2025). The KBIP offers wage assessments and/or income tax credits to new and/or expanding agricultural businesses, regional and national headquarters, manufacturing

firms, and non-retail service/technology-related companies expanding employment and investment in Kentucky (Kentucky Cabinet for Economic Development, n.d.).

The Kentucky Enterprise Initiative Act (KEIA) provides refunds for sales and use taxes incurred by technology/service companies, manufacturers, and tourism or attraction firms when purchasing building/construction materials used to improve real property for new and/or expanding projects. Such refunds can also be given for equipment purchases for the purposes of data processing and research and development (Kentucky Cabinet for Economic Development, n.d.).

Clearly, substantial efforts have already been made to address the dual burden of a struggling economy and relatively poor population health in Appalachian Kentucky. The interventions discussed above reveal a multi-pronged strategy involving investments in care coordination, prevention and early detection of lifestyle-related illnesses, workforce training, telehealth, construction and renovation, efforts to attract workers, and tax breaks. What appears to be lacking is a comprehensive approach to measuring the impacts of the numerous interventions, scaling up the ones that prove effective, and abandoning the ones that do not. Evidence-based decision-making is necessary to maximize the impact of limited federal, state, and local resources.

VIII. Possible Future Directions

This section discusses additional possible policy directions that could increase health care investment in Appalachian Kentucky or preserve current investments that are under threat.

Attract Providers

This paper has emphasized the importance of addressing health care supply constraints in Appalachian Kentucky. While investment in facilities is an essential part of doing so, this would be ineffective if physicians and other health care providers cannot be attracted to work in the area. As explained in more detail by Courtemanche and Garuccio (2026a), the financial support mechanisms that encourage newly trained health care providers to locate in shortage areas often have incentive

structures that dissuade private practice. For instance, student loan repayment programs offered in the state seem largely weighted toward newly trained individuals accepting positions with established providers. Federally funded programs with such stipulations preclude altering these conditions/incentives; however, new or existing state-funded programs that are not reliant on federal funds could support independent practice and open location options where a larger-scale provider may not be able to survive.

Beyond incentive programs, some evidence indicates that granting full practice authority to nurse practitioners may have positive effects on supply, and nurse practitioners are usually willing to work independently of physicians. This could result in increased primary care availability in physician shortage areas (Kuo et al., 2013; Norris et al., 2024; Plemmons et al., 2023; Reagan and Salsberry, 2013; Slade et al., 2025; Stange, 2014; Yang et al., 2021). However, neither incentive programs nor changes in practice authority supersede the impact of baseline finances. If providers are too poorly compensated for either of those things to matter, then neither will have an impact on Appalachian Kentuckians' access to care. Thus, these courses of action are likely dependent on action concerning Medicaid reimbursements.

Protect Medicaid

Another objective is to protect Medicaid in the face of increasing downward pressures. One of the key provisions of the One Big Beautiful Bill Act (OBBBA) restricts payments authorized under state-directed payment arrangements with Managed Care Organizations (MCOs) to prevent them from exceeding Medicare payment rates. While payment rates for traditional state-run Medicaid programs are often lower than those of Medicare, Medicaid coverage is now frequently provided by a private insurer in the form of MCOs. State-directed payments (SDPs) increase the payment rates made by Medicaid MCOs for specified providers/services to be closer to those of other private insurance plans, which are usually much higher than Medicare's rates. In Kentucky,

SDPs are applied to inpatient and outpatient hospital services (CMS, 2024). Therefore, tying Medicaid MCO payment rates to those of Medicare could lead to substantial losses for hospitals. In turn, revenue losses could cascade into service reductions or closures. As Medicaid reimbursements decrease, access to care can decrease for Medicaid enrollees. These decreases can come through providers being less willing to accept Medicaid patients or because those that do accept Medicaid patients are put in financial jeopardy.

Courtemanche and Garuccio (2026b) estimate that the payment caps in OBBBA reduce Kentucky providers' Medicaid revenues by $1.163 billion annually. This value is in excess of the collective net operating revenue of Kentucky hospitals, which was estimated to be $1.1 billion in 2023, two years before the OBBBA (Kentucky Hospital Association, 2024). According to the State Health Access Data Assistance Center, data from 2014-2017 indicate that roughly 86 percent of private/solo practice physicians in Kentucky accepted new Medicaid patients (State Health Access Data Assistance Center, n.d.). However, since 2019, the numbers of rural independent physicians and independent rural practices in Kentucky have both declined by around 40 percent (Physicians Advocacy Institute and Avalere Health, 2024). If Medicaid reimbursements remain on a downward trend, representing a disinvestment in health care, this is likely to worsen health care access in rural Appalachia as providers either leave the area or leave independent practice, likely for more costly care settings.

Of course, the broader issue that led to the implementation of cost-cutting measures such as payment caps is the fiscal pressure created by continually rising health care costs. In such an environment, evidence-based strategies to improve the efficiency of health care delivery are essential. Moreover, treating Medicaid as a priority even as budgets tighten is warranted given its ability to both improve population health and stimulate the economy, in turn feeding the amplifying cycle of bi-directional causality.

Protect 340B

Another important area in which action is needed to prevent disinvestment is the 340B program, which faces downward pressure from several directions. First, since 2020, drug manufacturers have begun imposing limitations on pharmacies they will recognize for 340B discounts. For instance, some manufacturers will only provide 340B discounts to a 340B covered entity's in-house pharmacy, or, in the absence of an in-house pharmacy, one external contract pharmacy (Courtemanche and Garuccio, 2026c). Twenty-one states have passed legislation to preserve covered entities' full networks of contract pharmacies (National Association of Community Health Centers [NACHC], 2026). Contract pharmacy protections were proposed in Kentucky's General Assembly in 2024 with Senate Bill (S.B.) 27 (); however, neither S.B. 27 nor a similar bill, such as S.B. 14 in 2025, became law (S.B. 27, 2024; S.B. 14, 2025; Yetter, 2025).

Second, many manufacturers have also imposed claims data requirements on 340B participants wishing to acquire program-mandated discounts (NACHC, 2023; Sanofi, 2020, 2024). Courtemanche (2026a) estimates that the value of these data to drug companies totals $10.9 billion per year nationally, most of which comes at the expense of covered entities. Twenty-two states have responded by enacting legislation – often as part of the broader contract pharmacy protection laws – to prohibit such claims-data requirements, and the National Conference of State Legislatures describes such prohibitions as a bipartisan focus of state 340B legislation (Bluesight, n.d.; NCSL, n.d.).[6]

Other forces pushing in the direction of shrinking covered entities' 340B revenue come from federal legislation and agency directives. The Medicare Drug Price Negotiation Program (MDPNP),

[6] For instance, Maine bars manufacturers from requiring a covered entity to submit claims or utilization data as a condition of obtaining 340B pricing (Me. Rev. Stat. tit. 24-A, § 7753). Colorado's 2025 Contract Pharmacy Protection Act prohibits manufacturers from requiring health information, claims, or utilization data unrelated to a federal health care program claim unless federal law requires it (Colo. Rev. Stat. § 6-29-105(1)(b)). Washington's 2026 law similarly bars manufacturers from conditioning 340B pricing on the submission of claims, utilization, or purchasing data (Becker's Hospital Review n.d.-b).

which started in 2026 with ten high-cost drugs and is slated to add another 15-20 drugs each year, shrinks margins and therefore 340B revenue. Courtemanche (2026c) estimates that this will cost covered entities in the U.S. $5.73 billion per year in 2027 and $24 billion per year by 2036. Due to logistical challenges created by the MDPNP, the Health Resources and Services Administration (HRSA) has recently announced a pilot program to switch the 340B program from an upfront discount model to a rebate model for MDPNP drugs. This strains covered entities' liquidity and imposes new administrative and staffing burdens, among other costs. Courtemanche (2026b) projects that the rebate model pilot will cost covered entities across the U.S. $1.5 billion annually. Moreover, manufacturers have pushed for broader implementation of the rebate model, and Courtemanche (2026b) projects that covered entities would lose $22.8 billion per year if it is expanded to the entire 340B program. Finally, CMS has proposed a 2027 Outpatient Prospective Payment System (OPPS) rule that would lower 340B Part B hospital reimbursement by an estimated total of $4.55 billion (CMS, 2026a).

The future of 340B has become a contentious battle involving covered entities, pharmaceutical manufacturers, federal and state governments, and the court system. The sources cited in this subsection provide much more complete descriptions of the specific points of contention and the status of each of the potential changes discussed above. Nonetheless, it is clear even from the abbreviated discussion here that state legislation, legal challenges, and lobbying efforts that aim to push back on the various forces threatening 340B could help preserve a vital revenue stream for health care providers in Appalachian Kentucky.

IX. Conclusion

This paper examines how investment in health care could improve circumstances in Appalachian Kentucky, which has higher disease and morbidity burdens than other regions of the state and is also a region of relatively stagnant earnings. The literature on income and health has

established causal links in both directions, in that higher income tends to improve health and better health leads to higher incomes. Investments in health care can stimulate both sides of this interaction.

Specifically, Appalachian Kentucky faces health care shortages, high rates of risky health behaviors, and disproportionate reliance on public insurance, and evidence suggests that targeted investment in all three areas can improve both the local economy and population health. The bi-directional causality would then trigger a feedback loop that amplifies these effects. Significant targeted investments have already been made in care coordination, prevention and early detection of behavior-related health conditions, telehealth, workforce training, facility construction, attracting health care and other workers, and strategic tax breaks. However, more efforts are needed towards measuring the impacts of these interventions and scaling up the ones that are the most effective. Additionally, broader strategies regarding incentivizing physicians and other health care providers to work in the region, protecting Medicaid, and preserving 340B revenue streams will be needed moving forward.

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Appendix A – Estimation of Medicaid and Medicare Spending on Appalachian Kentucky Residents and How Much Is Spent Outside the Region (for online publication only)

Medicaid

We begin this estimation with statewide spending. The Kentucky Department for Medicaid Services reports total Medicaid spending of about $20.3 billion in fiscal year 2024-2025 after drug rebates (Kentucky Department for Medicaid Services, n.d.). Using data from the Kentucky Cabinet for Health and Family Services, in January of 2026, just under 35 percent of Kentucky's Medicaid enrollees resided in Appalachia (Kentucky Cabinet for Health and Family Services, 2026). This outsized share is due to a significantly higher Medicaid enrollment rate of 41 percent in Appalachian Kentucky, which contained roughly 25.3 percent of Kentucky's population in 2025, compared to nearly a 27 percent enrollment rate outside of Appalachia. Applying the Appalachian share to the Medicaid spending of $20.3 billion gives an estimated $7.11 billion a year of Medicaid spending in Appalachian Kentucky, assuming all enrollees are provided the average per-enrollee spending.

However, this amount may be overstated, as some residents will be dually eligible for both Medicaid and Medicare, and we intend to sum expenditures for Medicare and Medicaid. For fiscal year 2024, the Kaiser Family Foundation (KFF) indicates that Kentucky Medicaid paid Medicare just under $341 million (KFF, n.d.). In December of 2024, there were 178,727 dual-eligible Medicare enrollees in Kentucky, with 73,811 in Appalachian Kentucky (Centers for Medicare & Medicaid Services [CMS], n.d.-e). Assuming the same average payment was made for all Kentuckians, regardless of region, the share of Appalachian Kentuckians who were dually eligible suggests Kentucky Medicaid payments to Medicare on their behalf of just under $141 million. Adjusting for this, we find a total of $6.97 billion. According to Williams (2026), about 6 percent of Medicaid spending is for prescription drugs, which would put the share of spending in Appalachian Kentucky at roughly $418.1 million.

Medicare

For our estimation of Medicare spending, we first examine Medicare enrollment by region, aggregating county-level data to Appalachian and non-Appalachian Kentucky (CMS, n.d.-e). CMS data from January 2026 indicate that about 1.01 million Kentuckians were enrolled as Medicare beneficiaries. Appendix Table A1 shows the breakdown of enrollment across coverage options for Medicare Parts A and B (Original Medicare and Medicare Advantage (MA)) and prescription drug coverage under Medicare Part D, which is provided as either add-on coverage or included in some MA plans. For all but Original Medicare enrollment, Appalachian Kentucky represents an outsized share of enrollees relative to its overall population share. This again underlines the region's reliance on public health insurance and differences in age and economic status among residents.

Appendix Table A1. Medicare Enrollment in Kentucky January 2026

Medicare Program	Total	Non-Appalachian Enrollees	Appalachian Enrollees
All (Any Part)	1,008,222	717,183	291,039
Original Medicare	452,154	340,838	111,316
Advantage/Other	556,068	376,345	179,723
All (A&B)	929,720	659,717	270,003
All (A only)	64,870	50,039	14,831
All (B only)	13,632	7,427	6,205
All (Part D)	835,200	589,175	246,025
Standalone Part D (PDP)	361,757	272,070	89,687
Embedded Part D (MA-PD)	473,443	317,105	156,338

Notes: Prescription Drug Plan (PDP) is how the CMS refers to standalone Part D plans. MA-PD plans are Medicare Advantage plans with a Part D component.

To gauge spending, we need estimates of spending by plan type. Unfortunately, Medicare Advantage plans are run by private insurers that do not face the same reporting requirements and public data provision that the CMS provides for Original Medicare. Further, MA plan types may vary in whether they offer Part D coverage, and it could be unclear whether spending per beneficiary

measures would be contaminated by expenditures that include and exclude Part D. Given this, we make use of spending data for Original Medicare and assume MA beneficiaries exhibit similar spending. We then make use of a CMS measure of gross Part D cost per enrollee based on plan type: standalone or included in an MA plan. Ordinarily, gross costs per enrollee would be undesirable as they can include coinsurance, deductibles, and copayments made by beneficiaries; however, in this context, gross spending is useful to assess the total leakage effect. A caveat would be likely overestimation when drug rebates and discounts are not incorporated.

We use 2024 data from the CMS for the two measures. For Original Medicare spending per capita, we turn to a CMS dashboard on state spending, which indicates average spending of $12,540 for beneficiaries enrolled in Parts A and B (CMS, n.d.-d). Some caveats to this value are that it excludes add-on payments such as disproportionate share hospital payments, which would result in a lower amount, but it also standardizes amounts across states to remove the effects of geographical factors such as the Medicare Area Wage Index. Removing such effects should cause the amount of spending for Kentucky to be higher, potentially overstating actual spending. A value is not provided for beneficiaries enrolled in only Part A or only Part B. For these values, we turn to an alternative CMS dataset on monthly per capita costs for enrollees in Parts A and B at the state and county level for 2024 (CMS, n.d.-c). This secondary dataset does not contain all of the cost elements included in the $12,540 value, and likely represents a somewhat conservative value. To illustrate, in 2024, we find per capita spending for those with Parts A and B in non-Appalachian Kentucky and Appalachian Kentucky of $11,826.71 and $11,469.10, respectively. This suggests the added cost elements in the larger number, and potentially the abstraction from geography-specific payment variation, may meaningfully affect the final number. We found annual spending for Appalachian Kentuckians enrolled in Part A in 2024 to be $4,477.42 and annual spending for Part B to be

$6,991.68. To address all Medicare spending, we assume the spending amounts for Original Medicare Parts A and B apply to MA beneficiaries.

Our gross Part D spending data have separate values for standalone Part D plans – those which would be acquired alongside Original Medicare enrollment for prescription drug coverage – and for Part D plans embedded in MA plans, allowing for separate estimation of prescription drug expenditures. In Kentucky, there were noticeable differences in spending across plan types. For standalone plans, the average gross cost per enrollee was $5,287 in 2024, while it was $6,515 for embedded plans (CMS, n.d.-b). To estimate aggregate spending in the Appalachian region of Kentucky, we use the following equation,

$$\begin{aligned}\text{Medicare Spending}_{\text{Appalachia}} = {} & \$12{,}540 \times \text{Appalachian_A\&B_Enrollees} \\ & + \$4477.42 \times \text{Appalachian_A_Enrollees} \\ & + \$6991.68 \times \text{Appalachian_B_Enrollees} \\ & + \$5{,}287 \times \text{Appalachian_Enrolled}_{\text{PDP}} \\ & + \$6{,}515 \times \text{Appalachian_Enrolled}_{\text{MA-PD}}.\end{aligned}$$

Using this equation provides estimated Medicare spending in Appalachia of approximately $4.99 billion, with roughly $1.49 billion being spent on prescription drugs.

Adding the calculated Medicaid spending, the two public insurers spend a combined $12.1 billion on residents of Appalachian Kentucky. Excluding the roughly $141 million in Medicaid payments to Medicare from the combined spending amount leaves total spending of around $11.96 billion.

Medicare and Medicaid Expenditures Leakage

The aim of this section is to approximate the amount of spending that is attributable to Appalachian residents with public insurance who travel outside of Appalachia for care. This results

in public insurance expenditures outside of the region due to unavailability or constrained availability of local care, or perceived differences in quality between local care and care in other areas. This spending represents potential revenues that could be captured with additional health care investments in Appalachia.

The challenge is in constructing a share of public insurance spending on what are called "bypass" visits, wherein a patient bypasses local providers in favor of a provider further away. While there is a literature on rural bypass visit counts and types, there is relatively little evidence on shares of expenditures. Thus, we aim to piece together a coarse estimate from available sources. For example, it is not as clear whether a prescription drug bypass effect from delivered-by-mail prescriptions can be captured with additional investment; however, we choose to err on the side of it being capturable. We found only a single paper from 2003, exclusive to West Texas, that finds a pharmacy bypass rate of 29.2 percent (Xu and Borders, 2003). Within this rate, 15.5 percent used mail-order pharmacies and 13.7 percent used non-local pharmacies. It is unclear how much this split was driven by the extremely low population density of West Texas.

A key factor to account for in estimating spending that could be retained in Appalachia is the relative price of care in urban areas compared to that in rural areas. For example, negotiated prices by urban hospitals are frequently higher than those of smaller rural hospitals. Therefore, one cannot assume that the amount spent on services for which Appalachian residents bypassed local rural providers is the same amount rural providers would receive. To account for the bypass spending leakage, we need a value for the share of expenditures for bypass services, and a means to adjust for urban versus rural settings.

We begin with the latter. Hammerslag et al. (2025) examined negotiated prices in twelve states, including Kentucky, for seven services. These services included office visits, two types of emergency department visits, three imaging services, and Cesarean sections. While not a

comprehensive list of all services that Appalachians may acquire, it does provide urban-to-rural comparisons in Kentucky specifically. To adjust Medicare outpatient spending (Part B), we take these negotiated prices, minus Cesarean sections, and weight their ratio ($\frac{\text{Rural Value}}{\text{Urban Value}}$) by their relative share of 2025 Medicare expenditures by Berenson-Eggers Type of Service codes using data from the CMS (CMS, n.d.-a).[7] This gave us a scalar for outpatient spending of approximately 0.678. To scale Part A payments, we take the average of Medicare Area Wage Index values for areas such as Lexington, Kentucky; Louisville, Kentucky; Cincinnati, Ohio; Charleston, West Virginia; and the Huntington-Ashland area at the border of Kentucky and West Virginia, as they are potential urban areas where Appalachian Kentuckians may travel for hospital care. This average comes out to about 0.92. We use this average and the Wage Index value for the non-urban areas of Kentucky (0.89) to find the relative deflator of 0.967 for the labor component of Part A payments.[8] This results in a deflator of 0.979 when accounting for how the labor component and non-labor component amounts are calculated.[9]

The next requirements for a leakage estimation are the shares of spending Parts A and B represent and the share of spending that bypasses to urban areas. Using the data from which we found only Part A and only Part B spending, we find that Part B accounts for approximately 60.1 percent of annual Part A and B spending in Appalachian Kentucky. This means we will scale aggregate bypass spending for Medicare outpatient and hospital spending by:

$$\text{Medicare Bypass Spending Deflator} = 0.601 \times 0.678 + 0.399 \times 0.979 \approx 0.798.$$

[7] We took the shares of total spending for each relevant service and summed those shares. This sum came out to just under 0.188. The reciprocal of this value was then used to scale each service's standalone share to form its weight when generating the final relative urban-to-rural deflator value for Medicare spending.
[8] For a more in-depth discussion of the Medicare Area Wage Index, see Courtemanche and Garuccio (2026b).
[9] $0.62 \times 0.967 + 1 \times 0.38$

Examining the relative shares of Kentucky's Medicaid spending on inpatient vs outpatient/primary care services, we get an inpatient share of 0.644.[10] To scale the Medicare inpatient deflator for use for Medicaid, we note that Kentucky Medicaid aims to reimburse hospitals for acute inpatient care at around 95 percent of Medicare rates (907 KAR 10:830). Using these adjustments, we get the following:

$$\text{Medicaid Bypass Spending Deflator} = 0.356 \times 0.678 + 0.644 \times 0.979 \times 0.95 \approx 0.840.$$

If we assume both Medicaid and Medicare beneficiaries acquire the same prescription drug regardless of whether it is acquired at a local pharmacy or not, then there seems little reason to assume price differences purely by location, as quality should remain largely the same and there is less incentive to travel for a higher-priced drug if it is available locally. Given this assumption, we do not deflate bypass prescription drug spending.

For the bypass share of Part A spending, we turn to Holden et al. (2026). These authors examine bypass rates for hospital admissions for micropolitan areas, small towns, and rural areas. For hospitalizations among residents of these areas, they find a bypass rate of roughly 30.4 percent. However, they find Medicare patients were less likely to bypass local hospitals while Medicaid patients were more likely. Adjusting for differences in bypasses by insurance type, the Medicare bypass rate is about 24.4 percent for hospitalizations, and the Medicaid bypass rate is about 32.6 percent. The private insurance bypass rate came out to roughly 49.3 percent, though a study by Chang and Carroll (2026), using exclusively those with employer-sponsored insurance, suggests a bypass rate between 56.8 and 66.6 percent for the privately insured.

[10] The itemized spending list is very detailed, and rather than attempt to arbitrarily assign line items to a larger category using our own discretion, we took the lines that explicitly stated they were outpatient, inpatient, or primary care spending to find this share. These items are for Medicaid Fee-For-Service (FFS) spending, which is relatively small compared to the single item of "Managed Care" accounting for over $15 billion in spending, but managed care spending is largely left ambiguous. This may result in a skew toward inpatient spending if individuals in particular need of persistent inpatient care are more likely to be on Medicaid FFS.

Turning to outpatient and primary care, a 2021 CMS report provides an examination of bypass for Original Medicare outpatient services (CMS Office of Minority Health, 2021). Using its Appendix Tables 2a and 2b, excluding drugs/pharmacy bypasses, we find an average bypass rate of 27.1 percent, which largely tracks with the inpatient bypass rate found previously. Liu et al. (2008) find an average bypass rate for primary care of 32 percent. However, in a fairly direct analog to Medicare beneficiaries, they find a bypass rate of roughly 30.7 percent for individuals aged 65 or older. As the values are not wildly different, we take this as support for the 27.1 percent we inferred from the 2021 CMS report. Weighting the inpatient and outpatient bypass rates by their respective shares of spending, we obtain a combined bypass rate of

$$\text{Medicare Combined Non-Pharmacy Bypass Rate} = 0.271 \times 0.601 + 0.244 \times 0.399 \approx 0.260.$$

Establishing a combined Medicaid bypass rate is not as straightforward. The 2021 CMS report only examines Medicare data, and so cannot be used to assign a bypass rate to Medicaid. Liu et al. (2008) did not have a clear equivalent for Medicaid enrollees. To best approximate Medicaid enrollees' characteristics from the available results in Liu et al., we used the average bypass rate for those under 65 with a high school education or less and incomes less than or equal to $20,000. This provides a bypass rate of 38.9 percent, which serves as our primary care/outpatient bypass rate for Medicaid. Similar to our approach with Medicare, we combine this with the inpatient bypass rate weighted by respective spending share among inpatient and outpatient spending:

$$\text{Medicaid Combined Non-Pharmacy Bypass Rate} = 0.389 \times 0.356 + 0.326 \times 0.644 \approx 0.348.$$

With a bypass rate and deflator for Medicare and Medicaid, we can now find the deflated share of inpatient and outpatient spending that added health care investment may be able to retain within Appalachia:

$$\text{Medicaid Leakage} = \underbrace{0.348 \times 0.840 \times \$6.55 \text{ Bil.}}_{\text{Non-Prescription Spending}} + \underbrace{0.292 \times \$0.418 \text{ Bil.}}_{\text{Prescription Spending}} \approx \$2.04 \text{ Billion}$$

$$\text{Medicare Leakage} = \underbrace{0.260 \times 0.798 \times 3.5 \text{ Bil.}}_{\text{Non-Prescription Spending}} + \underbrace{0.292 \times \$1.49 \text{ Bil.}}_{\text{Prescription Spending}} \approx \$1.16 \text{ Billion.}$$

Together, these suggest that greater health care investment could retain up to $3.2 billion of public insurance spending in Appalachian Kentucky. This does not include spending that could be retained from the commercially insured, who have the highest bypass rate.

Of note is that without the deflators, the total amount we estimate to leak is given by

$$\text{Undeflated Medicaid Leakage} = \underbrace{0.348 \times \$6.55 \text{ Bil.}}_{\text{Non-Prescription Spending}} + \underbrace{0.292 \times \$0.418 \text{ Bil.}}_{\text{Prescription Spending}} \approx \$2.4 \text{ Billion}$$

$$\text{Undeflated Medicare Leakage} = \underbrace{0.260 \times \$3.5 \text{ Bil.}}_{\text{Non-Prescription Spending}} + \underbrace{0.292 \times \$1.49 \text{ Bil.}}_{\text{Prescription Spending}} \approx \$1.35 \text{ Billion.}$$

This comes to $3.75 billion, suggesting that serving bypassing Medicaid and Medicare patients in Appalachian Kentucky could save Kentucky's Medicaid program $360 million and the Medicare program $190 million, by serving rural Kentuckians in less expensive settings. The Medicaid savings would be split between state and federal governments while the Medicare savings would accrue to the federal government.

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