

#### SOCIAL DETERMINANTS OF HEALTH AND TYPE 2 DIABETES: MEDICAID BENEFICIARIES IN KENTUCKY Summary Prepared by the Office of Data Analytics Division of Analytics

**Partner University:** University of Louisville  
**College/School:** School of Public Health and Information Sciences  
**Principal Investigator:** Dr. Bert Little

#### What is Known on This Topic?

Research has shown that social determinants of health (SDOH), such as poverty and access to education, are predictive of the development of type 2 diabetes (T2DM). However, the degree to which SDOH and other circumstantial factors contribute to specific complications of T2DM is less defined.

#### What Did this Project Do?

Using claims data from 2010 to 2019, this study explored the impact of various medical and SDOH factors on a Kentucky Medicaid beneficiary's risk of developing T2DM and its associated complications.

#### What Could Medicaid Do with These Conclusions?

Based on its findings, the study suggests that Kentucky's Medicaid population may be uninformed as to what services are available to them, especially at lower levels of education and income. Improved access to health education materials could improve patient compliance and resulting health outcomes.

### Introduction

In Kentucky, the number of Medicaid beneficiaries with type 2 diabetes (T2DM) was estimated to be 90,000 in 2010. By 2019, this number grew to 126,000. While this is a notable increase, it is confounded by the expansion of Medicaid coverage in 2014 as a result of the Affordable Care Act.

Still, the influx of new T2DM patients to the Medicaid system creates a need for understanding the risk factors of both the disease and its complications that uniquely impact Kentuckians, especially those enrolled in the Medicaid population. Because of this, this study explored the impact

of various environmental, medical, and SDOH factors on a Kentucky Medicaid beneficiary's risk of developing T2DM and its associated complications.

There is further evidence that patients with chronic conditions experience compounded health complications when they struggle with poverty. When patients are forced to make difficult choices with scarce resources, it can be difficult to manage the demands of living with diabetes.

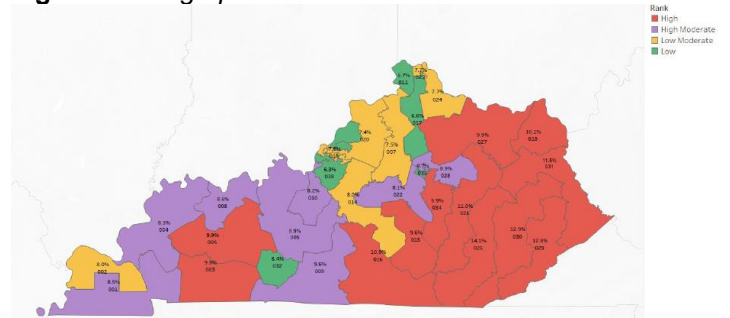
### Project Methods & Results

Over 1.5 billion Kentucky Medicaid claims from 2010 to 2019 were loaded into a longitudinal data warehouse using the data analytics platform KNIME. The primary outcomes of interest included the risk of developing T2DM itself, as well of five common complications of the disease: nephropathy (end stage renal disease (ESRD)); diabetic heart disease (myocardial infarction (MI)); peripheral artery disease (PAD); diabetic neuropathy; and diabetic retinopathy. For each condition, claims data and a set of medical/SDOH covariates were used to perform regression analyses. These models were then used to determine which factors posed a higher or lower risk to the onset of each condition. Study authors used geographically linked data from the Area Deprivation Index (ADI) to explore associations between the social determinants of health and complications of diabetes.

### Type 2 Diabetes Mellitus (T2DM)

With respect to T2DM itself, factors that were found to contribute to the disease's development included poverty, low educational attainment, and obesity, aligning with the literature. Figure 1 displays a county distribution of T2DM.

Figure 1. Geographic Distribution of Diabetes in KY



**End Stage Renal Disease (ESRD)**

Like T2DM, lower income and educational attainment was associated with an increased risk of ESRD. In addition, the presence of agriculture, fishing, and mining industries near the residence of beneficiaries were found to increase the risk for ESRD. Likewise, the presence of a federally qualified health center (FQHC) and a high area deprivation index (ADI) also increased this risk. In contrast, protective factors against ESRD included a greater number of physician’s assistants and/or nurse practitioners in the area.

**Diabetic Heart Disease**

The risk and protective factors for diabetic heart disease largely mirrored that of ESRD. One notable exception to this was the existence of industries near the patient’s area of residence was deemed to be protective against MI.

**Peripheral Artery Disease (PAD)**

Low income and education were found to be associated with a higher risk of PAD. Protective factors included the presence of nurse practitioners in an area.

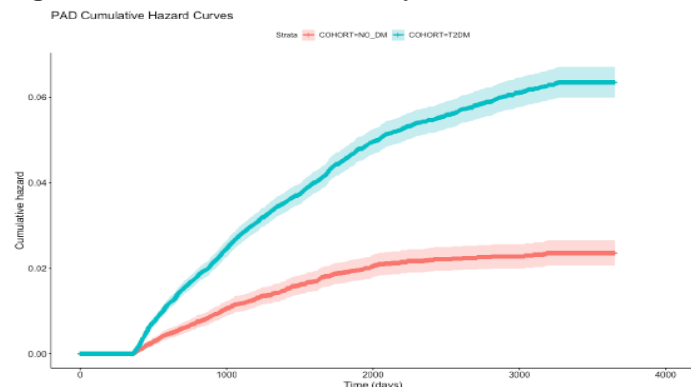
**Diabetic Neuropathy**

Like PAD, risk factors for diabetic neuropathy also included the presence of a CHC and education, social, and health industries in the beneficiary’s community. Interestingly, the only factor noted as significantly reducing the risk of diabetic neuropathy was obesity, which mirrors the findings related to the other complications examined in this study.

**Diabetic Retinopathy**

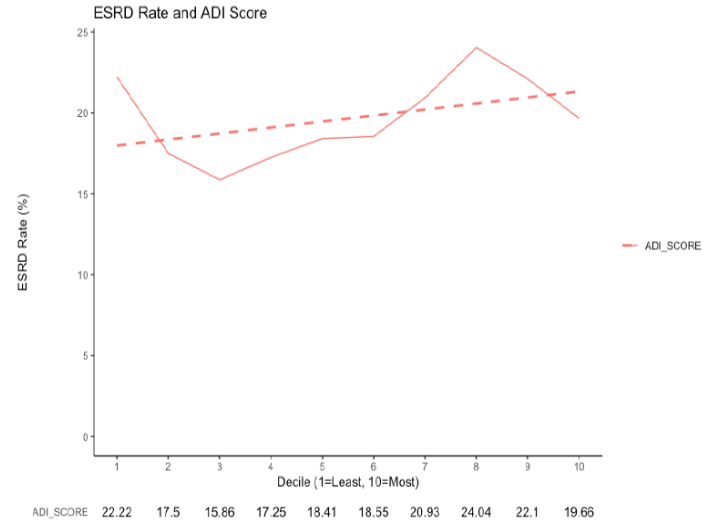
One notable risk factor that was found for diabetic retinopathy was a patient’s consumption of hypoglycemic medications. Extreme poverty and low education were risk factors for the development of diabetic retinopathy. A significant protective factor was the existence of agriculture, fishing, and mining industries in the area.

**Figure 2. Hazard Curve of PAD by T2DM Cohort**



**Note:** Green line = Diabetes; Red line = No Diabetes

**Figure 3. Association of ADI with ESRD**



**Note:** This analysis indicates that ESRD increases as the ADI increases, which agrees with the findings for poverty and education in the model. This suggests that areas with greater economic deprivation are at greater risk for the development of ESRD among patients with diabetes.

**Conclusion**

While this study generally affirmed some classic risk factors of T2DM and such complications, such as low educational attainment and poverty, other risks and protective factors that were observed contrast what is traditionally known about the disease.

One finding was that obesity was a protective factor against all five complications examined, which is contrary to what previous research has suggested. A possible explanation for this observation is that obesity is an indicator of the absence of physical “frailty” among beneficiaries. Similarly, the presence of some industries that are typically associated with poorer health outcomes, such as agriculture, fishing, and/or mining, were found to be protective against PAD, as was extreme poverty. Careers in these industries may promote physical activity that is protective against certain complications of T2DM. Similarly, comparatively “sedentary” industries such as education, social, and health industries were associated with a higher prevalence of PAD and diabetic neuropathy in their respective communities.

Because of the nuanced roles that SDOHs and medical factors play with respect to T2DM and its complications, the results of this study suggest that targeted interventions to populations could be useful in improving health outcomes related to diabetes. In particular, improved beneficiary education. Results of this study support continued efforts to pursue economic development initiatives that create good quality jobs for communities in the Commonwealth. In addition to enhanced quality of life, such efforts may also protect health.