Examination of Social Determinants of Health, Obesity Rates, & Health Outcomes at the University of Kentucky Pediatric High BMI Clinic

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INTRODUCTION

An abundant amount of research has demonstrated the relationship between early onset obesity in childhood with persistence into adulthood and the potential increased risk for cardiovascular diseases and various cancers such as breast, colon, kidney, and pancreatic.[1] As well, childhood obesity remains a public health threat to minority children, disproportionately affecting their health. Non-Hispanic Black and Hispanic youth have the highest rates of obesity.[4,5] The World Health Organization (WHO) estimated approximately 39 million children under the age of 5 were considered overweight or obese, with Kentucky ranking first for childhood obesity of ages 10-17 and sixth for adult obesity.[2,3] There are currently three clinics in Kentucky that offer pediatric obesity management (Figure 1). These clinics offer specialized support and care to their patients; however, rates of childhood obesity continue to rise. Understanding how social determinants of health may be potential barriers that these patients face outside of the clinic may be the key to understanding how to provide better evidence-based medicine to these patients.

PURPOSE OF STUDY

The purpose of this study is to examine relationships between social determinants of health and health outcomes in the patient population at the University of Kentucky Pediatric High BMI Clinic.

METHODS

A cross sectional study design was conducted with the patient population including pediatric patients that attended the University of Kentucky Pediatric High BMI Clinic from November 2017-November 2022. A de-identified data extraction was conducted under the honest broker UK Center for Clinical and Translational Science Expertise Data Trust, as per IRB protocol 45668.

Data collected were divided into social determinants of health or health outcome groups. Social determinants included distance from the clinic, insurance status, length of care, ethnicity, self-identified gender, rurality, and level of medical service. Positive health outcomes are described as a decrease in body mass index (BMI), a decrease in systolic blood pressure (SBP), and diastolic blood pressure (DBP), also known as blood pressure (BP) over time.

The linear random effect model was utilized to discover if a correlation exists between the social determinants of health and positive health outcomes, in the given population.
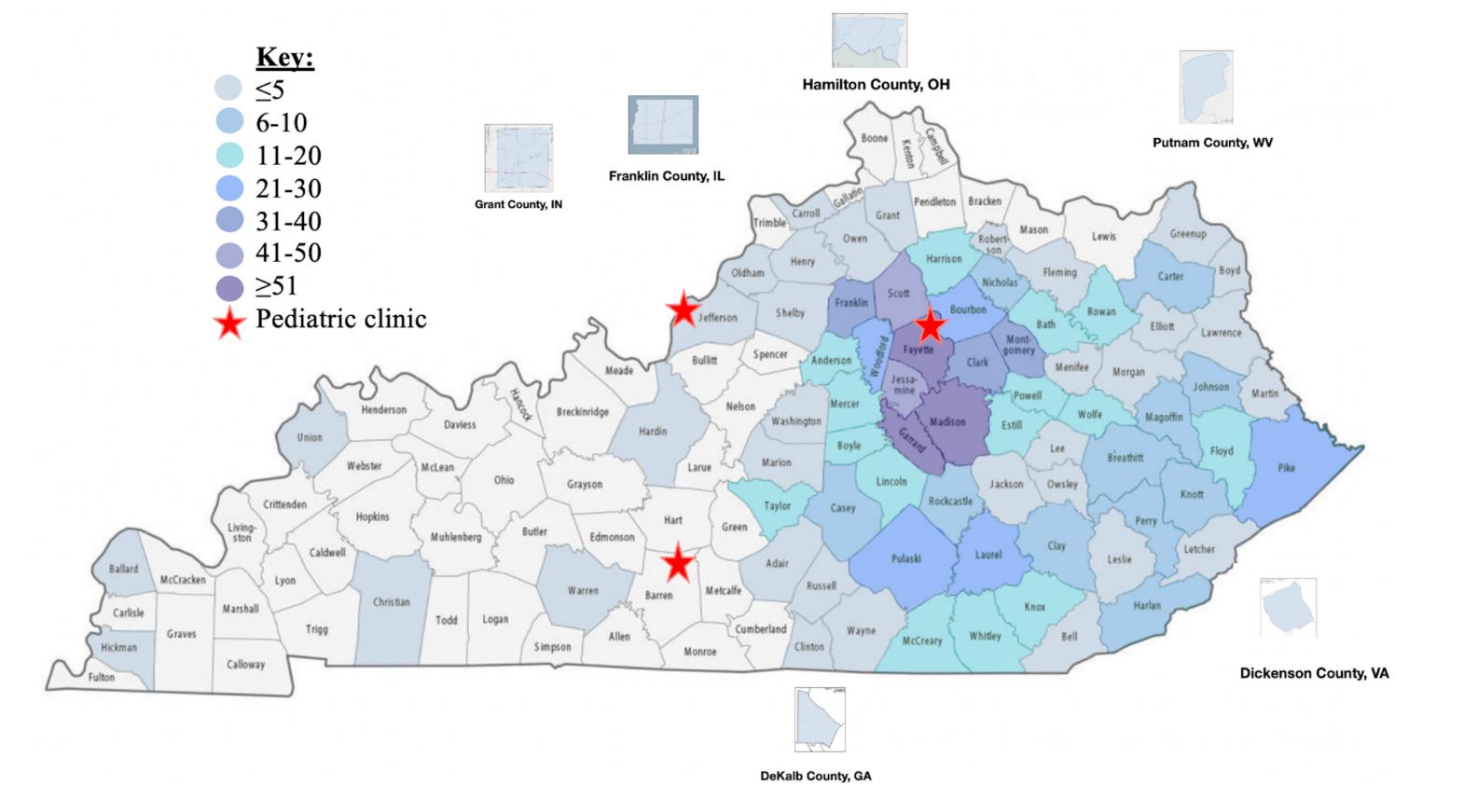
RESULTS

- Total # of patients: 2,793; Total # of patients in BMI analysis: 2,514; Total # of patients in BP analysis: 423
- SBP/DBP vs Ethnicity, self-identified gender, insurance type, and urban vs rural status, all were not significant.
- SBP/DBP vs Distance from clinic was found to have a strong positive correlation, ($p < 0.0001$).
- SBP/DBP vs Length of care was found to have a strong positive correlation, ($p < 0.0001$).
- SBP/DBP vs The combined effect of distance from clinic and length of care was found to have a strong negative correlation, ($p < 0.0001$).
- SBP/DBP vs Appointments cancelled/missed was found to have a negative correlation, ($p=0.02$/$p=0.013$).
- Mean BMI vs Distance from clinic was found to have a positive correlation, ($p<0.0001$).
- Mean BMI vs Insurance types: Commercial, Medicaid, Tricare, and Other, collectively illustrate a negative correlation effect, ($p=0.00006$).
- Mean BMI vs Insurance types: Medicaid Replacement and self-pay illustrate a positive correlation, ($p=0.00006$).
- Mean BMI vs Kept in person appointments was found to have a positive correlation, ($p < 0.0001$).

Table 1: Frequency of Top 10 diagnoses (excluding obesity and treatment ICD codes) and their descriptions

ICD codes	Frequency	Description
E55.9	5,601	Vitamin D deficiency, unspecified
L83	2,463	Acanthosis nigricans
E78.1	2,018	Pure hyperglyceridemia
R03.0	1,991	Elevated BP reading, without diagnosis
R06.83	1,874	Snoring
E78.6	1,461	HDL deficiency
E78.5	1,431	Hyperlipidemia, unspecified
R74.8	1,362	Abnormal levels of other serum enzymes
F41.9	1,287	Anxiety disorder, unspecified
R73.03	1,247	Prediabetes

Figure 1: Density Map of the High BMI Clinic's Patient Population by County from Self-Reported Zip Codes

Key:
- ≤5
- 6-10
- 11-20
- 21-30
- 31-40
- 41-50
- ≥51
- ★ Pediatric clinic

DISCUSSION

With past research, it was no surprise that there was an increase in BP with greater distance from the patients' residential zip codes to the clinic. Initially, length of care was presumed to show a decrease in BP; however, it showed an increase in BP. One possible explanation for this finding could be inaccurate readings of BP such as white coat hypertension.[6] White coat hypertension can be defined as having higher BP readings in a healthcare setting due to stress or other factors. Another explanation may be due to patients with improved BP needing less care. This could potentially right shift the data set toward the patients who have an increase in BP, raising overall trends. Lastly, there was no statistically significant effect noted between a decrease in BP and ethnicity, self-identified gender, insurance type, or urban versus rural location.

While BP is an important vital sign, it is not the only indicator for positive health outcomes. BMI was also tested against distance from clinic and found to have a positive correlation. Rural areas historically have less access to local resources, and the results from this study reveal a need for more local interventions, specifically to decrease BMI and the likelihood for developing comorbid conditions in the future. Elevated BMI was not found to correlate with self-identified gender or ethnicity. The lack of statistical significance in demographic data suggests merit to the significance of access to care.

In Table 1, the most frequent diagnoses (excluding obesity and other obesity-related diagnoses) were found within the study population with Vitamin D deficiency being the most frequent. This reveals that childhood obesity can lead to comorbidities early on in life and persist or worsen into adulthood. Acanthosis nigricans and Prediabetes were also noted as a frequent diagnoses, which are conditions that with clinical care from a specialty clinic, like the Pediatric High BMI clinic, can be reversed and treated before progressing into further diseases.

CONCLUSION

This study found that certain patient profiles correlate to different health outcomes. Patients who live in farther from the clinic, do not have the ability to afford medical care, and have not (or cannot) attend their appointments at the clinic for an extended period of time are at higher risk for either elevated BMI or BP. These patients are also at a higher risk for associated comorbid conditions (seen in Table 1), and this warrants future health considerations. At the same time, this study also revealed that children who live closer to the clinic, have medical insurance, and attend their appointments are all related to either lower BMI or BP. These findings reveal a clear need for more local and statewide interventions and access, such as the University of Kentucky Pediatric High BMI Clinic, in order to provide appropriate support to address the rise of pediatric obesity in the state of Kentucky.

REFERENCES & ACKNOWLEDGEMENTS