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Differences in Social Determinants of Health between Rural and Urban Counties of Ohio

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Abstract

Objective: The objective of this study is to investigate any possible differences in social determinants of health between rural and urban counties of Ohio and how the determinants relate to each other. *Methods:* All data for each variable (percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, average mentally unhealthy days for adults in a month, drug overdose death rate, life expectancy, and child poverty rate) was collected through County Health Rankings and Roadmaps from either statewide or nationwide programs through different studies and surveys from 2013-2017. I utilized descriptive statistics, a one-way between subjects analysis of variance (ANOVA), and regressions in order to answer my research questions. *Results:* I found that Ohio's rural and urban counties significantly differed ($p<0.001$) in two of the seven measures: percentage of population who have some college education and number of primary care physicians per population, with the rural counties having lower values in each. Additionally, the percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, and average mentally unhealthy days for adults in a month were found to predict 48.4% of the variance in drug overdose death rate, 77.5% of the variance in life expectancy, and 92.9% of the variance in child poverty rate.

Key Words: *social determinants of health, upstream factors, poverty, disparities, health outcomes*

Introduction/Literature Review

For years, the United States has faced growing obesity, mental illness, and substance abuse rates. When the traditional healthcare system failed to make a significant difference in the prevalence of these diseases, health care professionals looked upstream for possible causes and solutions. These social determinants of health include variables such as economic stability, neighborhood and physical environment, education, food, community and social context, and health care system.[1] It has become clear that these elements of everyday life have a broad impact on health outcomes as a whole. In the United States, the zip code that one is born into is a better indicator of one's health status than genetic code.[1] It has also been shown that one's zip code determines not only his or her future but also that of any successors, as poverty is often generational.

The finding that zip code has a stronger impact on one's health than any genetic predisposition speaks to the extent of the role that social determinants of health play in establishing wellness outcomes. It means that a population living in one area may be more likely to face certain barriers to equitable healthcare than the population living in the next neighborhood over. For example, a child born into one zip code may grow up with a supportive family, healthy diet and lifestyle, safe and clean places to play and explore, excellent education system, and plenty of opportunities later in life, while a child born into another zip code nearby may lack all of those resources. Maybe that child is raised in a single-parent, low-income household in a food desert where crime and violence are prevalent and the education system is failing. These differences in upstream factors will have downstream effects on not only the

general life trajectory but also the physical and mental well-being of those children. Previous studies have shown that lack of safety, increased neighborhood disorder, or less belongingness and social cohesion are directly related to worse language, emotional, and behavioral outcomes for children[2] and that higher opportunity neighborhoods protect against the negative consequences of low family socioeconomic status on children's stress response and physical health.[3] Upstream differences matter.

Although the concept of social determinants of health has been well-established and investigated for years, novel lenses for us to view it through still remain. The Ohio Department of Health and many other local entities have collected extensive data regarding social determinants of health and health outcomes but continue to overlook the clear distinction between rural and urban life in Ohio. Because the markers of poor health that I previously mentioned, such as obesity, adult depression, and smoking and heroin use, are higher in Ohio than the national average,[4] it is incredibly important to further investigate the role that psychosocial factors may play in establishing our state's population health. This project aims to explore any possible upstream differences between rural and urban counties of Ohio.

Any pertinent findings from this study will inform how government policies might better address the barriers that both rural and urban Ohioans face in accessing equitable healthcare. There has been extensive research supporting specific policy interventions that target education, urban planning, community development, and employment in order to improve health disparities.[5] After learning what obstacles are most likely present on each community's path to wellness, policy makers will have a better idea of what action to take to remove them. Promoting access and utilization of healthcare in both rural and urban areas will not only improve the lives of those currently living there but also build a stronger foundation for the future. Children born

into disadvantaged families often have poor developmental and psychosocial outcomes, predisposing them to lifelong hardship and diminished upward social mobility.[6] Challenging generational poverty and all that comes with it has rippling downstream effects on society as a whole. The information gathered from this study will be directed toward that effort.

Research Questions

1. How does the percent of the population who has some college education differ in rural versus urban counties of Ohio?
2. How does the percent of the population who experiences food insecurity differ in rural versus urban counties of Ohio?
3. How does the number of primary care physicians per population vary in rural versus urban counties of Ohio differ?
4. How does the average number of mentally unhealthy days per month for adults differ in rural versus urban counties of Ohio?
5. How does the drug overdose mortality rate vary in rural versus urban counties of Ohio?
6. How does life expectancy vary in rural versus urban counties of Ohio?
7. How does child poverty rate differ in rural versus urban counties of Ohio?
8. How do percent of the population who has some college education, percent of the population who experiences food insecurity, number of primary care physicians per population, and average number of mentally unhealthy days per month for adult relate to drug overdose mortality rate?
9. How do percent of the population who has some college education, percent of the population who experiences food insecurity, number of primary care physicians per

population, and average number of mentally unhealthy days per month for adult relate to life expectancy?

10. How do percent of the population who has some college education, percent of the population who experiences food insecurity, number of primary care physicians per population, and average number of mentally unhealthy days per month for adult relate to child poverty rate?

Methods

Context/Protocol

All data was collected from Ohio's County Health Rankings and Roadmaps. The population of each county was gathered from 2017's Census Bureau's Population Estimates Program (PEP) which includes people in households and group quarters, civilians and non-civilians, and citizens and non-citizens as residents.[7] The data for the remaining variables (percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, average mentally unhealthy days for adults in a month, drug overdose mortality rate, life expectancy, and child poverty rate) was collected by either statewide or nationwide programs through different studies and surveys from 2013-2017 (Appendix A).[7]

Data Collection

Using County Health Rankings and Roadmaps, I found the most recent population estimate of each Ohio county as well as studies that focused on upstream factors across Ohio. The upstream factors I chose to investigate were percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, average mentally unhealthy days in a month for adults, drug overdose mortality rate, life

expectancy, and child poverty rate. The studies that gave rise to this data were orchestrated by separate organizations at different times (from 2013-2017) but they all assessed for the presence of these upstream health factors in each Ohio county. I pulled every Ohio county's statistics from each study (Appendix A). In Ohio, counties with a population of less than 50,000 are considered rural, whereas those with 50,000 or more are considered urban.[8,9] Using this distinction, I categorized each county as either rural or urban (Appendix B). I then compared the upstream factors of the rural group of counties to those of the urban group. In my statistical comparison of a specific variable and population, I excluded any county that lacked a data point for a given variable, as not all counties had complete data for every variable.

Data Analysis

I found the mean, standard deviation, maximum, and minimum for each variable for each group (rural and urban counties of Ohio). Because my data was normal, I performed an ANOVA in order to compare upstream variables in rural versus urban Ohio counties. The seven variables that I studied are percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, average mentally unhealthy days in a month for adults, drug overdose mortality rate, life expectancy, and child poverty rate. I also performed three regressions to evaluate for a relationship between predictor variables (population who has some college education, food insecurity rate, number of primary care physicians per population, and average number of mentally unhealthy days per month for adults) and outcome variables (drug overdose mortality rate, life expectancy, and child poverty rate).

Results

To answer research questions one through seven, an ANOVA was conducted to compare social determinants of health in rural versus urban counties of Ohio. I found that Ohio's rural and urban counties differed significantly in two of the seven measures: percentage of population who have some college education ($p < .001$) and number of primary care physicians per population ($p < .001$), with the rural counties having lower values in each (Table).

Table. Social Determinants of Health in Rural versus Urban Counties of Ohio [a]

	Rural			Urban		
Social Determinant of Health	n	Mean	SD	n	Mean	SD
Percentage of Population who have Some College Education	39	51.8*	9.31	49	61.5	8.6
Food Insecurity Rate	39	13.5	2.45	49	13.9	2.66
Number of Primary Care Physicians per Population	39	3.55E-04*	1.75E-04	49	6.30E-04	2.44E-04
Average Mentally Unhealthy Days per Month for Adults	39	4.08	0.255	49	3.99	0.278
Drug Overdose Death Rate	35	28	14.3	49	33.5	13.7
Life Expectancy	39	76.7	2.04	49	77.1	1.79
Child Poverty Rate	39	19.5	6.62	49	18.3	6.77

[a] Data adapted from County Health Rankings & Roadmaps

* Differed significantly ($p < 0.001$) from that of the urban population

My eighth, ninth, and tenth research questions sought to ascertain if predictor variables (percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, and average mentally unhealthy days for adults in a month) are associated with outcome variables (drug overdose death rate, life expectancy, and child poverty rate). The regressions indicated that the percentage of population who have some college education, food insecurity rate, number of primary care physicians per population, and average mentally unhealthy days for adults in a month together predict 48.4% of the variance ($r = .484$, $p = .43$) in drug overdose death rate, 77.5% of the variance ($r = .775$, $p < .001$) in life expectancy, and 92.9% of the variance ($r = .929$, $p < .05$) in child poverty rate.

In looking at drug overdose mortality rate, food insecurity rate (std B = .378) accounts for the most variance, while percent who have some college education (std B = .015), average mentally unhealthy days (std B = .116), and number of primary care physicians per population (std B = .099) do not add much. An increase of any of these variables leads to an increase in drug overdose mortality rate.

In looking at life expectancy, average mentally unhealthy days (std B = -.464) and food insecurity (std B = -.321) account for the most variance, while percent who have some college education (std B = .078) and number of primary care physicians per population (std B = .035) do not add much. An increase in the first two variables mentioned leads to a decrease in life expectancy, whereas an increase in the second two leads to an increase in life expectancy.

In looking at child poverty rate, food insecurity rate (std B = .719) accounts for most of the variance. The average mentally unhealthy days (std B = .150), percent who have some college education (std B = -.242), and number of primary care physicians per population (std B = .041) account for far less of the variance. An increase in food insecurity increases child poverty rate

whereas an increase in percent of population with some college education leads to a decrease in child poverty rate.

Discussion

These findings shed some light on the current literature regarding this topic, which fails to differentiate between rural and urban areas of Ohio. It is now clear that rural populations face some unique challenges to achieving wellness. As previously stated, zip code often determines health outcomes more than genetic code.[10] It is likely that the lower educational attainment and primary care shortage in rural areas impact the health status of that population, as I found those two variables to be significantly lower in rural counties than in urban ones (Table).

The process of education and the product that it yields are essential components of one's health and contribute to other elements of one's current and future well-being.[11] For example, the prevalence of risk behaviors is greater in those with less than nine years of formal education and progressively declines with each additional year of education.[11] Additionally, higher educational attainment typically correlates with increased income later in life. As financial security often promotes access to nutritious food, opportunities to engage in healthy behaviors, and healthcare in general, it contributes to health status in a profound way.[11,12] Finally, one study in evaluating the relationship between education and life expectancy found that in 2005 a man who failed to complete high school had an average of life expectancy of 44.2 years. With a high school diploma, that life expectancy grew to 69.2 years. With a graduate education, it increased another fifteen years.[11] Education holds a somewhat unique power to break the cycle of generational poverty and promote health equity for all.[11,12] If rural Ohioans had more exposure and improved access to higher education, they could grow healthier as a community. With this knowledge,

healthcare and education policy makers should strongly consider working together to improve the population health of rural Ohio.

Limited access to primary care in rural areas also negatively impacts rural health outcomes. Primary care providers often serve as a bridge between patients and the greater healthcare system as a whole.[13] They prevent, diagnose, manage, and treat many of the conditions that Americans commonly face today.[13] Rural populations have a higher prevalence of smoking, adolescent pregnancy, chronic disease, and mental illness.[14] They are generally older with lower educational attainment and income, which makes them more likely to be medically under or uninsured.[14] In many ways, rural populations face greater health risk while also lacking sufficient access to necessary healthcare. For this reason, it makes sense that increased availability of primary care providers is related to reduced all-cause and cause-specific mortality.[15] Extensive research has established a multifactorial medical training approach that fosters long-term rural medical practice.[14] Additionally, financial incentives and specialty training programs have been found to strengthen rural physician retention.[16] With more primary care physicians in these neighborhoods, patients would be able to have more routine healthcare screenings and visits, leading to fewer unnecessary hospital visits and less healthcare spending down the road.[17] The specific hurdles that rural counties must leap over in order to remain healthy should now serve as targets of state legislation.

It is also important to note that in both rural and urban counties, average mentally unhealthy days per month largely contributes to the variance in life expectancy and food insecurity contributes greatly to the variance in life expectancy and child poverty rate. These findings offer further insight to how healthcare legislators and providers can work upstream to better support underserved and at-risk families in Ohio. It is possible that with more support from those around

them, patients might be better equipped to cultivate a healthy lifestyle.[5] These findings are promising, marking a clear path for policy makers as they strive to improve the health of these Ohio communities.

There are a few limitations of this research study. The most recent data used was from 2017. Ideally, I would have been able to analyze data from the last year or two in order to have the most accurate understanding of current rural and urban life in Ohio. Additionally, this study only investigated seven social determinants of health. Because any further insight to how to improve healthcare equity and accessibility in rural and urban Ohio counties would be of great value, I think it would be important to study as many upstream factors as possible. Because the study only compared social determinants of health of rural and urban counties of Ohio, the population and scope of the study in terms of context and applicability are also limited. Finally, the study used aggregate data, which prevents the tracking and analysis of individual data.

A future area of study might investigate additional social determinants of health such as race, employment status, economic stability, frequency of physical activity, neighborhood safety, and quality of local education system. I think it would also be interesting study social determinants of health in Ohio through the lens of income level, rather than rural versus urban. In the future, opening this study up to the broader context of the United States might increase the population size and diversity, which would allow for more comprehensive data analysis. Another future direction of this study might involve researching the downstream effects of poverty on child growth and development in rural versus urban counties of Ohio. Doing so might uncover possible interventions to mitigate the effects of child poverty. It is known that higher opportunity neighborhoods protect against the negative consequences of low socioeconomic status on

children's stress response and physical health,[3] but further research might indicate exactly how to effectively buffer poverty's lasting implications on children.

Conclusion

In this study, I identified significant differences in the social determinants of health present in rural and urban counties of Ohio. The results are important as they inform the way physicians might approach treating patients' obesity, mental illness, substance abuse, and other currently pervasive diseases in our state. This deeper understanding enlightens not only modern clinical practice but also healthcare and education legislation at the state level. Ohio leaders must to work together to improve educational attainment and the number of primary care providers per population in rural areas. They should also strive to reduce the state's average mentally unhealthy days per month, as it largely contributes to the variance in life expectancy, and food insecurity rate, as it largely contributes to the variance in life expectancy and child poverty rate. As the state begins to remove the barriers to equitable healthcare in Ohio, our population health will gradually improve in an indelible way. With this approach, Ohio might serve as an example for the rest of the country, leading the way to a healthier future.

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Appendix A

Social Determinant of Health	Year	Study/Survey
Percentage of Population who have Some College Education	2013-2017	American Community Survey Five Year Estimates
Food Insecurity Rate	2016	Map the Meal Gap Project
Number of Primary Care Physicians per Population	2016	Area Health Resource File/ American Medical Association
Average Mentally Unhealthy Days per Month for Adults	2016	Behavioral Risk Factor Surveillance System
Drug Overdose Death Rate	2015-2017	CDC WONDER Mortality Data
Life Expectancy	2015-2017	National Center for Health Statistics
Child Poverty Rate	2017	Behavioral Risk Factor Surveillance System

Appendix B

Rural		Urban	
County	Population	County	Population
Vinton	13,092	Darke	51,536
Monroe	13,946	Ashland	53,628
Noble	14,406	Seneca	55,243
Morgan	14,709	Union	56,741
Harrison	15,216	Pickaway	57,830
Paulding	18,845	Huron	58,494
Wyandot	22,029	Sandusky	59,195
Meigs	23,080	Lawrence	60,249
Henry	27,185	Washington	60,418
Carroll	27,385	Knox	61,261

Adams	27,726	Marion	64,967
Van Wert	28,217	Jefferson	66,359
Pike	28,270	Athens	66,597
Hocking	28,474	Belmont	68,029
Fayette	28,752	Erie	74,817
Gallia	29,973	Hancock	75,754
Hardin	31,364	Scioto	75,929
Jackson	32,449	Ross	77,313
Putnam	33,878	Muskingum	86,149
Morrow	34,994	Tuscarawas	92,297
Perry	36,024	Geauga	93,918
Coshocton	36,544	Ashtabula	97,807
Williams	36,784	Columbiana	103,077
Defiance	38,156	Allen	103,198
Champaign	38,840	Miami	105,122
Guernsey	39,093	Wayne	116,038
Ottawa	40,657	Richland	120,589
Mercer	40,873	Wood	130,492
Preble	41,120	Clark	134,557
Crawford	41,746	Fairfield	154,733
Clinton	42,009	Portage	162,277
Fulton	42,289	Greene	166,752
Highland	42,971	Licking	173,448
Brown	43,576	Medina	178,371
Holmes	43,957	Trumbull	200,380
Madison	44,036	Delaware	200,464
Logan	45,325	Clermont	204,214
Auglaize	45,778	Warren	228,882
Shelby	48,759	Mahoning	229,796
		Lake	230,117
		Lorain	307,924
		Stark	372,542
		Butler	380,604
		Lucas	430,887
		Montgomery	531,542
		Summit	541,228
		Hamilton	813,822
		Cuyahoga	1,248,514
		Franklin	1,291,981