Opioids and the Workforce: An Analysis of the Relationship between Opioid Deaths and Ohio's Economy

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Abstract

In 2016, Ohio was ranked third in the nation for opioid deaths. The number of opioid-related deaths was over double the national average (Cooper et al. 2020). By 2021, opioids were involved in nearly 75% of overdose deaths (CDC 2023). In 2023, opioid manufacturers and pharmacies were charged with paying Ohio 679.6 million dollars over the next 15 years, as retribution for their involvement in the opioid epidemic (Ohio Attorney General 2023). One of the reasons for this payment is the impact the opioid crisis has had on the labor market. There is much literature on the impact of opioid prescription rates on the labor market, but less research on the impact of opioid deaths (Aliprantis 2019). We utilize the Ohio Integrated Behavioral Health Dashboard to retrieve annual opioid death statistics by county in Ohio for 2019 to 2021, as well as the employment-to-population ratio by county for 2019 to 2021 from the Ohio Labor Market Information Database. We hypothesize a negative and bidirectional relationship between these variables. We utilize two cross-sectional regressions to model the impact of both directions in all 88 Ohio counties: the effect of the opioid death-to-population ratio on the employment-to-population ratio and the effect of the employment-to-population ratio on the opioid death-to-population ratio. We model this in an attempt to investigate the difference in the magnitude of the relationship in both these directions to uncover which relationship is dominant. We find that a stronger labor market in 2019 (lower employment-to-population ratio) is associated with a lower opioid death-to-population ratio in 2021 at a statistically significant level. We procure a negative but insignificant result in the converse model. Our work contributes to understanding the directionality of the relationships between the opioid epidemic and the labor market.

Introduction

Ohio, once emblematic of American industry, now struggles with the repercussions of its opioid epidemic. It currently stands at the crossroads of economic adversity and public health crisis. Opioid-related deaths have devastated communities and left behind a tale of human suffering and economic decline. In our article, we delve into the intricate relationship between opioid deaths and employment, shedding light on the dynamics that underlie Ohio's struggle with addiction and its toll on the workforce.

The opioid epidemic has numerous deaths due to unintentional overdose nationwide since the 1990s. The three primary types of opioids are prescription opioids, fentanyl, and heroin (CDC, 2023). The first wave of the opioid epidemic was from 1999 to 2010 (CRS, 2022) and was attributed to an increase in the prescription rate of opioids (Boysen et al., 2023). Opioid misuse and deaths doubled from 2.9 to 6.8 deaths per 100,000 people during the first wave (CRS, 2022). In the second wave, from 2010 to 2016, heroin usage began to rise and the rate of deaths involving heroin increased from 1 to 4.9 per 100,000 people (CRS, 2022). By 2016, fentanyl-related deaths exceeded the rate of

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deaths attributed to prescription opioids and heroin, which marked the start of the third wave of the epidemic as the death rate doubled again from 10.4 to 21.4 per 100,000 people. (CRS, 2022). The Ohio population is among the states hardest hit by the opioid epidemic, especially during COVID-19. The usage of opioids has increased during the COVID-19 pandemic due to mental health issues and social isolation (Vieson et al., 2021).

Opioid use and employment have a nuanced and delicate relationship. Aliprantis et. al (2019) elucidates the fact that increases in opioid prescription rates are associated with a decrease in employment in prime-age adults. Meanwhile, Cho et al. (2021) shed light on the disproportionate impact of heroin use on employment and labor force engagement, particularly among marginalized demographics. They also showed that it reduced employment. Finally, Hill et al. (2021) highlighted that the COVID-19 pandemic exacerbated labor market vulnerabilities, fostering a fertile ground for heightened opioid transactions, and exacerbating the already dire nexus between economic distress and substance misuse. Collectively, these studies underscore a need for the exploration of Ohio's opioid epidemic and its effects on the workforce.

Data

We inspect the bidirectional causality between opioid deaths and employment dynamics with 2 cross-sectional regression models across Ohio's 88 counties from 2019-2021. We use the employment/population ratio to view employment, and opioid deaths/population ratio to view opioid deaths. We ran 2 sets of regressions; one with employment and one with opioid deaths as an outcome variable to gauge which relationship has a stronger effect. We weighted the regression by county size. We hypothesize that there is a negative and bidirectional relationship between opioid deaths and the employment-to-population ratio across counties. We also hypothesize that the magnitude of the relationship between the employment-to-population ratio and opioid deaths with opioid deaths as the outcome is larger than the converse. We source our employment data from the Ohio Labor Market Information Database, opioid death data from the Ohio Integrated Behavioral Health Dashboard from the Ohio Department of Health, and population data from the Census Bureau.

Figure 1. (left) Opioid deaths in Ohio's five largest counties (2019 and 2020); **Figure 2.** (right) Ohio opioid overdose deaths by year (2017-2022)
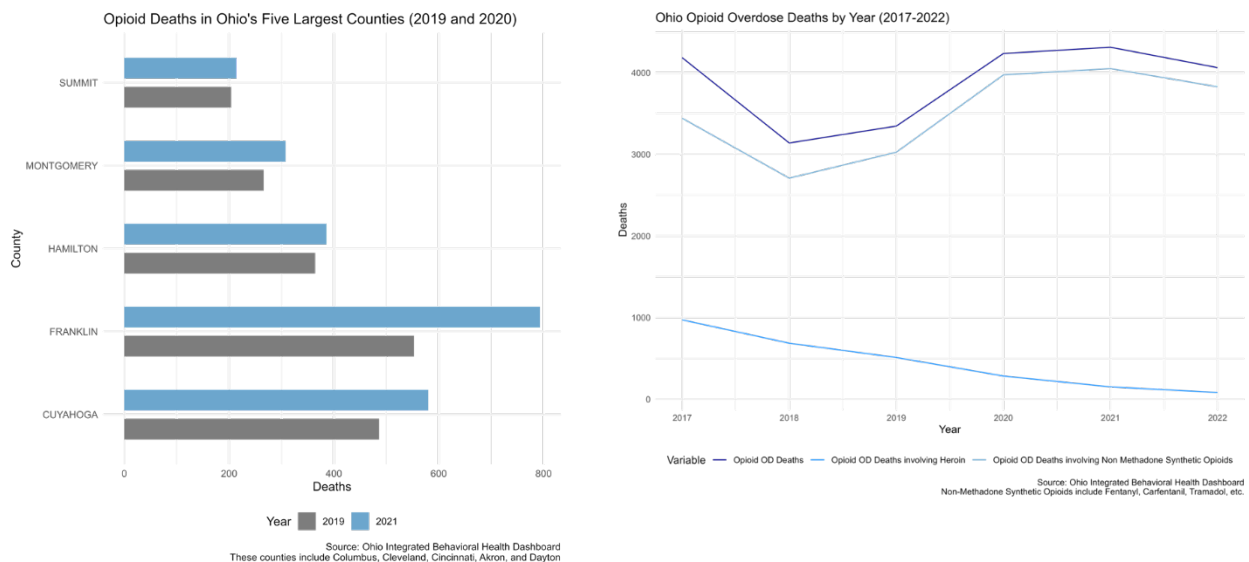
Note: There is a clear increase in Opioid Deaths from 2019-2021, which is seen throughout the five most populous counties in Ohio. The increase could be due to many variables, including COVID-19.

Note: This graph clearly shows the decrease in heroin use since 2017. The gap between Opioid Deaths and Opioid Deaths due to synthetic drugs such as fentanyl becomes smaller as we move closer to 2022. The two lines are also almost parallel, which shows that trends in opioid deaths are mostly decided by fentanyl, carfentanil, and other illicit synthetic opioids.

Methodology and Theoretical Model

Opioid usage and employment rates are related bidirectionally by multiple factors. On one hand, the impact of employment on opioid usage can be viewed through the lens of Becker's rational crime model, wherein economic strain increases the appeal of illicit activities, including drug usage as individuals seek to increase their marginal utility during times of financial distress. The lower opportunity cost associated with unemployment provides scope for substance abuse as individuals have reduced employment prospects. Conversely, opioid usage can have a large effect on employment. The surge in opioid supply within Ohio has increased widespread opioid usage. This has reduced labor force productivity and has caused a negative income effect that undermines worker efficiency and reduces effective income. Moreover, the substitution effect also plays into role wherein the perceived benefits of leisure overpower the appeal of labor, and individuals allocate resources towards sustaining their drug habits rather than pursuing employment opportunities.

Regression and Results

The regression models we ran were as follows:

Model 1: Employment/Population Ratio as an Outcome

$$1a.\ Emp/Pop_{C,2021} = \beta_0 + \beta_1 OD_{C,2019} + \beta_2 Emp/Pop_{C,2019} + \mu_{C,2021}$$

$$1b.\ Emp/Pop_{C,2021} = \beta_0 + \beta_1 OD_{C,2019} + \beta_2 Emp/Pop_{C,2019} + \beta_3 \Delta OD_{C,2019-2020} + \mu_{C,2021}$$

Model 2: Opioid Deaths/Population Ratio as an Outcome

$$2a.\ OD_{C,2021} = \beta_0 + \beta_1 Emp/Pop_{C,2019} + \beta_2 OD_{C,2019} + \mu_{C,2021}$$

$$2b.\ OD_{C,2021} = \beta_0 + \beta_1 Emp/Pop_{C,2019} + \beta_2 OD_{C,2019} + \beta_3 \Delta Emp/Pop_{C,2019-2020} + \mu_{C,2021}$$

Model 1 uses the employment/population ratio as an outcome of opioid deaths/population ratio, and Model 2 does the converse. Model 1a and 2a have an added control variable; this accounts for the changes in the employment/population ratio and opioid deaths/population ratio between 2019 and 2020 in each model respectively. This allows us to isolate the effects of the variables from 2019 to 2021.

The results of each of the models are shown below:

Table 1. Regression results with dependent variable employment/population ratio by county

	Dependent Variable: Employment/Population Ratio in 2021	
	Model 1a	Model 1b
Opioid Death/Population Ratio: 2019	-0.0001	-0.0001
	(0.0001)	(0.0001)
Employment/Population Ratio: 2019	0.865***	0.868***
	(0.022)	(0.022)
Change in Opioid Death/Population Ratio: 2019-2020		0.0001
		(0.0001)
Constant	0.049***	0.047***
	(-0.01)	(-0.011)
Observations	88	88
R^2	0.95	0.951
Adjusted R^2	0.949	0.949
Residual Std. Error	0.0001	0.0001
	(df = 2; 85)	(df = 3; 84)
F Statistic	815.433***	546.052***
	(df = 2; 85)	(df = 3; 84)

Table 2. Regression results with dependent variable opioid deaths/population ratio by county

	Dependent Variable: Opioid Deaths/Population Ratio in 2021	
	Model 2a	Model 2b
Opioid Death/Population Ratio: 2019	-110.505***	-110.505***
	(37.661)	(37.661)
Employment/Population Ratio: 2019	0.738***	0.738***
	(0.139)	(0.139)
Change in Opioid Death/Population Ratio: 2019-2020		
Constant	69.799***	69.799***
	(17.737)	(17.737)
Observations	88	88
R^2	0.344	0.344
Adjusted R^2	0.328	0.328
Residual Std. Error	0.096	0.096
	(df = 85)	(df = 85)
F Statistic	22.278***	22.278***
	(df = 2; 85)	(df = 2; 85)

In both tables, our coefficients of interest are those in the first row. In Table 1, we see that both coefficients are -0.0001 and statistically insignificant, meaning that we cannot infer anything about the effect of opioid deaths on employment across Ohio counties. On the other hand, both our variables of interest from models 2a and 2b are statistically significant, meaning that we can make inferences about the relationship that employment has on opioid deaths in Ohio. We will focus on our coefficient from model 2b since we conclude it is a better estimate due to the added control. The number -99.446 implies that a 10 percentage point decrease in the employment/population ratio is associated with 9.9 more opioid deaths per 100,000 in Ohio counties. Our main takeaway is that there is a negative and statistically significant association between the employment/population ratio in 2019 and the opioid death/population ratio in 2021 with the opioid death/population ratio in 2021 as an outcome.

Our study underlines the vulnerability of counties with weaker labor markets in 2019 to experience increased opioid deaths in 2021, thus emphasizing how economic disparities can shape the trajectory of the opioid epidemic. Despite this insight, we acknowledge several limitations, including the short timeframe of data collection, potential

issues of serial correlation among variables, and the omission of crucial factors such as manufacturing share and endogeneity within our model. To address these limitations and advance our understanding of Ohio's opioid crisis, we look to explore the differences between the waves of the epidemic, asses regional disparities in opioid usage, and compare trends with other neighboring states within the Rust Belt region.

Conclusion

In conclusion, our study offers a simplified examination of the intricate relationship between opioid deaths and employment across Ohio counties. This allows us to focus on the impact of the labor market on opioid deaths in the future, possibly researching a causal relationship based on more nuanced characteristics of Ohio counties. Highlighting the mechanisms driving these relationships will allow stakeholders and policymakers to devise strategies to mitigate the adverse effects of the opioid epidemic and improve economic and health resilience across Ohio. With our findings, it is possible to justify economic support going to counties with poor labor markets, to decrease the association between the labor market and opioid deaths. These findings show the impact of opioid deaths, instead of different indicators like prescription rates or opioid use rates, on the labor force which adds to the literature focused on the labor market and opioid use.

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