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Investigating a Modern Midwestern Crisis: The Economy and Opioid Overdose Death in Ohio

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Abstract

This paper examines the effect of local economic factors on the amount of opioid overdose deaths across counties in Ohio. Ohio leads the nation in opioid overdose deaths. The data examined spans all 88 counties of Ohio and compares 2009 and 2013 data, relying predominantly on Ohio Department of Health and US Census American Community Survey data. Using two linear regression models, I demonstrate that there is a significant correlation between insured rates and opioid overdose deaths in 2009 as well as a significant correlation between poverty rates and opioid overdose death rates in Ohio in 2013. Additionally, I show significant evidence that number of deaths caused by opioid overdose differs greatly in metropolitan counties compared to rural counties.

Keywords

opioid, Ohio, county, economy, poverty, fentanyl, carfentantil, insured, unemployment

I. Introduction

The United States is in the midst of the largest opioid epidemic it has ever seen. In 2015 alone, the CDC cited more than 33,000 deaths solely from opioid overdose. The term "opioid" includes prescription pain medications such as OxyContin and Vicodin, heroin, and other synthetic analgesics, such as fentanyl and Carfentanil. These drugs, some legal and some illegal, are highly addictive.

As Ohio Department of Health data reports, opioid addicts are predominantly covered by health insurance. They start on prescription opioids, going "doctor shopping"—seeing multiple doctors for the same ailment, therefore receiving several prescriptions in order to abuse the drugs. This process often becomes painstaking and time consuming, compelling addicts to cross state lines to find doctors and pharmacies that will feed their addiction. Eventually they turn to cheaper and more accessible forms of opioids, such as heroin and fentanyl that will give them a stronger high. Because of the highly addictive nature of these substances and the addicts' inability to know for certain what they are receiving when they buy these illicit substances, they can lead to overdose, which is often fatal.

Surprisingly, one may just now be hearing about this phenomenon on the news because it has become a much worse epidemic as of late. Though this issue is starting to gain more national coverage, a lack of awareness is common and may come from the general public's ignorance on the topic of opioids or the fact that much of the legislation surrounding drugs, overdose, and prescription regulation differ by state. As a result, little data and research have been collected about opioid use and overdose. This may also be due to the illicit nature of such substances and the abusers' reluctance to admit their abuse in survey or panel data.

This epidemic is running especially rampant in Ohio. As of 2014, Ohio had the most opioid overdose deaths of any state in the United States contributing 2,106 of the United States' 28,647 opioid overdose deaths. Headlines like "Heroin, other drugs killing Ohioans in record numbers" and "Two dead, 70 to ERs as overdoses surge" curse the local news daily. As more people are affected by this epidemic, the country wonders why. Is it because of the decline of the

blue-collar work Ohio once thrived on? Is it the poverty, which seems to be on the rise? Or are there immeasurable factors, factors only one that really lives the lives of these addicts can see and feel?

To understand why this epidemic has plagued Ohio of all states, one must look at the demographic makeup of its population. The Ohio Census reports that about 80% of Ohio's population is Caucasian and 80% also live in metropolitan areas like Cincinnati, Cleveland, and Columbus. White, metropolitan-living people have been hit the hardest by this epidemic, making Ohio a target for dealers, both foreign and domestic. Additionally, the majority of Ohioans—in every county—are covered by some sort of medical insurance, while also having a relatively high unemployment rate compared to many Midwestern states.

To control the opioid crisis, states have implemented individual Prescription Drug Monitoring Programs, or PDMPs, to track how often individual doctors are prescribing opioids and how often patients are receiving them. However, areas like Cincinnati and Dayton, which have been hit the hardest, are located near the borders of Kentucky and Indiana, making cross-border doctor shopping and hospital visits far more viable for addicts. This makes Ohio the perfect breeding ground for the opioid epidemic.

These factors are all important in understanding why Ohio has become the state leading in opioid overdose deaths, but there has not been much research on whether or not the state of the local economy has on opioid overdose deaths. This paper begins to look into county-level economic variables that could potentially affect the rates of opioid-related deaths. In two linear regressions, this paper examines the impact of poverty rates, income, unemployment, in addition to other factors and how those correlate to unintentional opioid overdose deaths in 2009 and 2013.

II. Literature Review

There has been little research on how the economy affects the use of drugs. Whether this is due to the illicit nature of the drug market or a general disinterest in the subject, there is very little reliable data to work with regarding drug use. That being said, the research that is done tends to surround the work of

Jeremy Arkes (2007), who researches the relationship between drug use and the economy several times. Though he limits his population to teens, his question boils down to how the economy affects drug use and the driving factors behind that.

Arkes' (2007) paper on teenage substance abuse seems to be the first time the counter cyclicality of the economy and drugs. His paper is cited repeatedly in most of the papers that follow. Though he includes an econometric model, the bulk of the paper explains the reasoning behind drug use in a bad economy, and why teens might be more or less likely to partake in the drug market. He discusses whether an expanding labor market would drive a teen to get a job and thus have less free time to use drugs, or whether it would cause them to have two parents in the workforce and have more unsupervised time in which to use and abuse drugs. Arkes (2007) uses New York state survey data from teens 16-18 and manages to get a good cross-section of races, genders and ages.

It does feel as though Arkes (2007) may try and tackle too much in this paper by looking at rates of recent alcohol, marijuana, and hard drug use across different demographics. His work may have been more effective had he focused on one substance type, but alas his point comes across. Teens are more likely to use drugs in a poor economy, predominantly because of the shrinking job market and increased amount of free, unsupervised time. He finds they may use drugs to "self-medicate" during a weak economy, due to the stress it puts on them and their households. Lastly, Arkes (2007) finds drug use in teens may increase in a weak economy because they may resort to selling drugs themselves, due to higher unemployment, thus making it easier for other teens to acquire drugs. This paper asks a similar question to mine but I am interested to see if using data during and after the Great Recession will make my results more or less significant. Regardless, it would be interesting to see what results Arkes' (2007) model would yield with data after 2007, when his paper was published.

Carpenter, Mclellan, and Rees (2016) elaborate on Arkes' (2007) research and focus on heroin and prescription pain medications. The paper highlights the lack of research that has been done on this topic versus alcohol and tobacco, mainly due to the lack of reliable data surrounding the sale. Carpenter et al.

(2016) use National Surveys on Drug Use and Health with a sample of 800,000 respondents. This paper is especially valuable because it spans 2002-2013 and is therefore able to show the effects of the Great Recession on drug use; this is what my paper will focus on as well. They are sure to state that the economy affects drug use differently across drug types. Carpenter et al. (2016), like Arkes (2007), focus on "illicit drugs," making their research question more about how the drug abuse rates differ from each other than how the economy affects one specifically.

The results for how the economy impacts heroin use were generally insignificant, but the paper mentions that substance abuse problems involving prescription pain medication, most of which are opioids, are highly countercyclical. They find that this is the case especially among white, uneducated males, which are abundant in Ohio. Though Carpenter et al. (2016) did not find much significant evidence, their work is a good framework for state-specific research, which has more specific data.

Bretteville-Jensen (2011) too depends on Arkes' (2007) paper on teen substance abuse, however she looks more into how the economy affects the price of drugs and the profit made off of drugs in a recession, and how that affects use and abuse. She explains that recession causes a lower income for most, but also decreases the price of drugs and thus increases the amount of users. Because illicit drug users commonly rely on crime to fund their habits, recession may affect them differently than normally employed non-drug users. She does not use an econometrics model, but instead uses previous research to defend her logic. Its results could greatly benefit from a quantitative model, but still comes across as logical and nonetheless helpful in my argument.

In this paper I contribute to previous work by focusing on unintentional opioid overdose deaths per county. Arkes (2007) suggests in his paper that this might be more precise without the measurement error of metropolitan data. The two papers I plan to draw from most heavily, Arkes (2007) and Carpenter et al. (2016), both use survey data, which tends to be somewhat biased data due to self-response, especially when centered around a topic like illicit drug use. My drug use data is overdose death rates, which is more straightforward and eliminates bias.

The one thing all these economists could agree on is that data and research on the topic of illicit drugs, especially opioids, is scarce. Luckily for my research and unluckily for the community, opioid use has become a much larger problem since many of these papers were written, especially in the Midwest, so data is more abundant and more specific than ever.

III. Data Description

I compile the majority of the data from the US Census Bureau's American Community Survey (ACS) and Small Area Health Insurance Estimates (SAHIE). Other data come from state-level sources, including the Ohio Department of Health (ODH), the Ohio Board of Pharmacy, and the Ohio Census report. I gather data from each of the 88 counties in Ohio and compared the data from 2009 to the data from 2013. Although I would have liked to have gathered data from 2005 to 2015, the data is not available for all variables. I choose 2009 and 2013 to show the effect of the Great Recession.

All of the variables are measured by county by year and all are quantitative variables, except the two dummy variables I include, which show whether a county is considered metropolitan (x=1) or not (x=0) and whether or not a county is on the border of Ohio (x=1) or not (x=0). This is purposeful; most of the research on addiction and overdose uses qualitative data, which is unreliable due to bias and the especially illicit nature of drug use. This is the reason I examine overdose deaths, which has less gray area than drug use or addiction rates.

To determine the state of the local economy, I gather data on median household income, rate of poverty, the rate of people that had graduated high school, and the rate of unemployment. Median household income is measured in thousands of dollars per county, while the others are measured in percentage per county, respectively.

I gather this data with the intention of creating several regressions with different combinations of these variables, because the chances of finding imperfectly multicollinearity are relatively high—for example, as unemployment

rates increase, poverty rates would likely increase and median household income would likely decrease across counties.

Besides these variables, I include several controls into my regressions to avoid bias, namely simultaneous causality bias. More specifically, I want to ensure that I am finding the effect of the economy on opioid overdose deaths, not the effect of opioid overdoses on the economy. In order to do this, I incorporate rates of insurance coverage per county, prescription rates per capita per county, and the aforementioned dummy variables—metropolitan status and border status. Prescription rates, in particular, would not be impacted by the economy and only affect overdose rates, and therefore control for simultaneous causality bias. Insurance rates are included to see their impact on overdose deaths. Though this paper does not employ microdata and we cannot be sure that the majority of overdose victims were insured or not, insured rates are typically steady over time and thus are a good way to control against economic shock. Lastly, I include metropolitan status because economic downturn tends to hit metropolitan areas and rural areas differently and I want to capture that difference. These economic struggles have led to great differences in both their prescription rates and overdose death rates, which is interesting in its own right. This will be discussed more in Section V.

Table 1 shows an obviously more bullish economy in 2013 than 2009—higher median household income, lower unemployment rate, and higher insured rate. The one surprising statistic is the increased poverty rate mean, which will prove itself important in the regression models, and in turn, the severe increase in overdose deaths—shown in both the mean statistic and max statistic in Table 1[1].

Variables such as poverty rate, unemployment rate, prescription rate, and overdose rate have a wide range of values across counties, as shown by the minimums and maximums. It should also be noted that in 2009 the maximum

[1] Table 1 includes the descriptive statistics for both regression 1 (2009) and regression 2 (2013). They are placed in the same table in order to more easily compare the two years. Metropolitan status did not change from 2009 to 2013 so the same dummy variable was used in both regressions.

number of overdoses in any county was 144, and in 2013 that maximum has changed to 255 overdoses due to opioids. This amount of growth is much larger than the growth in median household income or the decrease in unemployment

TABLE 1

Summary Statistics for Observational Variables

Variable	Mean	Std. Dev.	Min	Max	Obs
Med. Household Inc. 2009	46024.41	9055.03	30190	85054	88
Med. Household Inc. 2013	47136.30	8936.48	33823	89757	88
% Below the Poverty Line 2009	13.40	4.70	4.5	32.8	88
% Below the Poverty Line 2013	15.43	4.38	4.9	31.7	88
HS Graduation Rate 2009	85.27	4.93	54.2	95	88
HS Graduation Rate 2013	87.08	4.86	55.2	96	88
Unemployment Rate 2009	11.66	2.21	6.9	15.9	88
Unemployment Rate 2013	8.07	1.64	5.1	12.7	88
Insured Rate 2009	85.86	2.12	74	92.3	88
Insured Rate 2013	86.78	1.98	75.6	92.6	88
Prescription Rate 2009	67.03	22.20	19.1	133.0	88
Prescription Rate 2013	69.17	17.67	22.1	119.2	88
Overdose Rate 2009	16.17	27.42	0	144	88
Overdose Rate 2013	23.93	46.53	0	255	88
Metropolitan Status	.398	.4922	0	1	88
Border Status	.375	.4869	0	1	88

rate.

IV. Theoretical Framework

I use two linear regression models to compare my 2009 and 2013 data. I run several regressions for each observed year. I test a total of 8 variables for both 2009 and 2013, including several controls and two dummy variables. In doing so, I hope to show the effect the state economy has on the number of unintentional opioid overdose deaths per county in Ohio.

In some regressions—regressions [4] and [4] in Table 2 and 3, respectively—I leave out several variables after modeling a stepwise function. The maximum models are as follows:

$$OverdoseDeaths_{2009} = \alpha_{it} - \beta Unemployed_{it} - \gamma Insured_{it} + \delta HSGrad_{it} + \kappa MetroStatus_{i} + \varepsilon_{it}$$

$$OverdoseDeaths_{2013} = \alpha_{it} - \beta Unemployed_{it} + \gamma Insured_{it} + \theta Poverty_{it} + \kappa MetroStatus_i + \varepsilon_{it}$$

I use a stepwise function to identify the variables that are significant at the 5% level. In the 2009 stepwise regression the significant variables include insured rate, unemployed rate, and high school graduation rate. In the 2013 stepwise regression, the variables significant at the 5% level include rate of people below the poverty line, rate of unemployment, and metropolitan status. I alter the regressions slightly in order to include at least one control and one dummy variable. The results are shown in Tables 2 and 3.

Table 2
Regression Results for 2009 Data
Dependent Variable: Opioid Overdose Deaths

Regressor	[1]	[2]	[3]	**[4]**	[5]
Unemployment Rate	-1.69 *	-3.75*	-2.42	**2.19**	-2.31
	{-1.37}	{-2.52}	{-1.82}	**{1.22}**	{1.36}
Insured Rate	-7.72*	-6.75	-6.13	**7.48***	-7.16**
	{-1.74}	{-1.77}	{-1.79}	**{3.63}**	{2.55}
High School Graduation Rate	3.18*	3.02*	2.84*	**2.94***	2.13*
	{1.98}	{2.00}	{2.02}	**{1.42}**	{1.08}
% Below the Poverty Line	1.62		1.02		
	{1.19}		{1.53}		
Metropolitan Status	15.80*		16.78**	**16.80****	16.26*
	{2.47}		{2.84}	**{5.88}**	{6.27}
Prescription Rates	0.06				
	{0.27}				
Median Household Income	0.0007				
	{1.02}				
Border Status					5.81
					{5.48}
Constant	362.8	382.2	308.3	**426.56**	409.49
	{1.65}	{1.75}	{1.66}	**{208.4}**	{149.31}
Observations	88	88	88	**88**	88

*p<0.05, **p<0.01, ***p<0.001

Table 3
Regression Results for 2013 Data
Dependent Variable: Opioid Overdose Deaths

Regressor	[1]	[2]	[3]	**[4]**	[5]
Unemployment Rate	-7.17*	-9.30*	-28.54	**-9.51***	-11.07*
	{-2.16}	{-2.01}	{-1.92}	**{-2.02}**	{3.91}
Insured Rate	-3.71		-2.45	**1.57**	1.69
	{-0.74}		{-0.72}	**{0.84}**	{2.91}
High School Graduation Rate	2.10		1.92		
	{1.23}		{1.34}		
% Below the Poverty Line	5.60	4.49*	4.57	**4.95***	5.11**
	{1.77}	{2.08}	{1.90}	**{2.05}**	{1.66}
Metropolitan Status	29.51*	33.84**	32.27**	**32.78****	30.90**
	{2.40}	{3.11}	{2.98}	**{3.03}**	{9.67}
Prescription Rates	- 0.07				
	{-0.17}				
Median Household Income	0.00094				
	{0.91}				
Border Status					18.09
					{9.50}
Constant	83.19	16.21	55.01	**-124.80**	-131.33
	{0.31}	{1.39}	{0.28}	**{-0.74}**	{262.9}
Observations	88	88	88	**88**	88

*p<0.05, **p<0.01, ***p<0.001

V. Results and Analysis

The regression analysis shows that different factors aided in opioid overdose deaths in 2009 and than did in 2013. As Table 2 Equation 4 shows, in 2009 the factors most correlated to overdose deaths are insured rate and rate of people above the age of 25 who had graduated high school. The positive correlation of overdose deaths and high school graduation rates shows that the more adults there are that are out of school and likely in the labor force, the more overdoses there are. Not surprisingly, insured rate is positively correlated with overdose deaths. For every additional one percent of people that were insured in 2009, there were 7 more overdose deaths per county. This slowed in 2013 to 1

death for every 1% increase in insurance coverage per county. This aligns with the fact that the majority of addicts and overdose victims are covered by health insurance. It also shows that in 2009, as opioid overdoses started to take off and PDMPs were put in place, prescription opioids were still fairly accessible and affordable. We see a shift in the 2013 data, however. The regression analysis in Table 3 demonstrates this shift. The factors most significant in predicting overdose death rates in 2013 are unemployment rates and poverty rates.

Surprisingly, unemployment has a negative correlation with overdose deaths. As Arkes (2007) may claim, as more people lose employment, the willingness to buy and use drugs may decline because of a decrease in income, and thus a decrease in overdose. However, the correlation between poverty and overdose death rates is not surprising. Additionally, unemployment rate includes those in the labor force actively looking for a job, whether full or part time. This group may be more motivated than those below the poverty line to stay clean, in hopes of finding and keeping a job.

Although insured rates also has a significant correlation in 2013, its impact on opioid rates appears to have dropped drastically since 2009; every percent increase originally correlated to 7 overdose deaths per county per year and in 2013 it correlated to only 1.5 overdose deaths per county per year.

In both regressions, metropolitan status shows a correlation significant at the 1% level, demonstrating that there are many more overdose deaths in metropolitan areas. It can be assumed, therefore, that opioids are more easily accessible in metropolitan counties in Ohio. Or, alternatively, it expresses that the addicts that come in from rural counties to buy opioids may be more likely to use the opioids in metropolitan counties, not being able to wait until they get back home. This is a trend that has been confirmed by police and highway patrols; the trend has been named “heroin happy hour.”

I predicted a higher correlation between border status and opioid overdoses. As aforementioned, addicts by the Ohio border can easily travel to Indiana, Kentucky, Michigan, Pennsylvania, and West Virginia. Furthermore, because PDMPs vary by state, the border county addicts would not have to worry about being regulated by the very strict Ohio PDMP because of easy access to

other states. However, when using a stepwise function to measure 5% significance, it was found insignificant. I include it in regression 5 to show its effects. It oddly changes the signs of the first several variables in Table 2, but in Table 3 has little effect. Regardless, it proves an insignificant factor of actual overdose deaths.

Figure 2 shows that prescription rates are much higher in rural counties than in metropolitan counties in both 2009 and 2013, while still maintaining fewer overdoses. I also attribute the fewer overdoses in rural counties to the fact that there are lower insured rates in these counties, so it may be more difficult to get addicted to prescription opioids in the first place. Furthermore, it is likely that synthetic opioids are not as abundant in rural areas, because wholesale dealers are more likely to deal in higher density counties.

Conversely, overdose rates are much higher in metropolitan areas. This may seem contradictory, but it is more intuitive when we think about non-prescription opioids as the predominant cause of overdose. Maps 2 and 3 show the startling overlap between the counties with the highest overdose rates and the metropolitan counties. Counties surrounding Cincinnati, Columbus, Dayton, Cleveland, Toledo, and Akron are especially obvious.

There has been a drastic shift in opioid use, which is a direct result of the decline in prescription rates per capita. As doctors prescribe fewer opioids over the last 20 years and PDMPs become more widely accepted in the medical community nationally, heroin and synthetic opioids became more accessible and more commonly used. According to the CDC, overdose deaths by heroin are far surpassing those by prescription opioids as of 2015. Furthermore, deaths by synthetic opioids like fentanyl and Carfentanil are increasing rapidly. Tom Synan, a Police Chief in Hamilton County and member of the Hamilton County Heroin Coalition, says, “What we saw in Cincinnati with the spike [in overdoses] was the literal transition from organic opiates, like heroin, to synthetic opioids like fentanyl and Carfentanil.”[2]

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[2] Locker, Melissa. "Heroin Epidemic's New Terror: Carfentanil." *Rolling Stone*, 8 Sept. 2016. www.rollingstone.com/culture/news/heroin-epidemics-new-terror-carfentanil-w438712.

This is often due to the fact that users do not know what they are taking when buying non-prescription opioids. They are given a powder substance in a bag, which often contains a mix of several substances, and do not know the "correct" amount to take, therefore making it easier to overdose. Unluckily, there is not data available solely on heroin overdoses because users who overdose are typically on a lethal dose of two or more different opioids. If this data was available, it would clearly show the shift aforementioned.

Despite all this, overdose rates have increased at a shocking rate over the last decade since the recession. As the economy gets stronger and this epidemic becomes a more pressing issue, more funding has been allotted to stopping it, especially in metropolitan counties, where funding of al types is often more abundant. In the communities this affects, addiction and fighting is a main concern, yet overdoses across counties have increased drastically. With this increased funding, an antidote for opioid overdose, called Narcan, has become more widely used. The police and EMTs that respond to overdose reports use it to revive overdose victims, practically bringing them back to life. Despite all of this, overdose deaths in 2013 were 150% of what they were in 2009. Two factors contribute to this; heroin and its synthetic counterparts are getting stronger and there are more people using these opioids—compared to prescription opioids—than ever before.

To conclude, it is evident that opioid addiction can occur in any economic climate. However, the takeaway from the data should be that poverty, especially in a metropolitan environment, has a great affect on the rate of opioid overdose deaths even in a "good economy." It may be a common misconception that when the economy comes out of recession, everyone is better off. This data says otherwise. Ohio's opioid epidemic was partially caused by addicts finding more dangerous alternatives in a time of recession. These alternatives have now overtaken the market and made the opioid epidemic more fatal than ever before.

VI. Caveats

One caveat I have for my regressions is that was hard to control for in my regression was imperfect multicollinearity. Simply put, many of my variables—as

is typical of economic variables—had linear relationships. Though I tried to control for this with prescription rates and insured rates, not all of my regressions contained all of those controls, leaving room for bias.

Another caveat I had is that I wish I had had more data. If the data had been available I would have added several more controls. I wanted to control for the downturn in the manufacturing industry in Ohio, which has caused a lot of unskilled workers to be unemployed and has driven them to drugs. This figure could come closest to capturing the immeasurable feeling of hopelessness among working class Ohioans. I also wanted to include each county's funding for fighting and preventing addiction, but this was hard to capture per county. An ever-growing number of nonprofits and police forces have joined forces to fight opioid and educate Ohioans on the dangers of addiction. Lastly, I wanted to include the rate of overdose rescues per county per year, which has undoubtedly been increasing with the increased prevalence of Narcan and police force's increased knowledge of opioid overdose in general.

VI. Conclusion

In conclusion, my linear regression model for 2009 indicates a significant correlation at the 5% level between unintentional opioid overdose deaths and insured rates. My linear regression model for 2013 indicates a significant correlation at the 5% level between unintentional opioid overdose deaths and unemployment and poverty rates. In both correlations, metropolitan status has a correlation significant at the 1% level. None of this indicates causation, but it is a step in the right direction in fighting the opioid epidemic. Simply put, poverty is a catalyst for this epidemic. In the past 15 years, poverty rates have spiked in 9 of the 10 biggest cities in Ohio. This is about the same timeline of the spike in opioid overdoses. To deny a connection between these two variables would be irresponsible.

In the introduction I pose a question on whether or not there may be immeasurable factors at work in the Ohio opioid crisis. My research tells me yes. It seems to me that the pain and hardship that the downturn of the economy caused never escaped Ohioans minds. As J.D. Vance explains in his book,

Hillbilly Elegy, about the Appalachian workingman's cultural crisis, there is an air of hopelessness throughout the white working class in the Rust Belt. They are yearning for an escape. And they find that escape, as unfortunate as it may be, in opioids. This epidemic is real and it is happening now. It transcends class and age and it is affecting real communities and families of all shapes, sizes, and colors. It is time this becomes a national issue. If this paper does nothing else, I hope that it serves to raise awareness for this epidemic and its victims.

VII. Appendix

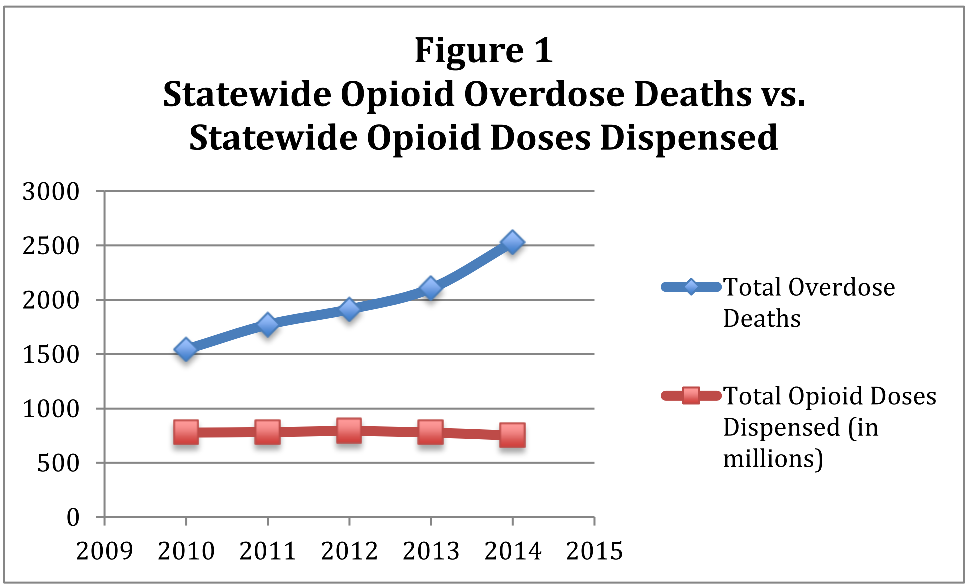
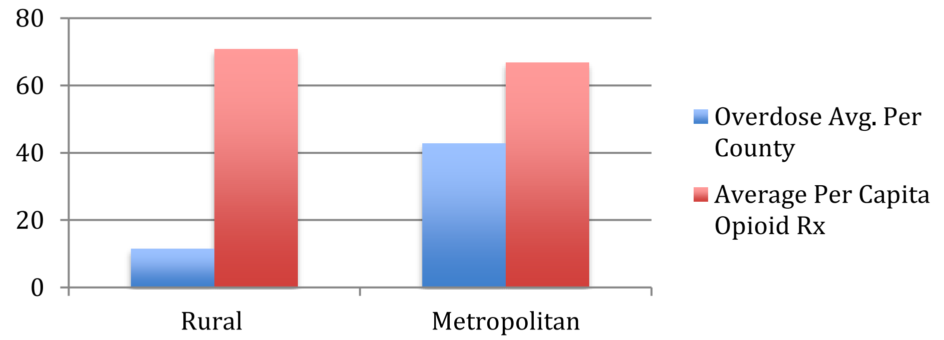
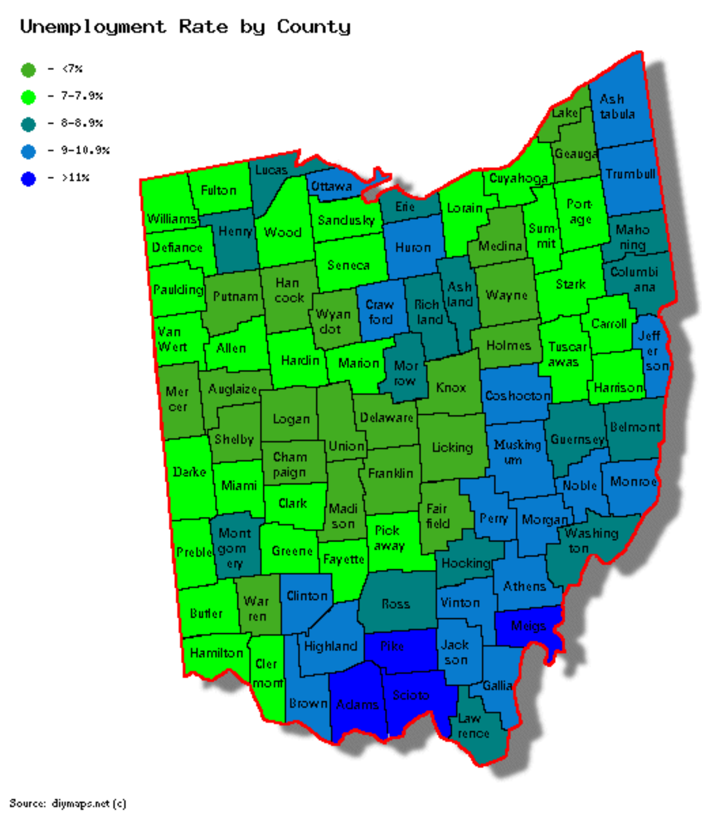
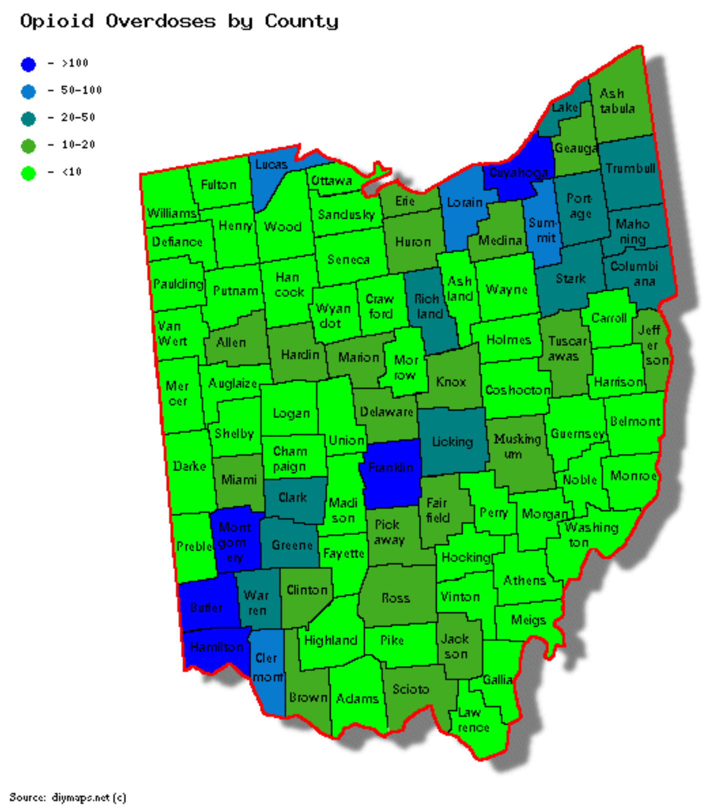
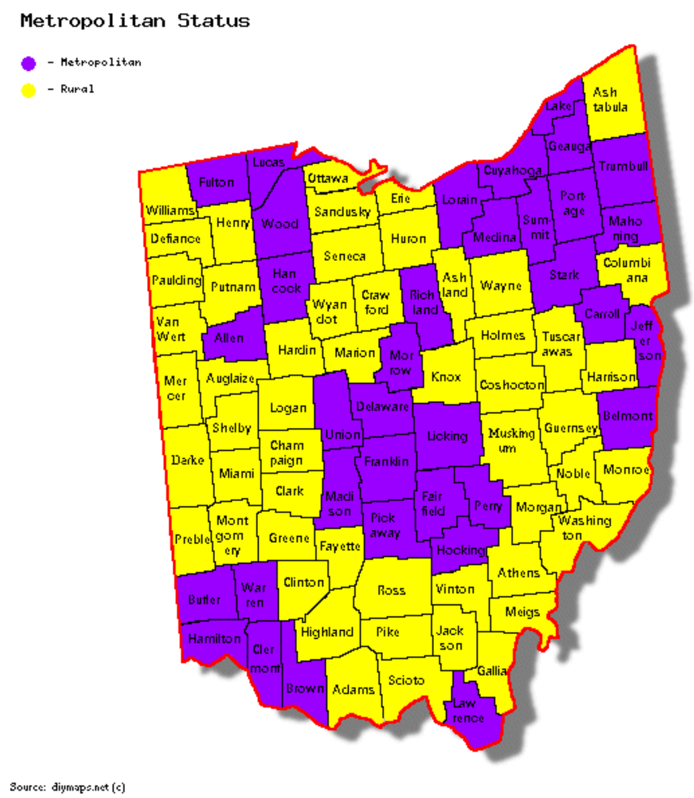


Table 2
Overdose Death Average and Per Capita Opioid Prescription Average in Metropolitan vs. Rural Counties
2013






Opioid Overdoses by County
- >100
- 50-100
- 20-50
- 10-20
- <10
Lucas
Fulton
Williams
Ottawa
Henry
Wood
Sandusky
Erie
Lorain
Cuyahoga
Lake
Ash tabula
Geauga
Trumbull
Port age
Sum mit
Medina
Huron
Seneca
Defiance
Paulding
Putnam
Han cock
Wyan dot
Craw ford
Rich land
Ash land
Wayne
Stark
Maho ning
Columbi ana
Carroll
Jeff er son
Van Wert
Allen
Hardin
Marion
Mor row
Holmes
Tuscar awas
Harrison
Mer cer
Auglaize
Knox
Coshocton
Logan
Delaware
Shelby
Union
Licking
Musking um
Guernsey
Belmont
Darke
Cham paign
Miami
Franklin
Noble
Monroe
Clark
Madi son
Fair field
Perry
Morgan
Washing ton
Mont gom ery
Preble
Greene
Pick away
Fayette
Hocking
Athens
Butler
War ren
Clinton
Ross
Vinton
Meigs
Hamilton
Cler mont
Highland
Pike
Jack son
Gallia
Brown
Adams
Scioto
Law rence
Source: diymaps.net (c)


Metropolitan Status
- Metropolitan
- Rural
Ash tabula
Lake
Geauga
Trumbull
Lucas
Fulton
Ottawa
Cuyahoga
Williams
Henry
Wood
Sandusky
Erie
Lorain
Port age
Maho ning
Defiance
Seneca
Huron
Medina
Sum mit
Columbi ana
Paulding
Putnam
Han cock
Wyan dot
Craw ford
Rich land
Ash land
Wayne
Stark
Carroll
Van Wert
Allen
Hardin
Marion
Mor row
Holmes
Tuscar awas
Jeff er son
Mer cer
Auglaize
Knox
Coshocton
Harrison
Logan
Delaware
Belmont
Shelby
Union
Licking
Musking um
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Source: diymaps.net (c)

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