Geospatial Analysis of Drug-Related Overdose Deaths in Cuyahoga County, Ohio
Analysis of ZIP Codes by Count and Census Tracts by Rate, 2017-2021*

The following maps and tables provide various levels of geographic information related to drug overdose deaths in Cuyahoga County, Ohio. The data used are the residential addresses of persons who resided in Cuyahoga County and experienced a drug-related overdose death between January 2017 and approximately June 2021 (n=2,325); this time period will be referred to as the reporting period throughout this document. The analysis includes this partial year to ensure the most current data is available for 2022 outreach planning purposes. These data were provided by the Cuyahoga County Medical Examiner's Office (CCMEO) to support the public health surveillance activities of the Overdose Data to Action grant led by the Cuyahoga County Board of Health.

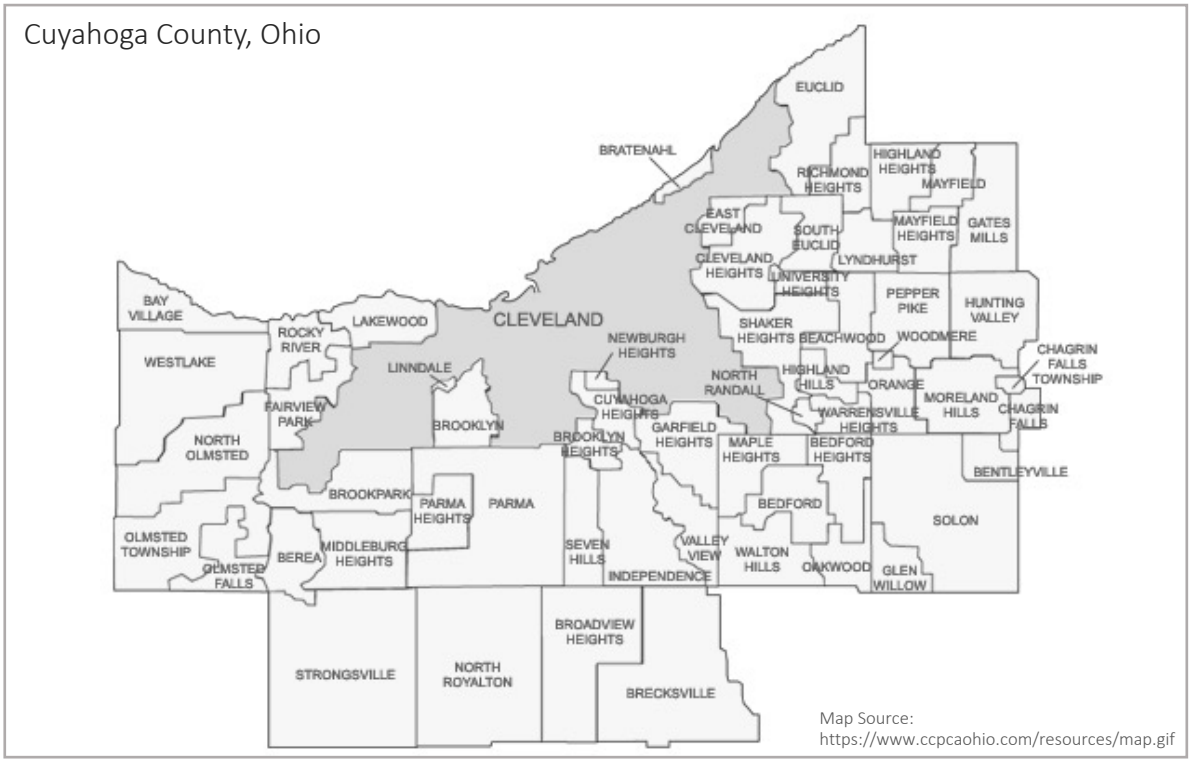
This analysis was accomplished to satisfy a partner agency request for detailed mapping products to support outreach planning for activities beginning in 2022. The request included:

- Fatal overdose hotspots by ZIP code and census tract
- Non-fatal overdose hotspots by ZIP code and census tract
- Overlays for demographic data for the general population in each ZIP code or census tract, to include race/ethnicity, and income level

This analysis is broken down into two sections:

1. Analysis by total overdose deaths (counts) by ZIP code
2. Analysis by death rate per 1000 population by census tract

ZIP code analysis was conducted using total counts of incidents per ZIP code. Census tract level analysis was conducted using the crude rate of overdose death per 1,000 population based on the population totals obtained from 2010 Census data. Census tract analysis also includes select estimates reported in the 2015-2019 American Community Survey (ACS) Planning Database. Partner agencies requested these data to improve planning for potential outreach areas. The ACS data provided in this specific product are limited to a select group of tracts; however, partner agencies will be provided ACS data for the entire county.

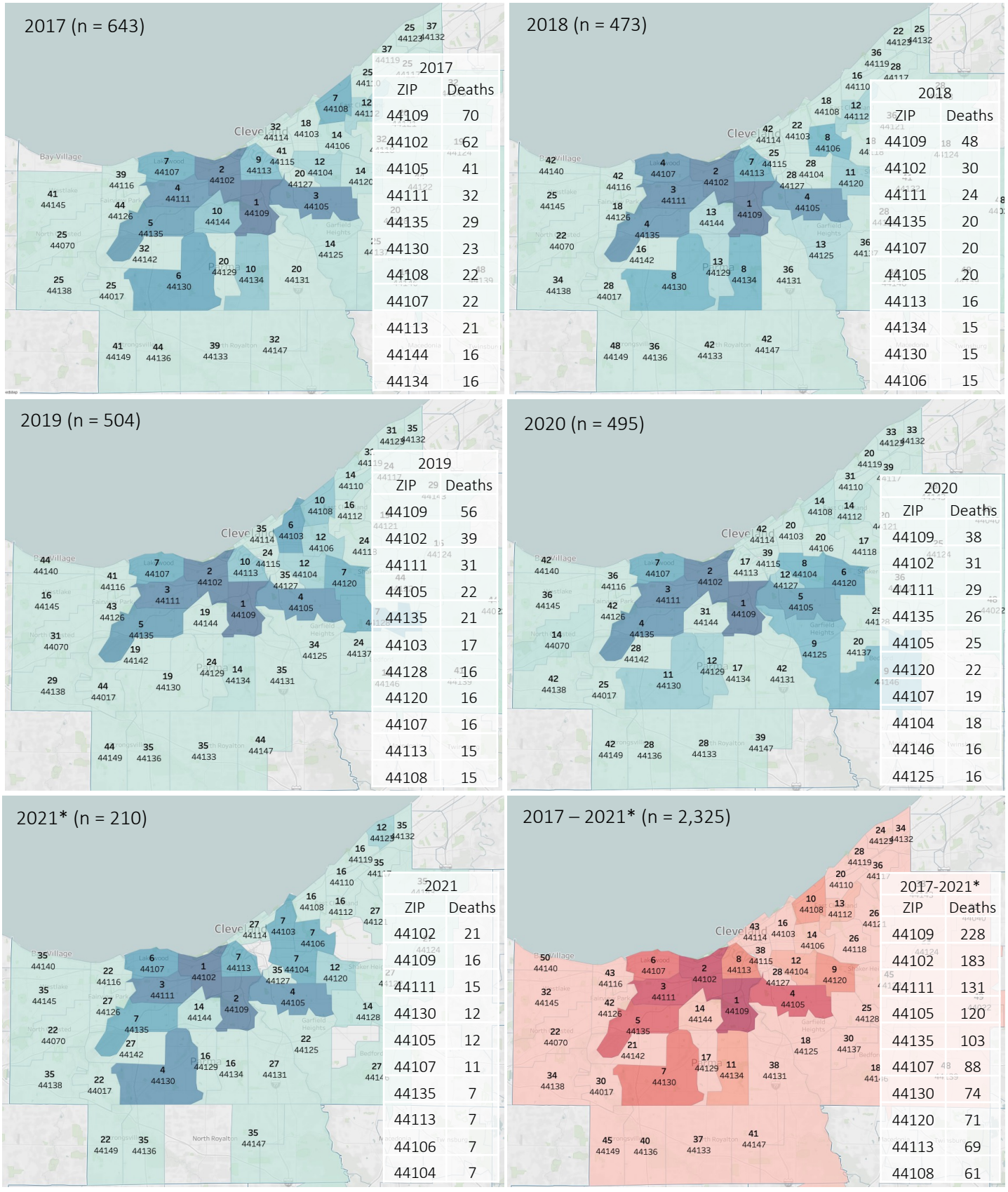


*2021 decedent data includes approximately January to June overdose deaths

Analysis by ZIP Code

The following maps (Figure 1) provide the overall rank of each ZIP code by the total number of overdose deaths in the ZIP code for that year. The location is based on the decedent's residence, not the overdose incident location.

Figure 1: Cuyahoga County ZIP Codes Ranked by Overdose Death, 2017-2021* (n = 2,325).
Labels are rank and ZIP code. Darker shading indicates higher number of deaths



2017

ZIP	Deaths
44109	70
44102	62
44105	41
44111	32
44135	29
44130	23
44108	22
44107	22
44113	21
44144	16
44134	16

2018

ZIP	Deaths
44109	48
44102	30
44111	24
44135	20
44107	20
44105	20
44113	16
44134	15
44130	15
44106	15

2019

ZIP	Deaths
44109	56
44102	39
44111	31
44105	22
44135	21
44103	17
44128	16
44120	16
44107	16
44113	15
44108	15

2020

ZIP	Deaths
44109	38
44102	31
44111	29
44135	26
44105	25
44120	22
44107	19
44104	18
44146	16
44125	16

2021

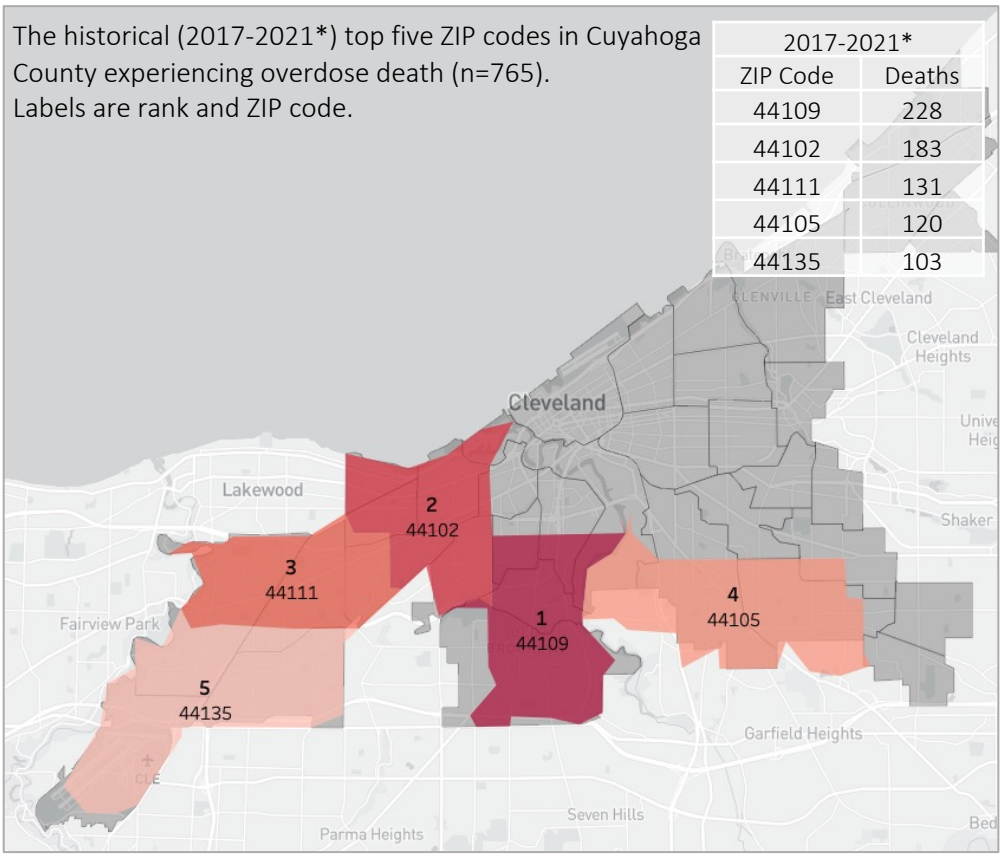
ZIP	Deaths
44102	21
44109	16
44111	15
44130	12
44105	12
44107	11
44135	7
44113	7
44106	7
44104	7

2017-2021*

ZIP	Deaths
44109	228
44102	183
44111	131
44105	120
44135	103
44107	88
44130	74
44120	71
44113	69
44108	61

*2021 decedent data includes approximately January to June overdose deaths

Figure 2: Top Five ZIP Codes in Cuyahoga County Experiencing Overdose Death, 2017-2021*

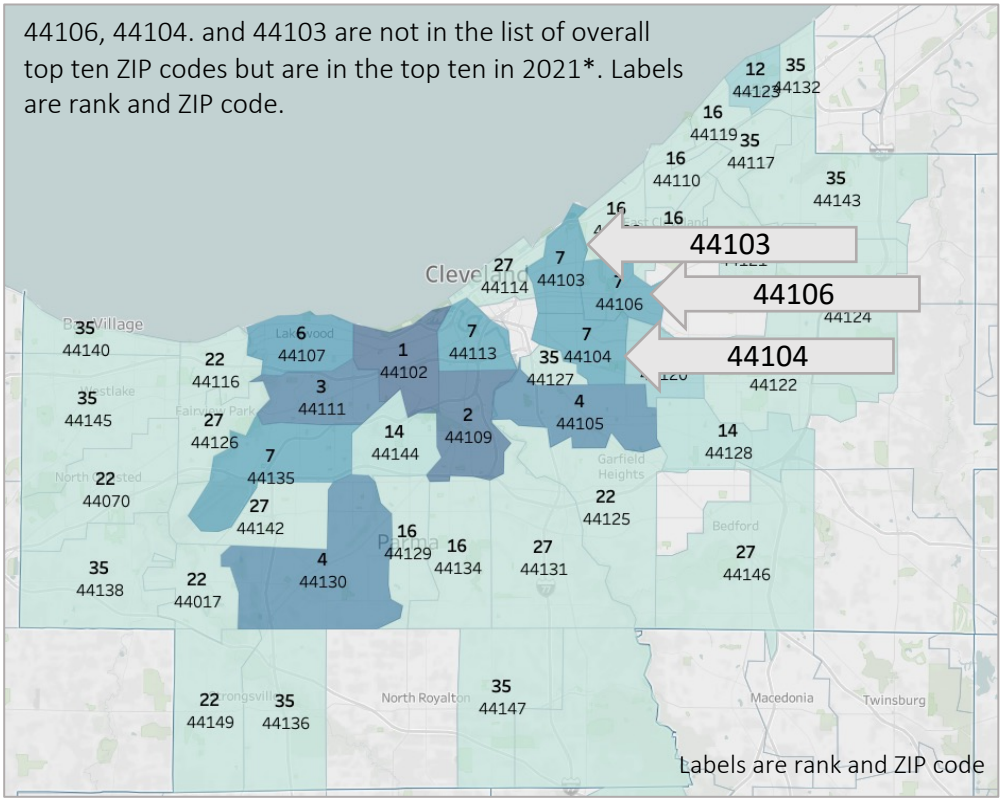


*2021 decedent data includes approximately January to June overdose deaths

Historically (2017-2021*), the ZIP codes 44109, 44102, 44111, 44105, and 44135 have accounted for the most drug-related overdose deaths and are primarily located in the western half of the City of Cleveland (see Figure 2).

Figure 3 & Table 1 below identify recent changes in the top ZIP codes experiencing drug-related deaths. The ZIP codes that don't appear in the overall top-ten for deaths from 2017 to 2021 are 44106, 44104, and 44103. These three ZIP codes could be considered for specific activities in 2022.

Figure 3: Three Potential Target ZIP Codes for 2022



*2021 decedent data includes approximately January to June overdose deaths

Table 1: 2021 ZIP Codes Experiencing 4+ Overdose Deaths (n=168)

ZIP Code	Deaths
44102	21
44109	16
44111	15
44130	12
44105	12
44107	11
44135	7
44113	7
44106	7
44104	7
44103	7
44123	6
44120	6
44144	5
44128	5
44134	4
44129	4
44119	4
44112	4
44110	4
44108	4

Potential Target ZIP Codes Based on Increased Deaths

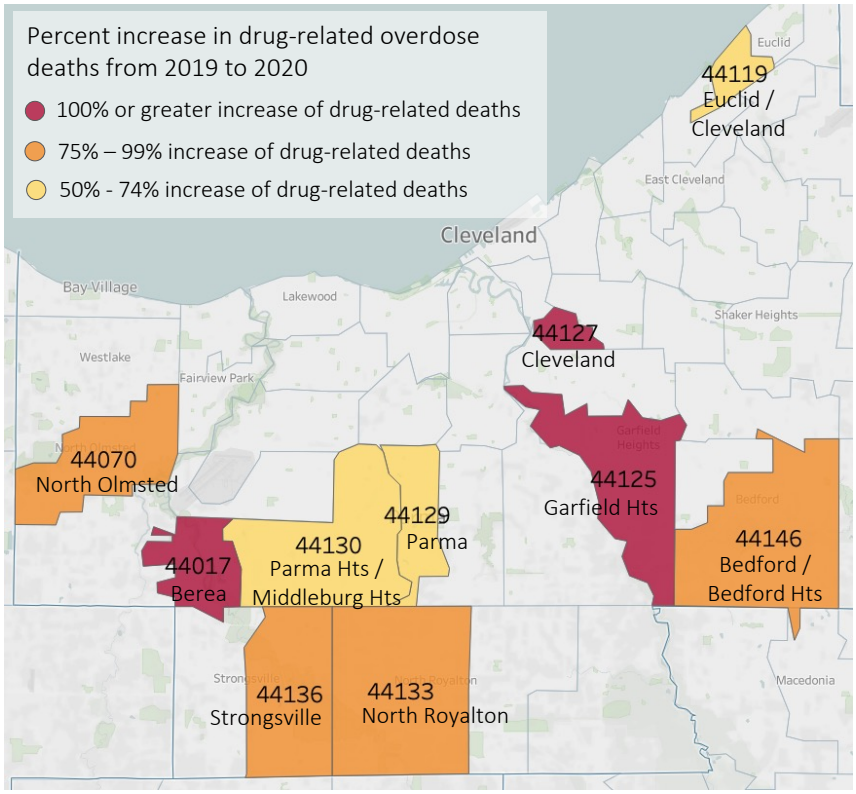
Figure 4 and Table 2 identify Cuyahoga County ZIP codes that experienced an increase in drug-related overdose deaths from 2019 to 2020. Table 2 identifies all ZIP codes in the county that experienced at least five overdose deaths in 2020 and an increase from the previous year. Figure 4 highlights ZIP codes experiencing increases in overdose deaths greater than 50% from 2019 to 2020 with a minimum of five overdose deaths in 2020.

Table 2: 2017-2021* Overdose Deaths by ZIP Code with Percent Change

ZIP Code		2017	2018	2019	2020	2021*
44017	# of deaths	8	6	1	**8**	3
	% change		-25%	-83%	**700%**	-
44125	# of deaths	13	12	5	**16**	3
	% change		-8%	-58%	**220%**	-
44127	# of deaths	9	6	4	**12**	1
	% change		-33%	-33%	**200%**	-
44070	# of deaths	8	8	6	**11**	3
	% change		0%	-25%	**83%**	-
44146	# of deaths	13	5	9	**16**	2
	% change		-62%	80%	**78%**	-
44136	# of deaths	3	4	4	**7**	1
	% change		33%	0%	**75%**	-
44133	# of deaths	5	2	4	**7**	0
	% change		-60%	100%	**75%**	-
44130	# of deaths	23	15	9	**15**	12
	% change		-35%	-40%	**67%**	-
44129	# of deaths	9	12	8	**12**	4
	% change		33%	-33%	**50%**	-
44119	# of deaths	6	4	6	**9**	4
	% change		-33%	50%	**50%**	-
44120	# of deaths	13	14	16	**22**	6
	% change		8%	14%	**38%**	-
44104	# of deaths	14	6	14	**18**	7
	% change		-57%	133%	**29%**	-
44132	# of deaths	6	7	4	**5**	1
	% change		17%	-43%	**25%**	-
44118	# of deaths	7	9	8	**10**	0
	% change		29%	-11%	**25%**	-
44135	# of deaths	29	20	21	**26**	7
	% change		-31%	5%	**24%**	-
44107	# of deaths	22	20	16	**19**	11
	% change		-9%	-20%	**19%**	-
44105	# of deaths	41	20	22	**25**	12
	% change		-51%	10%	**14%**	-
44137	# of deaths	8	4	8	**9**	0
	% change		-50%	100%	**13%**	-
44112	# of deaths	14	13	10	**11**	4
	% change		-7%	-23%	**10%**	-

Note: This table includes only ZIP codes in which a) at least five residents experienced a drug-related overdose death in 2020, and b) there was an increase in in overdose deaths from 2019 to 2020.
*2021 decedent data includes approximately January to June overdose deaths.

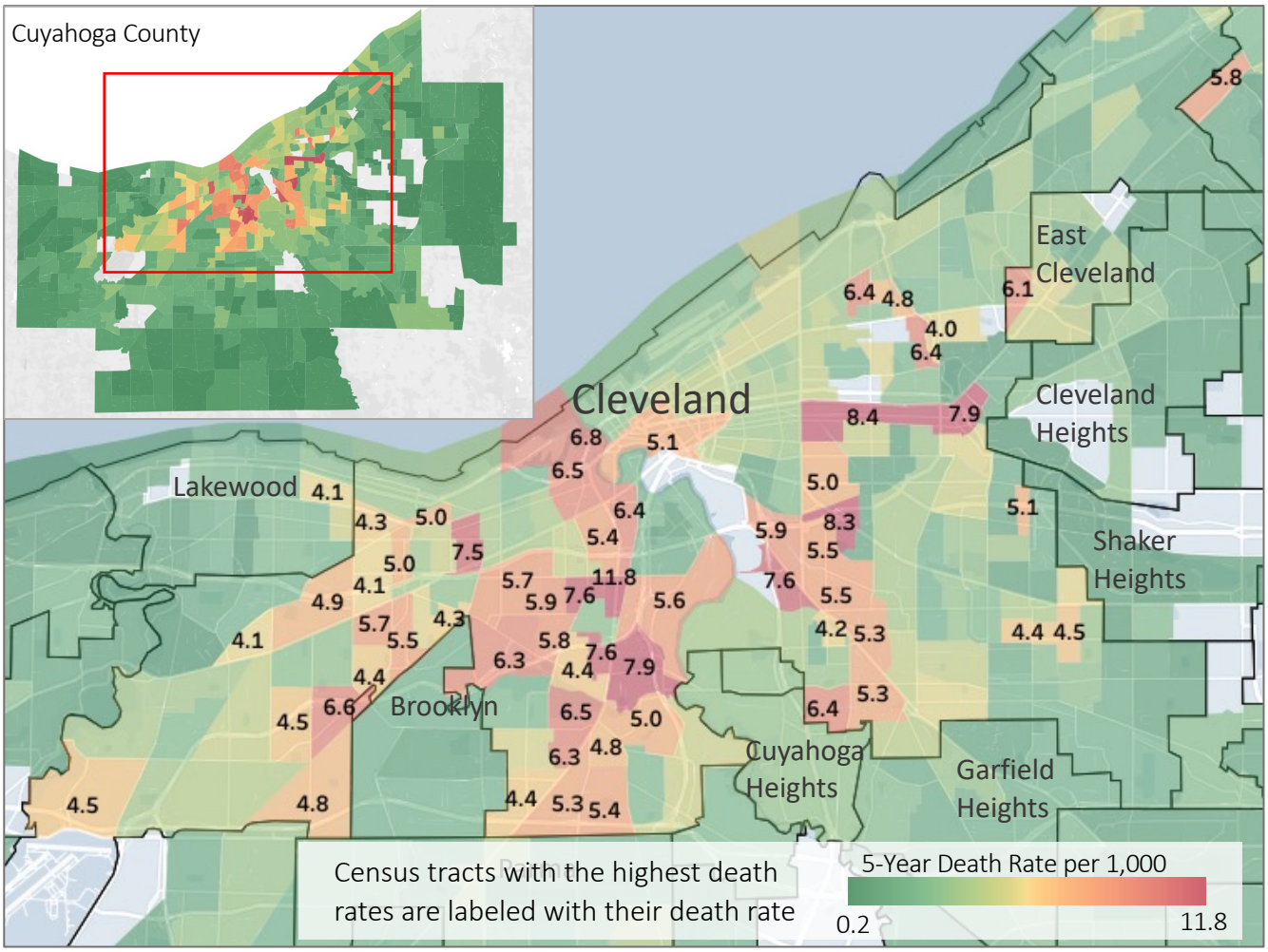
Figure 4: Select ZIP Codes Experiencing Increased Overdose Deaths from 2019-2020



Analysis by Census Tract

The maps in this section analyze areas of high burden based on the *rate* of overdose deaths occurring in census tracts. Census tracts are a geographic area smaller than ZIP codes. Thus, the value of performing this analysis at the census tract level includes the ability to: (a) focus on small "target" areas, and (b) use associated data available from the U.S. Census Bureau to provide some understanding of the local population of the tracts, such as estimated population size, racial demographics, income and poverty levels.

Figure 5: In Cuyahoga County Overdose Death Rates are Highest in the City of Cleveland (2017-2021*)

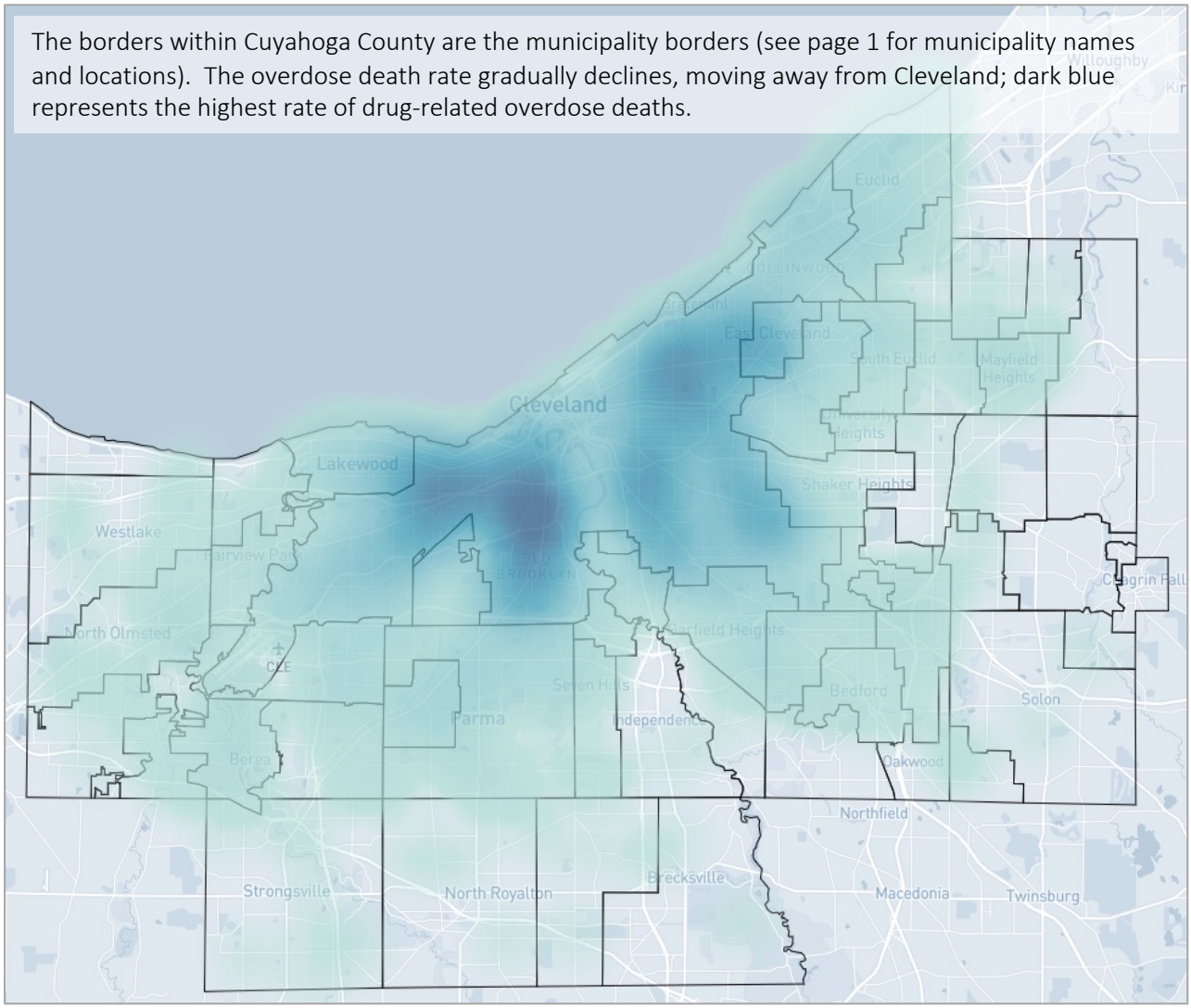


*2021 decedent data includes approximately January to June overdose deaths

The crude death rate used for the census tract information displayed in the above map was calculated using all drug-related overdose deaths for Cuyahoga County residents for the reporting period and the total population reported for the 2010 Census. Death rates are per 1,000 population.

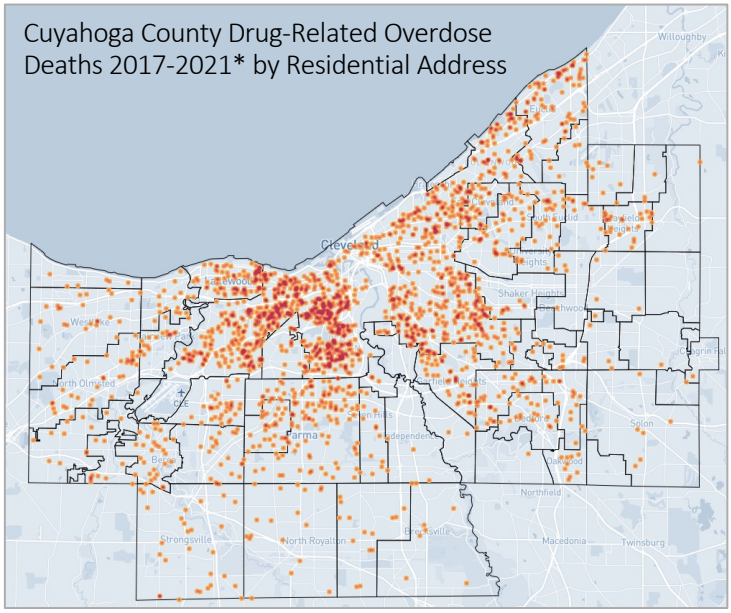
The cluster of red and orange (highest rates) in Figure 5 range in rate from approximately 4 deaths per 1,000 population for 5 years to 11.8. Cleveland experienced the highest death rates for drug-related overdose in Cuyahoga County and represents the epicenter of overdose death rates. The density map on the next page (Figure 6) visualizes this well.

Figure 6: Density Map of Drug Overdose Death Rates by Municipality, 2017-2021*



*2021 decedent data includes approximately January to June overdose deaths

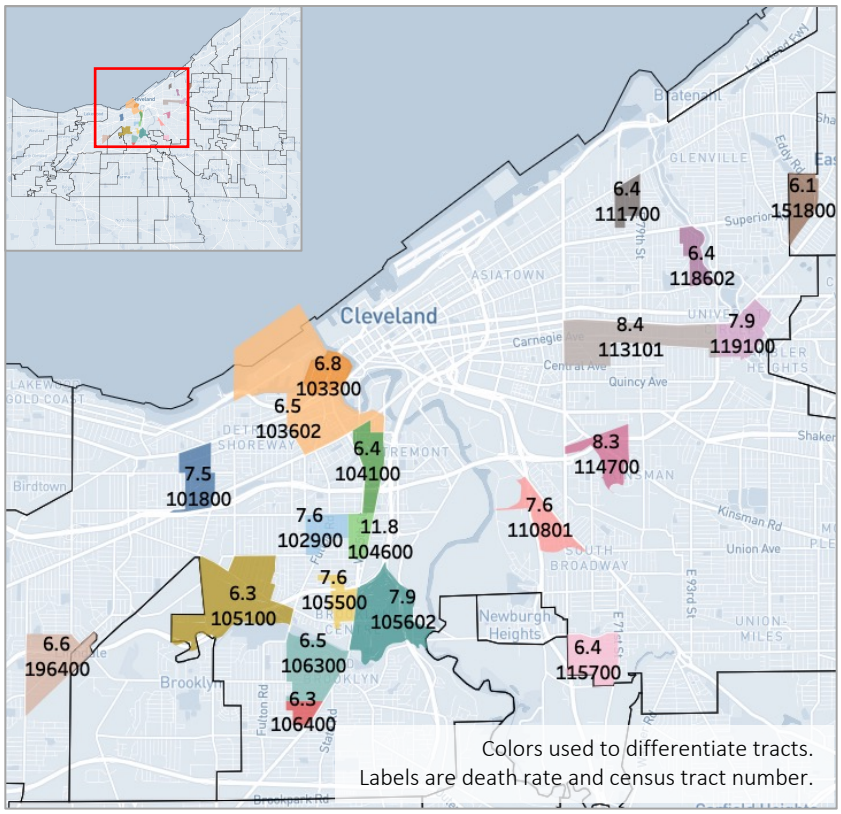
Figure 7: Point Map of Drug Overdose Deaths by Residential Address, 2017-2021*



This point map displays a similar picture of drug-related overdose deaths in Cuyahoga County from 2017 to approximately June 2021 when compared to the density map above. The point locations represent the decedents residential address, not the incident location. The west side of the City of Cleveland accounts for approximately 30% of all overdose deaths in the County during this period (approximately 730 of 2,325)

*2021 decedent data includes approximately January to June overdose deaths

Figure 8: Top 20 Cuyahoga County Census Tracts by Overdose Death Rate, 2017 – Jun 2021*



*2021 decedent data includes approximately January to June overdose deaths

Figure 8 shows the top 20 census tracts by overdose death rate; all are in the City of Cleveland other than one which is in East Cleveland (151800). The top ZIP codes for the number of overdose deaths are primarily located on the city's west side, but analysis of rates by census tract shows that some of the highest rates appear east of the Cuyahoga River.

Table 3 provides several data points accessed through the ACS Planning Database. The estimates are associated with the specific census tract in which the decedent lived. These estimates are used only to provide some context for the overall environment in which persons experiencing drug-related overdose lived. Agencies conducting outreach may better prepare for activities with a better understanding of the population they are engaging; ACS estimates provide this information.

Table 3: Top 20 Census Tracts by Overdose Death Rate with ACS Estimates. Death rate and total overdose deaths are for all incidents from 2017 through ~ June 2021. Population totals are from the U.S. Census 2010.

Census Tract	Death Rate per 1,000	Death Count	Population	% Un-employed	% Below Poverty	% Public Assistance	% Black	% Hispanic	% White	Med HH Income
104600	11.8	14	1,190	25.2%	48.9%	7.6%	23.5%	50.5%	24.4%	$17K
113101	8.4	8	956	18.7%	34.7%	4.6%	80.2%	7.3%	12.5%	$14K
114700	8.3	2*	240*	23.3%	65.0%	3.5%	100.0%	0.0%*	0.0%*	$17K
119100	7.9	1*	127*	0.0%*	58.1%	0.0%*	21.2%	0.0%*	41.4%	$0K*
105602	7.9	17	2,163	14.3%	38.1%	4.7%	30.1%	34.6%	33.1%	$25K
102900	7.6	15	1,961	16.2%	37.4%	4.4%	13.3%	46.7%	38.9%	$35K
110801	7.6	10	1,323	16.6%	39.5%	2.8%	32.4%	14.7%	51.3%	$26K
105500	7.6	14	1,854	15.9%	22.9%	8.4%	11.8%	49.7%	34.5%	$34K
101800	7.5	22	2,942	16.1%	50.0%	8.7%	31.5%	22.4%	42.7%	$24K
103300	6.8	15	2,222	19.6%	52.9%	8.2%	62.1%	5.8%	24.3%	$15K
196400	6.6	18	2,726	19.7%	42.0%	5.8%	55.9%	21.8%	18.6%	$21K
106300	6.5	18	2,764	7.1%	22.5%	9.4%	8.9%	17.5%	69.4%	$33K
103602	6.5	21	3,254	7.2%	23.8%	5.2%	17.2%	11.7%	65.9%	$53K
118602	6.4	13	2,024	11.3%	46.4%	8.6%	88.2%	1.3%	4.5%	$16K
111700	6.4	9	1,404	23.3%	43.9%	10.4%	71.5%	13.8%	10.5%	$26K
104100	6.4	7	1,095	13.5%	32.2%	2.7%	10.5%	26.6%	58.3%	$39K
115700	6.4	9	1,416	9.4%	37.2%	9.5%	53.9%	7.0%	36.5%	$26K
105100	6.3	24	3,790	21.3%	35.9%	5.8%	7.7%	37.5%	46.7%	$31K
106400	6.3	7	1,115	11.0%	19.7%	1.7%	6.7%	26.8%	63.4%	$34K
151800	6.1	11	1,789	25.9%	37.1%	9.5%	94.3%	0.5%	0.5%	$24K

*Some estimates are not published due to the various methods or restrictions applied to ACS data. These restrictions are in place to limit disclosure of information about respondents and to reduce the number of estimates with unacceptable levels of statistical reliability. Also, see the limitations section at the end of this document for brief discussion of the utilization and limitation of small numbers or low counts.
For more information on data suppression, see https://www.census.gov/programs-surveys/acs/technical-documentation/data-suppression.html

Methodology

Drug-related overdose death data from January 2017 through approximately June 2021 were used for this analysis, specifically the residential addresses of persons reporting to live in Cuyahoga County at the time of death. The data were provided by the Cuyahoga County Medical Examiner's Office (CCMEO). All drug-related overdose deaths were geocoded (n=2,645) and spatially joined to their corresponding census tract based on the US Census Bureau's TIGER/Line shape files (2017). After spatial joining, only Cuyahoga County residential addresses were retained for the analyses (n=2,325). The crude death rate used in this analysis utilized a) the total number of deaths per census tract that occurred from January 2017 to approximately June 2021, and b) the population totals for each tract based on the 2010 Census.

ZIP code analysis was based solely on the count of deaths for the ZIP code based on the reported address of the decedent. Rates were not calculated for ZIP codes.

Estimates provided in Table 3 were accessed through the 2015-2019 ACS Planning Database; these data are available through the US Census Bureau. Population totals for census tracts were based on 2010 census data.

All data merging and geospatial analyses were performed in Tableau® using map layers accessed through Cuyahoga Counties Open Data Portal, Cleveland Planning Commission Open Data Portal, and the US Census Bureau's TIGER/Line shape files.

Limitations

The residential addresses reported to the CCMEO for persons experiencing overdose death are only one source of geographic information. Overdose incident location can provide additional insight, both for fatal and non-fatal incidents. However, county-wide public safety incident response data is not yet available for this analysis, although some ad hoc requests and analyses have been conducted to support harm reduction activities. Additionally, incident location for persons experiencing overdose death is not as complete as residential address data provided by the CCMEO. As these data become available, we hope to provide additional geospatial analysis to inform our collaborative response across Cuyahoga County.

This work includes small numbers (low counts) of overdose deaths in low population census tracts. Analyzing health outcomes in small subgroups is valuable, but this limitation and statistical concern must be considered when planning activities or responses.

Suggested Citation: McMaster, R., Rinderle, D. (2022). *Geospatial Analysis of Drug-Related Overdose Deaths in Cuyahoga County, OH: Analysis of ZIP Codes by Count and Census Tracts by Rate 2017-2021.* Begun Center for Violence Prevention Research and Education, Jack, Joseph and Morton Mandel School of Applied Social Sciences, Case Western Reserve University. https://www.ccbh.net/overdose-data-dashboard/

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