

Comprehensive Spatiotemporal Analysis of Opioid Poisoning Mortality in Ohio from 2010 to 2016

Supplementary Material

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Category	Group	Significant?	Mean1	Mean2	Difference	SE of difference	t ratio	Adjusted P Value
Age	Under 5	Yes	6.11	0.13	5.99	0.07	90.72	<0.000000000000001
	5 to 17	Yes	17.24	0.29	16.96	0.14	118.10	<0.000000000000001
	18 to 24	Yes	9.53	8.64	0.89	0.25	3.54	0.008147083
	25 to 44	Yes	25.13	51.27	-26.14	1.40	18.72	1.20224E-09
	45 to 54	Yes	14.63	25.90	-11.27	1.65	6.85	5.34781E-05
	55 to 64	No	12.84	12.17	0.67	0.48	1.39	0.190856629
	65 to 74	Yes	7.79	1.40	6.39	0.24	27.00	2.045E-11
	Over 75	Yes	6.74	0.19	6.56	0.07	98.61	<0.000000000000001
Race	White	Yes	84.71	91.17	-6.46	0.28	23.31	1.15872E-10
	Black or African American	Yes	12.43	7.91	4.51	0.29	15.41	1.13898E-08
	American Indian or Alaska Native	Yes	0.20	0.09	0.11	0.01	8.00	1.12797E-05
	Asian	Yes	1.79	0.17	1.61	0.06	27.68	1.8327E-11
	Native Hawaiian or Other Pacific Islander	No	0.00	0.01	-0.01	0.01	1.00	0.337049058
	Other	No	0.86	0.69	0.17	0.07	2.58	0.047787177
Sex	Male	Yes	48.87	66.76	-17.89	0.59	30.41	2.007E-12
	Female	Yes	51.13	33.24	17.89	0.59	30.41	2.007E-12

Table S 1. Detailed results of the statistical tests for investigating disparities between population groups.

Year	2010	2011	2012	2013	2014	2015	2016
Representing with County for top 10 Tract by LISA	Hamilton	Hamilton	Hamilton	Cuyahoga	Butler	Butler	Summit
	Franklin	Hamilton	Cuyahoga	Butler	Butler	Butler	Montgomery
	Franklin	Cuyahoga	Montgomery	Butler	Butler	Hamilton	Cuyahoga
	Cuyahoga	Hamilton	Franklin	Cuyahoga	Hamilton	Butler	Montgomery
	Franklin	Hamilton	Montgomery	Cuyahoga	Butler	Clark	Summit
	Ross	Franklin	Cuyahoga	Butler	Butler	Montgomery	Summit
	Franklin	Franklin	Cuyahoga	Cuyahoga	Hamilton	Hamilton	Montgomery
	Franklin	Cuyahoga	Hamilton	Cuyahoga	Butler	Clark	Summit
Most Popular County (how Popular) (near city)	Franklin	Hamilton	Cuyahoga	Cuyahoga	Butler	Butler	Summit
	County: 7/10	County: 4/10	County: 4/10	County: 7/10	County: 8/10	County: 5/10	County: 5/10
	(in Columbus)	(in Cincinnati)	(in Cleveland)	(in Cleveland)	(in Cincinnati)	(in Cincinnati)	(in Akron)
	22.713	10.792	15.508	15.683	33.174	26.137	19.071
	7.835	6.930	15.091	13.258	28.665	17.406	18.977
	5.897	6.305	15.000	12.516	13.559	17.028	14.672
	5.316	5.288	13.030	11.431	11.540	16.645	13.514
	5.052	5.068	11.734	10.880	11.525	13.854	12.387
LISA_I (P-value < 0.05)	4.521	4.610	11.374	10.306	11.471	13.344	11.337
	4.203	4.243	10.623	7.317	11.382	11.492	11.096
	3.846	3.745	9.057	7.185	11.199	9.197	10.254
	3.716	3.654	8.903	7.074	6.632	8.781	9.744
	3.447	3.499	8.203	6.606	6.565	8.055	9.102

Table S 2. List of top 10 census tracts and their corresponding county by statistics value from 2010 to 2016. Three large cities: Cleveland, Columbus and Cincinnati, experienced more clustering of opioid poisoning than any other regions.

Representative terms (from health condition)

Acute Respiratory Failure
Alcohol Abuse
Anoxic Encephalopathy
Anxiety
Bipolar Disorder
Cardiomegaly
Cardiovascular Disease
Chronic Back Pain
Chronic Obstructive Lung Disease
Chronic Obstructive Pulmonary Disease
Chronic Urinary Tract Infections, Bi-Polar Disorder, Multiple Abdominal Surgeries, Psoriasis
Cirrhosis
Cocaine Abuse
Coronary Artery Disease
Depression
Diabetes Mellitus
Dilated Cardiomyopathy
Drug Abuse
Emphysema
Exposure To A Cold Environment
Extensive Pulmonary Thromboembolism With Polarizable Foreign Material Consistent With Recent And Remote Iv Drug Abuse
Fatty Liver
Hepatitis C
Morbid Obesity
Pneumonia
Pulmonary Edema
Seizure Disorder, Drug And Alcohol Abuse, Remote Traumatic Brain Injury
Sleep Apnea
Thrombosis Of Right Common Iliac Artery With Attached, Occlusive Thrombus Of Greenfield Type Filter Of Inferior Vena Cava
Tobacco Smoke Exposure-Related Lung Disease

Table S 3. Results of clustering health conditions. We set the number of clusters to 70 through several empirical experiments

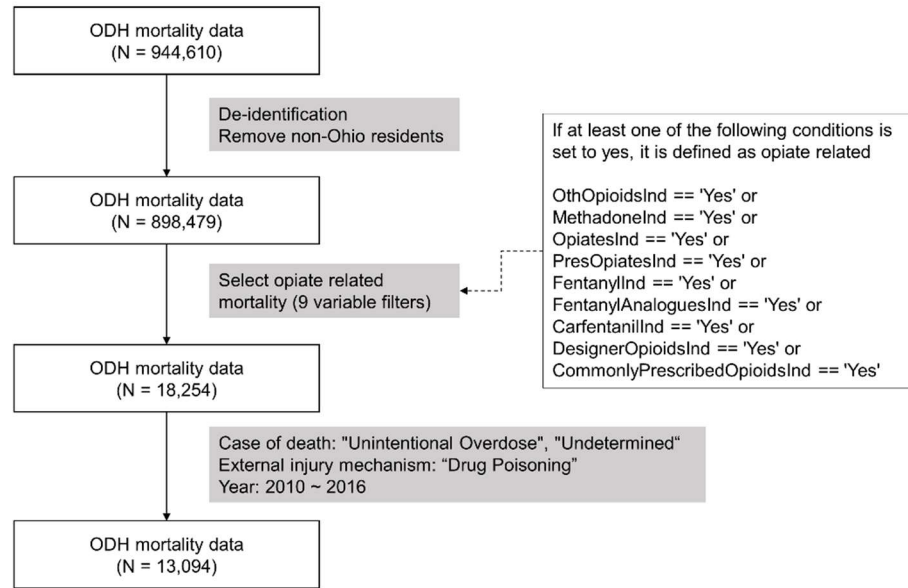


Figure S1. The process of data refinement. From the entire ODH mortality data, we finally extracted 13,094 records related with opioid poisoning.

Analysis for frequent cause of death and its related health condition

Input

decedent	Cause of Death (ICD-10)	Health Condition (Literal form)
P1	X42 E668 I119 T401 T402 T405 T509	HYPERTENSIVE ATHEROSCLEROTIC CARDIOVASCULAR DISEASE. SEVERE MORBID OBESITY.
P2	X44 T402 T424 T509	Obesity With Large Heart And Large Liver
P3	X42 E668 F209 I119 M545 R51 T404 T509	Schizophrenia, Chronic Low Back Pain, Hypertensive Cardiovascular Disease, Morbid Obesity
...	...	...

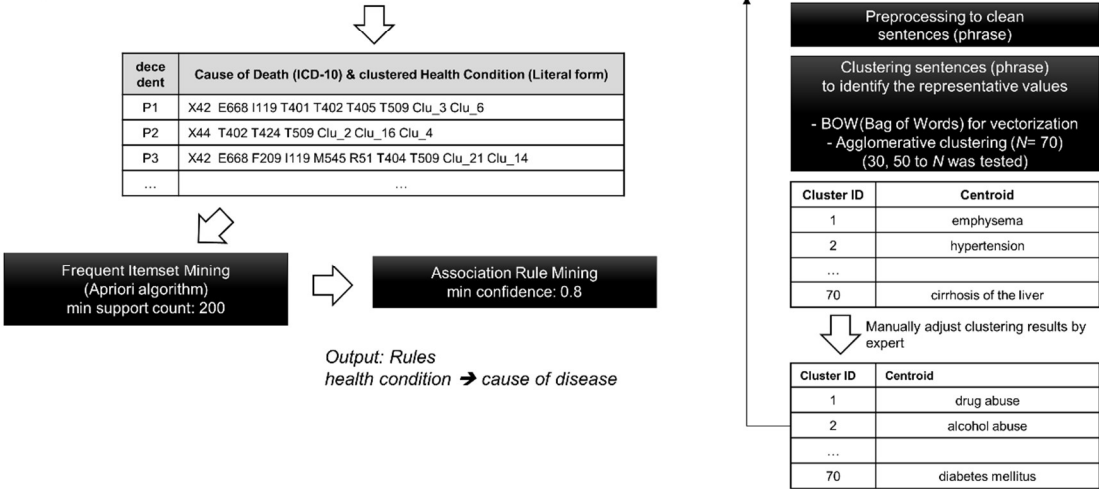


Figure S2. Entire workflow of co-occurrence analysis with the list of cause of death and corresponding health condition.