



# HAMILTON COUNTY **PUBLIC HEALTH**

PREVENT. PROMOTE. PROTECT.

## FENTANYL

THE EMERGING PUBLIC  
HEALTH THREAT IN  
HAMILTON COUNTY

1/19/2016 ADDENDUM

Kevin Strobino, MPH  
Epidemiologist - Hamilton County Public Health

---

# **OVERVIEW**

This report serves as an addendum to *Fentanyl: The Emerging Public Health Threat in Hamilton County*, published 10/26/2015. The purpose of this addendum is to provide updated information and additional analysis on the ongoing fentanyl-related overdose epidemic in Hamilton County. In particular, the goal of this updated analysis was to provide improved information on drug combinations involved in fentanyl-related overdose deaths. In addition, spatial analysis of fentanyl-related deaths was performed using geographic information system (GIS) software in order to identify potential geographic clusters within Hamilton County.

## **METHODS**

Data for the 10/26/2015 report were provided by the Ohio Department of Health (ODH) Bureau of Vital Statistics on 9/30/2015. That report focused on fentanyl deaths in comparison to deaths related to other opioids. The present report is based on updated data provided by ODH and examines *only* fentanyl related deaths. This data was obtained on 1/13/2016 and includes deaths through November of 2015; it is expected that there will be more fentanyl-related deaths in Ohio than what was found in this analysis. 2015 data is preliminary and is subject to misclassification error as deaths take several months to be fully processed. Furthermore, whereas the original report only analyzed Hamilton County, the present report additionally considers all fentanyl-related deaths in Ohio. Deaths were identified by appearance of the word 'fentanyl' somewhere on the death certificate free text fields - either 'cause of death' or 'other condition.' Inclusion of all Ohio deaths allowed for comparison between Hamilton County and the rest of Ohio's fentanyl-related overdose deaths. There were 1,442 Ohio deaths identified in this manner.

Deaths were reviewed to ensure that they were indeed drug overdose deaths, and other drugs listed on death certificates were identified. Marijuana was not included in analysis because it is rarely indicated on the death certificate. Of the 1,442 deaths identified, 1,412 were identified as fentanyl-related drug overdose deaths upon review, 224 of which were Hamilton County residents. All drugs involved in each death per the death certificate free text fields were identified.

For comparison, all Ohio deaths and deaths in other metropolitan Ohio counties were categorized. Other metropolitan Ohio counties included Cuyahoga, Franklin and Montgomery counties, which respectively incorporate the cities of Cleveland, Columbus, and Dayton.

Preliminary analysis indicated that fentanyl-related deaths fell fairly evenly into four categories:

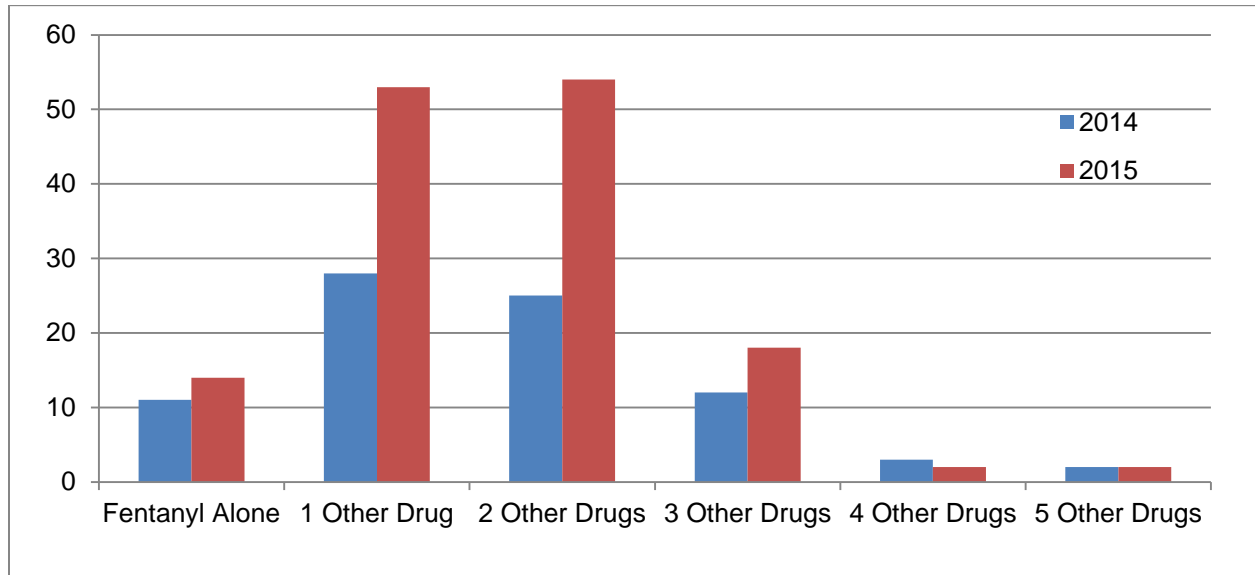
- Deaths that involved neither heroin nor cocaine
- Deaths that involved heroin, but not cocaine
- Deaths that involved cocaine, but not heroin
- Deaths that involved both heroin and cocaine

Therefore, these four groups were selected as analysis categories.

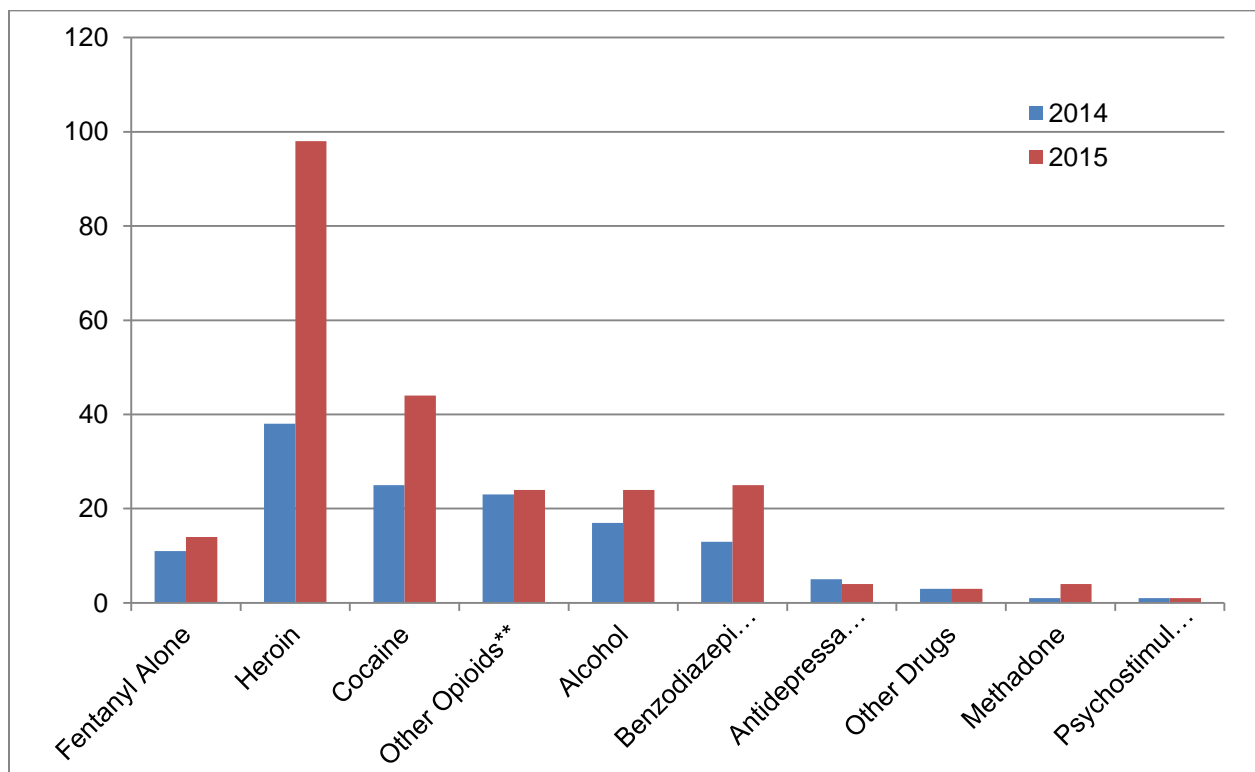
Analysis was carried out using SAS® version 9.3 of the SAS System for Windows, Copyright © 2010 SAS Institute Inc., Cary, NC. Maps based on analysis were generated using ArcGIS® version 10.3.

# UPDATE

UPDATE to Fentanyl Report Figure 4. Count of drugs involved for overdose deaths involving fentanyl; Hamilton County, 2014-2015 (n=224).



UPDATE to Fentanyl Report Figure 5. Drug combinations involved in overdose deaths involving fentanyl; Hamilton County, 2014-2015 (n=224).\*



\*Columns will add to more than 224 due to combinations of more than 2 drugs implicated in some overdose deaths.

\*\*Other opioids than fentanyl or heroin

# **HEROIN TESTING**

From the DEA's *2015 National Drug Threat Assessment Summary*:

"Heroin deaths are often undercounted because of variations in state reporting procedures, and because heroin metabolizes into morphine very quickly in the body, making it difficult to determine the presence of heroin. Many medical examiners (MEs) are reluctant to characterize a death as heroin-related without the presence of 6-monoacetylmorphine (6-MAM), a metabolite unique to heroin, but which quickly metabolizes into morphine. Thus many heroin deaths are reported as morphine-related deaths. Further, there is no standardized system for reporting drug-related deaths in the United States. The manner of collecting and reporting death data varies with each ME and coroner."<sup>1</sup>

## **Hamilton County Testing**

6-MAM can be detected in three bodily fluids: blood, urine, and vitreous fluid (fluid between lens and retina of the eyeball). 6-MAM metabolizes very quickly into morphine in blood, and Hamilton County's Coroners have the most success in finding 6-MAM in urine. Therefore, urine is typically tested first and if 6-MAM is not detected, vitreous fluid and/or blood are tested in succession to ensure thoroughness. Even with these measures, 6-MAM is often not identified in instances when heroin was likely used. Testing results are considered along with circumstances of death to determine if death will be classified as due to heroin or morphine.

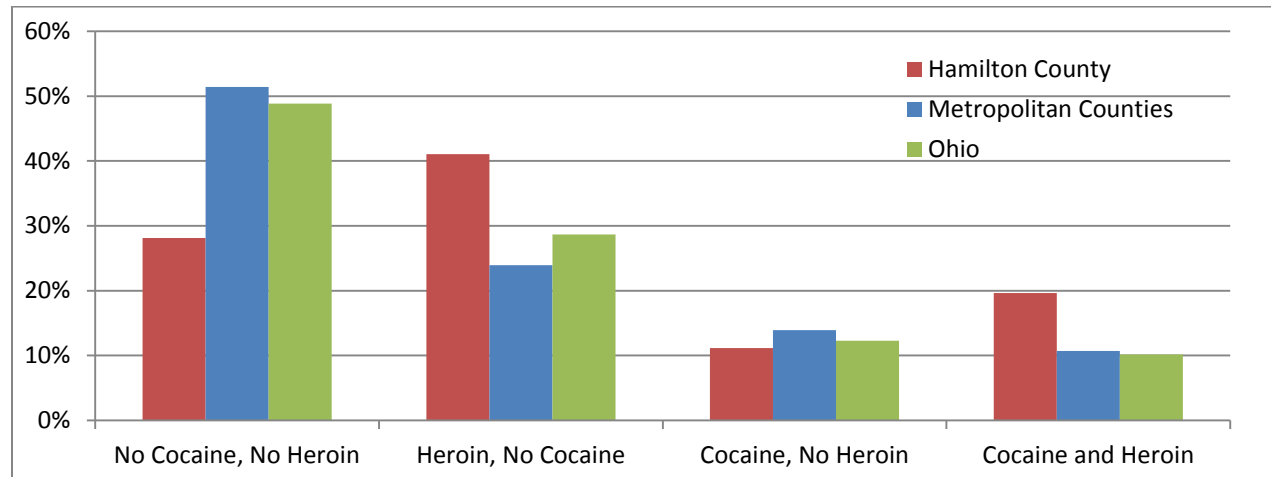
Methodology for determining presence of heroin in autopsies varies depending on office. However, methods are fairly consistent across coroner's offices throughout Ohio. Heroin usage rates across regions therefore likely reflect true differences, and not differences in testing.

---

<sup>1</sup> U.S. Department of Justice; Drug Enforcement Administration (DEA), Prepared by the DEA Strategic Intelligence Section, October 2015. *2015 National Drug Threat Assessment Summary*.

## RESULTS

Figure 6. Combination of heroin and/or cocaine implicated in overdose deaths involving fentanyl; Ohio, 2014-2015.\*



\*Metropolitan Counties represent Cuyahoga, Franklin, and Montgomery County grouped together. Fentanyl-related overdose deaths for Hamilton County, Metropolitan Counties, and Ohio totaled 224, 280, and 1,413 respectively.

Hamilton County generally had more heroin use in combination with fentanyl than the rest of Ohio. About 61 percent of fentanyl overdoses in Hamilton County involved heroin, compared with about 35 percent in other metropolitan areas. Combined cocaine use was more consistent with the rest of Ohio; about 31 percent in Hamilton County, compared to about 25 percent for all of Ohio.

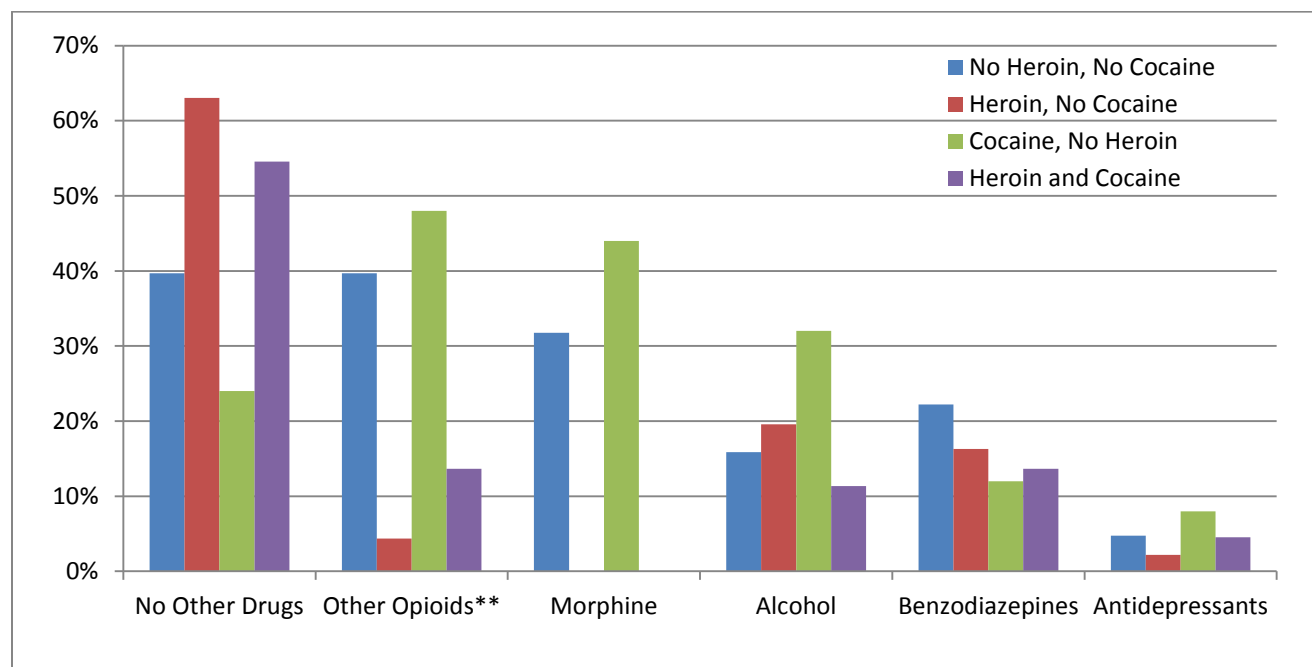
A chi square test compares observed counts across groups to what would be expected if there were no difference in group rates. At the  $\alpha=0.05$  level, the common level chosen, a p-value < 0.05 is significant, which indicates that it is unlikely the observed difference across groups occurred by chance. Chi-Square tests:

	Heroin (n,%)	No Heroin (n,%)	Chi-Square p-Value
<b>Hamilton County (n=224)</b>	136 (60.7)	88 (39.3)	-
<b>Metropolitan OH Counties (n=280)</b>	97 (34.6)	183 (65.4)	<0.001

Note: prevalence of morphine was fairly consistent with these numbers (involved in 31 fentanyl-related ODs in Hamilton County, 21 ODs in other Ohio metropolitan counties), indicating that difference in rate of heroin use is not due to major discrepancies in testing.

	Cocaine (n,%)	No Cocaine (n,%)	Chi-Square p-Value
<b>Hamilton County (n=224)</b>	69 (30.8)	155 (69.2)	-
<b>Metropolitan OH Counties (n=280)</b>	69 (24.6)	211 (75.4)	0.12

Figure 7. Percent of overdose deaths involving fentanyl that also included specific drugs in combination with heroin and/or cocaine; Hamilton County, 2014-2015.\*



\*Columns will add to more than 100% due to combinations of more than two drugs other than fentanyl, heroin, or cocaine implicated in some overdose deaths.

\*\*Includes morphine

#### *No Heroin, No Cocaine (n=63)*

- Forty percent of this group overdosed on fentanyl alone. Another 40 percent were found to have used other opioids as well, most of which were morphine (32 percent). Over one-fifth of this group had benzodiazepines detected in their system – the highest proportion of benzodiazepine use among the four major drug groups.

#### *Heroin, No Cocaine (n=92)*

- The majority of overdoses that involved heroin and fentanyl only involved the two drugs, about two thirds of the time. About 20 percent used alcohol, and about 16 percent used benzodiazepines.

#### *Cocaine, No Heroin (n=25)*

- This was the smallest drug combination subgroup, representing about 11 percent of all fentanyl-related overdoses. Half of these deaths involved some other opioid, identified as morphine in 11 of 12 cases. Alcohol was involved in about 32 percent of these deaths, the largest proportion for any of the four major drug groups.

#### *Heroin and Cocaine (n=44)*

- Most users of cocaine, heroin, and fentanyl did not use other drugs. When other drugs were involved, they were an assortment of other opioids, alcohol, benzodiazepines, and/or antidepressants.

Table 4. Demographics within most common groups of drugs combined with fentanyl in overdose deaths; Hamilton County, 2014-2015.\*

	Drugs Combined with Fentanyl			
	No Heroin, No Cocaine (n=63)	Heroin, No Cocaine (n=92)	Cocaine, No Heroin (n=25)	Heroin and Cocaine (n=44)
<b>Race (n,%)</b>				
Asian/P.I.	1 (1.6)	0	0	0
Black	11 (17.5)	11 (12.0)	6 (24.0)	10 (22.7)
White	51 (81.0)	81 (88.0)	19 (76.0)	34 (77.3)
<b>Sex (n,%)</b>				
Female	22 (34.9)	20 (21.7)	8 (32.0)	18 (40.9)
Male	41 (65.1)	72 (78.3)	17 (68.0)	26 (59.1)
<b>Age (n,%)</b>				
15-24	5 (8.3)	11 (12.1)	2 (8.0)	4 (9.1)
25-34	22 (36.7)	34 (37.4)	2 (8.0)	11 (25.0)
35-44	14 (23.3)	19 (20.9)	7 (28.0)	13 (29.6)
45-54	12 (20.0)	19 (20.9)	12 (48.0)	11 (25.0)
55-64	4 (6.7)	7 (7.7)	2 (8.0)	4 (9.1)
65 & Older	3 (5.0)	1 (1.1)	0	1 (2.3)

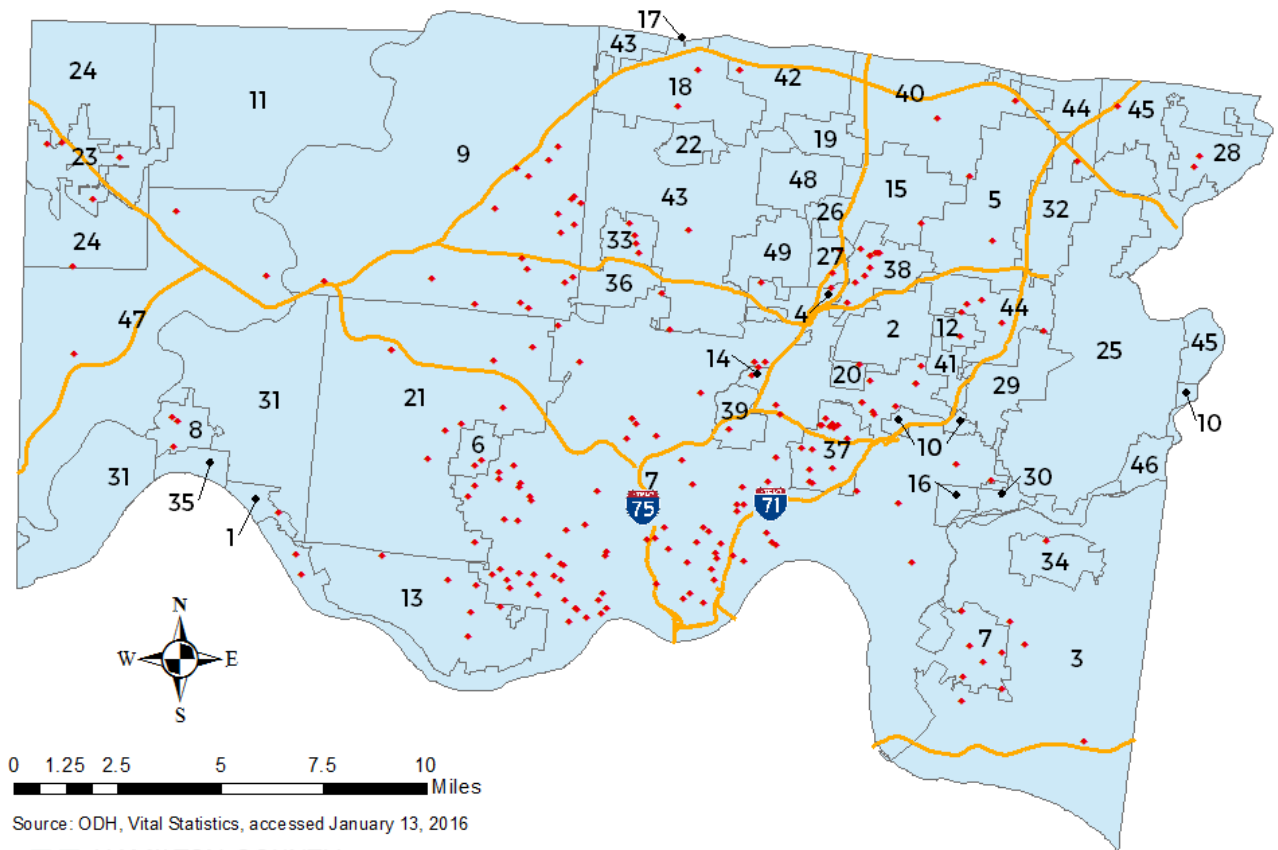
\*Note; percentage may add to more than 100 due to rounding. 4 individuals had missing age – percentages reflect proportions among those with known age.

Fentanyl-related deaths involving cocaine were more likely to occur among black individuals. However, by chi-square test, this association was not significant at the  $\alpha=0.05$  level;

	Cocaine (n,%)	No Cocaine (n,%)	Chi-Square p-Value
<b>Black (n=38)</b>	16 (42.1)	22 (57.9)	-
<b>Not Black (n=186)</b>	53 (28.5)	133 (71.5)	0.10

Men were more likely to overdose on fentanyl than women, regardless of drug combination. In general, those who overdosed on combined cocaine and fentanyl were older than those who overdosed on a combination of heroin and fentanyl. The average age for those who died with heroin in their system was 38.4, and the average age for those who died with cocaine in their system was 41.7.

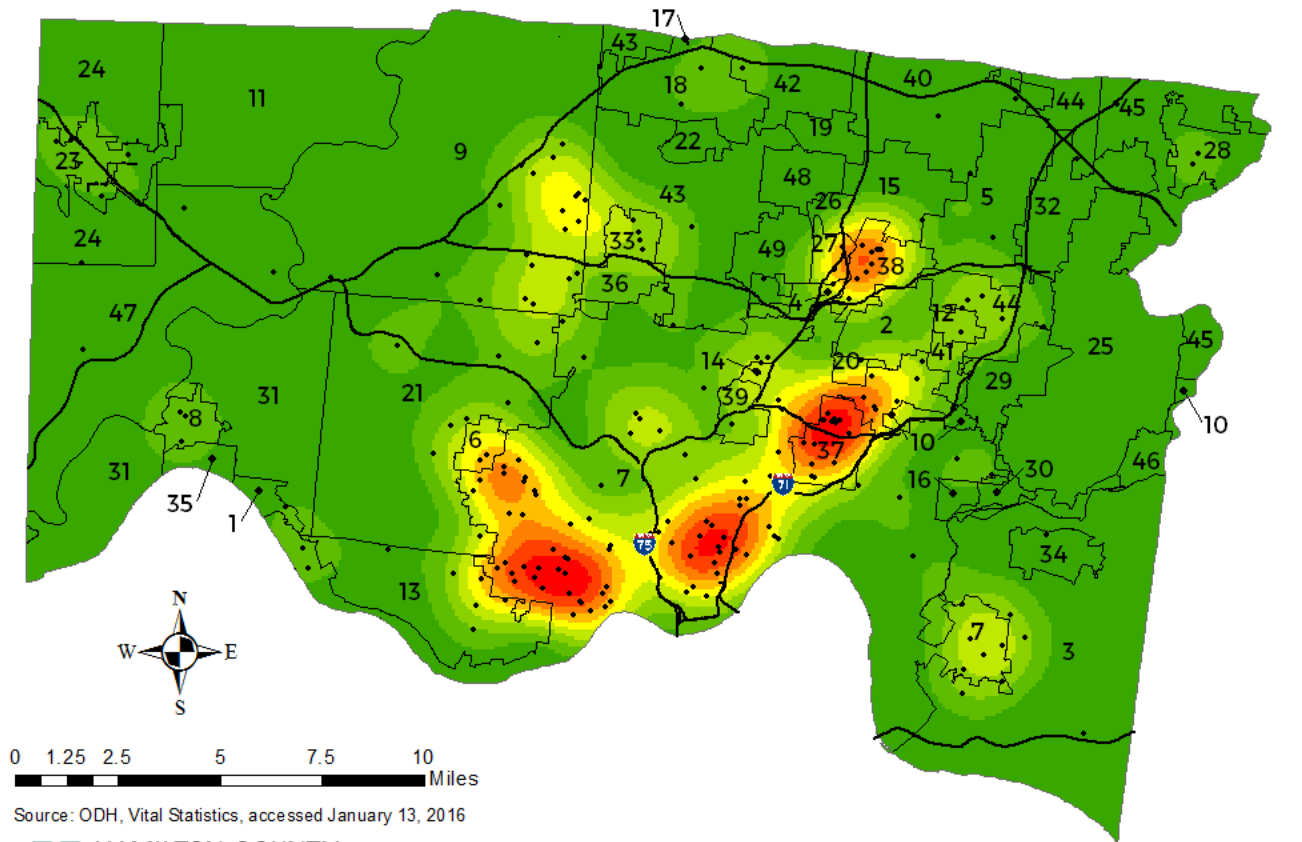
**Figure 8. Residences of individuals who died from fentanyl-related drug overdose; Hamilton County, 2014-2015**



- |                       |                       |                          |
|-----------------------|-----------------------|--------------------------|
| 1. Addyston           | 18. Forest Park       | 35. North Bend           |
| 2. Amberley Village   | 19. Glendale          | 36. North College Hill   |
| 3. Anderson Township  | 20. Golf Manor        | 37. Norwood              |
| 4. Arlington Heights  | 21. Green Township    | 38. Reading              |
| 5. Blue Ash           | 22. Greenhills        | 39. Saint Bernard        |
| 6. Cheviot            | 23. Harrison          | 40. Sharonville          |
| 7. Cincinnati         | 24. Harrison Township | 41. Silverton            |
| 8. Cleves             | 25. Indian Hill       | 42. Springdale           |
| 9. Colerain Township  | 26. Lincoln Heights   | 43. Springfield Township |
| 10. Columbia Township | 27. Lockland          | 44. Sycamore Township    |
| 11. Crosby Township   | 28. Loveland          | 45. Symmes Township      |
| 12. Deer Park         | 29. Madeira           | 46. Terrace Park         |
| 13. Delhi Township    | 30. Mariemont         | 47. Whitewater Township  |
| 14. Elmwood Place     | 31. Miami Township    | 48. Woodlawn             |
| 15. Evendale          | 32. Montgomery        | 49. Wyoming              |
| 16. Fairfax           | 33. Mount Healthy     |                          |
| 17. Fairfield         | 34. Newtown           |                          |



**Figure 9. Density map of residences for individuals who died from fentanyl-related drug overdose; Hamilton County, 2014-2015\***



**HAMILTON COUNTY  
PUBLIC HEALTH**

PREVENT. PROMOTE. PROTECT.

\*Note: Density map reflects clustering of resident deaths and does not account for variable population sizes across Hamilton County. Highly populated areas may be more likely to exhibit clustering.

- |                       |                       |                          |
|-----------------------|-----------------------|--------------------------|
| 1. Addyston           | 18. Forest Park       | 35. North Bend           |
| 2. Amberley Village   | 19. Glendale          | 36. North College Hill   |
| 3. Anderson Township  | 20. Golf Manor        | 37. Norwood              |
| 4. Arlington Heights  | 21. Green Township    | 38. Reading              |
| 5. Blue Ash           | 22. Greenhills        | 39. Saint Bernard        |
| 6. Cheviot            | 23. Harrison          | 40. Sharonville          |
| 7. Cincinnati         | 24. Harrison Township | 41. Silverton            |
| 8. Cleves             | 25. Indian Hill       | 42. Springdale           |
| 9. Colerain Township  | 26. Lincoln Heights   | 43. Springfield Township |
| 10. Columbia Township | 27. Lockland          | 44. Sycamore Township    |
| 11. Crosby Township   | 28. Loveland          | 45. Symmes Township      |
| 12. Deer Park         | 29. Madeira           | 46. Terrace Park         |
| 13. Delhi Township    | 30. Mariemont         | 47. Whitewater Township  |
| 14. Elmwood Place     | 31. Miami Township    | 48. Woodlawn             |
| 15. Evendale          | 32. Montgomery        | 49. Wyoming              |
| 16. Fairfax           | 33. Mount Healthy     |                          |
| 17. Fairfield         | 34. Newtown           |                          |