Montgomery County Poisoning Death Review: 2010 - 2016

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Boonshoft School of Medicine

Wright State University

Public Health - Dayton & Montgomery County

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The Poisoning Death Review (PDR) is conducted by the WSU Boonshoft School of Medicine Center for Interventions, Treatment & Addictions Research (CITAR), in collaboration with the Montgomery County Coroner's Office, under contract with Public Health - Dayton & Montgomery County.

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Montgomery County Poisoning Death Review: 2010 — 2016

Highlights

- **Unintentional drug overdose trends.** In 2016, the number of unintentional drug overdose deaths increased 34.7% from 259 in 2015 to 349 in 2016. Over 90% of the deaths involved at least one opioid. Of the 349 deaths, 89% (309) were Montgomery County residents. Based on the Montgomery County 2010 (U.S. Census Bureau) population of 535,141, the 309 drug overdose deaths among residents in **2016 represent an estimated unadjusted rate of 57.7 per 100,000**, the highest on record. In comparison, the estimated unadjusted drug overdose death rate per 100,000 in 2015 was 42.8.
- **Heroin**. **The percentage of heroin mentions in overdose deaths declined from 45% in 2015 to 21% in 2016.** This is the lowest percentage of heroin mentions since the PDR was initiated in 2010 when heroin was present in 31% of the decedents. The percentage of heroin mentions with no illicit fentanyl decreased from 35% in 2015 to 11% in 2016.
- **Illicit fentanyl**. In 2016, there was an escalating impact of illicit fentanyl (clandestinely manufactured, non-pharmaceutical fentanyl) and/or fentanyl analogues (such as carfentanyl)/metabolites on overdose deaths in Montgomery County. In 2016, there were 250 mentions of illicit fentanyl and/or fentanyl analogues/metabolites, compared to 107 mentions of illicit fentanyl in 2015, a 134% increase. The **percentage of illicit fentanyl and/or analogue mentions** among all 349 deaths increased from 41% (illicit fentanyl only) in 2015 to 72% (illicit fentanyl and/or analogues/metabolites) in 2016. *Although this comparison is not equivalent, it does provide some indication of the tremendous increases in the impact of illicit fentanyls in the community.*
- **Illicit fentanyl analogues/metabolites.** In the Montgomery County Coroner's office, routine in-house screening for carfentanil began in Quarter III, 2016. An additional analysis for up to 21 fentanyl analogs and suspected metabolites was also utilized when a fentanyl analog was suspected. **Findings:** Ten fentanyl analogues/metabolites were identified among 32 decedents in 2016. Among these, furanylfentanyl mentions were the most common (23), followed by despropionyl fentanyl mentions (20). In addition, four decedents had mentions of U47700, an opioid analgesic with medical use, present in their toxicology reports.
- **Illicit fentanyl and/or analogue/metabolite: Combinations.** The percentage of **illicit fentanyl and/or fentanyl analogue/metabolite mentions — with no heroin or prescription opioid mentions present — increased from 20% in 2015 to 55% in 2016.** Illicit fentanyl with no heroin or prescription opioid mentions increased substantially from 53 in 2015 to 193 in 2016, a 264% increase. Similarly, the percentage of illicit fentanyl and/or fentanyl analogue/metabolite and no heroin mentions increased from 31% in 2015 to 61% in 2016.
- **Illicit fentanyl: Demographics.** The mean age of decedents who tested positive for illicit fentanyl and/or analogues (illicit fentanyls) was 39.1 years, compared to 44.4 years among decedents who tested negative. More decedents who tested positive for illicit fentanyl and/or analogues/metabolites were male (67.6%), compared to decedents who did not test positive (55.6%).
- **Prescription opioids**. The percentage of unintentional drug overdose deaths in which any prescription opioids were present continued to decline from 37% in 2014 to 31% in 2015 to 18% in 2016. The presence of pharmaceutical opioids in unintentional drug overdose cases dropped to 18% in 2016, compared to 74% in 2010.

- **Benzodiazepines**. In 2016, the *percentage* of benzodiazepine mentions in accidental drug overdose deaths decreased from 43% in 2015 to 26% in 2016, the lowest recorded since 2010 when the percentage of benzodiazepine mentions was 69%. Nevertheless, benzodiazepines were present among 92 decedents, which is slightly higher than 87 mentions in 2010.
- **Prescription opioids and benzodiazepines.** The percentage of cases with both a prescription opioid and a benzodiazepine present declined from 19% in 2015 to 9% in 2016. Twenty-six percent of the decedents had a benzodiazepine present, compared to 18% with a prescription opioid.
- **Illicit fentanyl and/or analogues/metabolites and other drugs.** Among cases where illicit fentanyl was present (250), about a fourth (59) (24%) also had a benzodiazepine present. The percent of mentions of both cocaine and illicit fentanyl increased from 15% in 2015 to 31% in 2016. **The number of decedents with both cocaine and illicit fentanyl and/or analogues increased from 38 in 2015 to 109 in 2016, a 187% increase.**The percent of mentions of illicit fentanyl plus methamphetamine increased from 2% in 2015 to 7% in 2016.
- **Multiple CNS depressants.** In 2016, the percent of decedents who had two or more CNS depressant drugs in their systems at the time of death decreased to 54%, compared to 63% in 2015, about 70% in 2013-2014, 66% in 2012, and 85% in 2010. These declines in percentages should be interpreted in the context of significant increases in deaths due to fentanyl analogues which are significantly more powerful drugs than heroin or most other pharmaceutical opioids.
- **Any opioid**. The percentage of any opioid (heroin, prescription opioids, and/or illicit fentanyl) in accidental drug overdose deaths was 93% (325) in 2016 and has remained stable around 90% since 2010.
- **Naloxone administration.** In Montgomery County in 2016, the Dayton Police Department administered naloxone on 222 occasions for drug overdose, the EMS administered naloxone 487 times for overdose, and the Dayton Fire Department administered naloxone to 820 overdose victims, **totaling 1529 naloxone administration occasions**.
- The unintentional overdose epidemics in Montgomery County took another step increasing to a new, unprecedented high level. Illicit fentanyl and/or fentanyl analogs/metabolites are assuming an increasingly negative impact on risk reduction efforts being implemented by Montgomery County community partners.

I. Introduction

The findings in this Poisoning Death Review (PDR) result from the compilation and interpretation of multiple data sets from the Montgomery County Coroner's Office. The PDR, funded by Public Health—Dayton & Montgomery County, is carried out by faculty and staff at the Wright State University Boonshoft School of Medicine in collaboration with the Montgomery County Coroner's Office. The designation of deaths as either unintentional (accident) or intentional (suicide) is made by the Montgomery County Coroner. This Report describes changes in unintentional drug overdose deaths since 2010, but focuses on 2015 compared to 2016.

II. Methodology

Data Management

The Montgomery County Coroner's office sends overdose death case data to the Center for Interventions, Treatment, and Addictions Research when cases are completed. These data include: 1) Death certificates; 2) Detailed toxicology reports; and 3) Brief descriptions of each case. After the data are received, the database manager edits the toxicology report to include only the drug information. Then, death certificates and toxicology reports are printed. Finally, data on: 1) Demographics; 2) Health; 3) History of Substance Abuse; 4) Location of Death; and 5) Toxicology, are entered into excel spreadsheets. SAS programs are written to analyze the data and prepare figures and tables for Quarterly and Final Reports.

III. Drug Toxicology Data

Definition of Drug "Mentions"

A drug "mention" means that a specific drug was found in a bodily system or fluid of a decedent, not that the drug was necessarily the sole cause of death. The presence of more than one drug can result in more than one mention from a single decedent. We note that 17 cases, autopsies were not performed in 2016 due to extenuating circumstances. Of these, four included some specific information on drugs present in the death certificates. In these cases, corresponding entries were made in the toxicology report. Five of the cases indicated "opioid" or "opiate" intoxication/overdose, and these were added to the Any Opioid category in the toxicology table. The Tables in **Appendix I** provide data on: 1) Demographics; 2) Health; 3) History of Substance Abuse; 4) Location of Death; and 5) Toxicology. The toxicology tables indicate mentions of drugs found in decedents' bodies as identified by the Coroner's office. (Note that Figures in the Report are largely derived from the tables in Appendix I.)

Pharmaceutical Fentanyl, Illicit Fentanyl, and Fentanyl Analogues

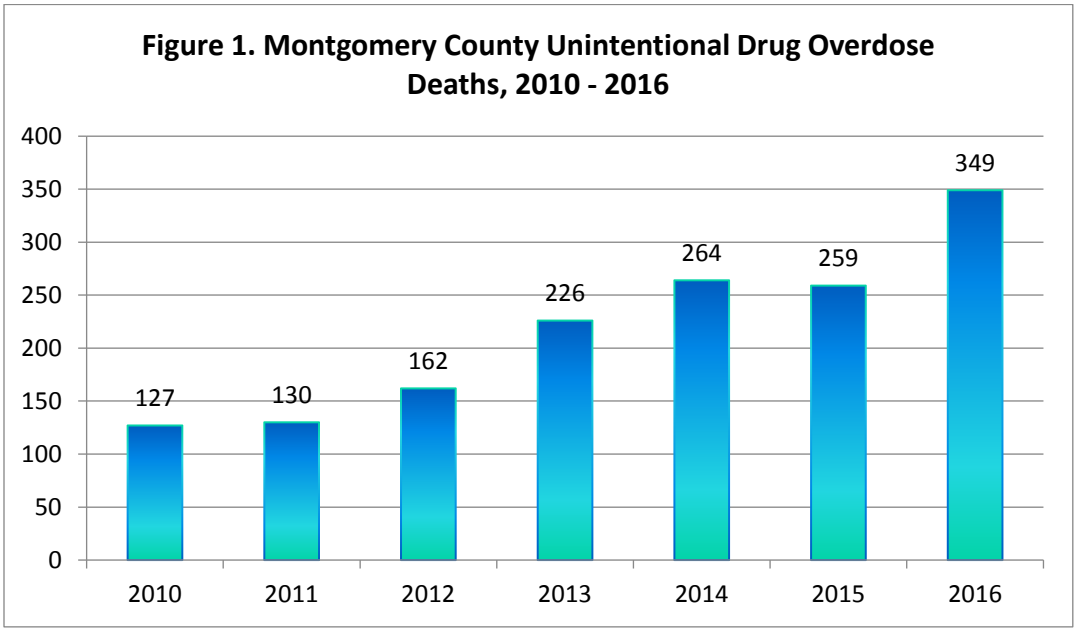
This report distinguishes **illicit** fentanyl from **pharmaceutical** fentanyl mentions in toxicology reports that almost certainly resulted from prescription forms of the drug, such as transdermal patches (which we classify as a prescription opioid). Illicit fentanyl refers to fentanyl that has been produced in clandestine labs, rather than by fentanyl produced by licensed pharmaceutical companies. The prescription form of fentanyl is included in our discussion of prescription opioids. In this Report, we compare the number of illicit/non-pharmaceutical fentanyl and/or fentanyl analog mentions with illicit

fentanyl in previous years, noting that the Coroner's office did not screen for fentanyl analogues before 2016. For this reason, the comparisons are not completely accurate.

Special Note regarding illicit fentanyl and fentanyl analogues/metabolites: Note that fentanyl analogues are also illicit and manufactured in clandestine labs often located overseas. They are also sold on the Dark Web. In the Montgomery County Coroner's office, routine in-house screening for carfentanil began in Quarter III, 2016. An additional analysis for up to 21 fentanyl analogs and suspected metabolites was also utilized when a fentanyl analog was suspected.

IV. Overdose Death Trends

In 2016, 349 unintentional drug overdose deaths occurred in Montgomery County, Ohio, the highest number recorded to date. The number of unintentional drug overdose deaths increased 34.7% from 259 in 2015 to 349 in 2016. Similar to previous years, about 90% (93%) of the overdose deaths involved at least one opioid, including prescription opioids, heroin, and/or illicit fentanyls. Figure 1 shows the overall increasing trend in the number of unintentional drug overdose deaths from 2010 through 2016. **Since 2010, 1,517 people have died of unintentional drug overdose deaths in Montgomery County.**

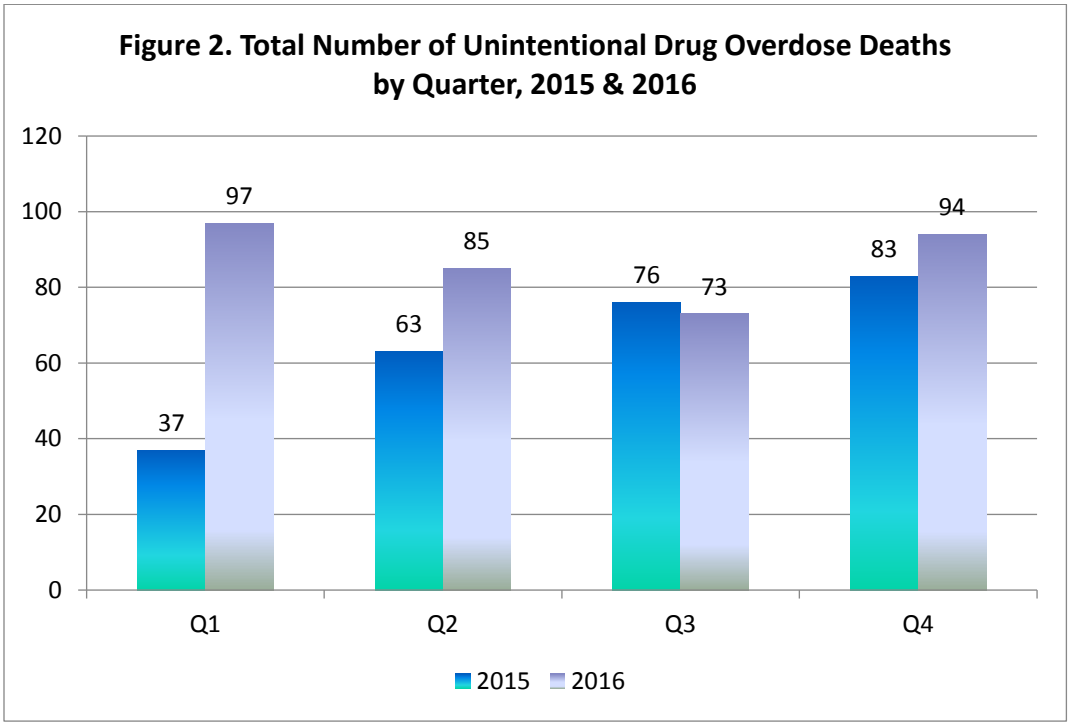


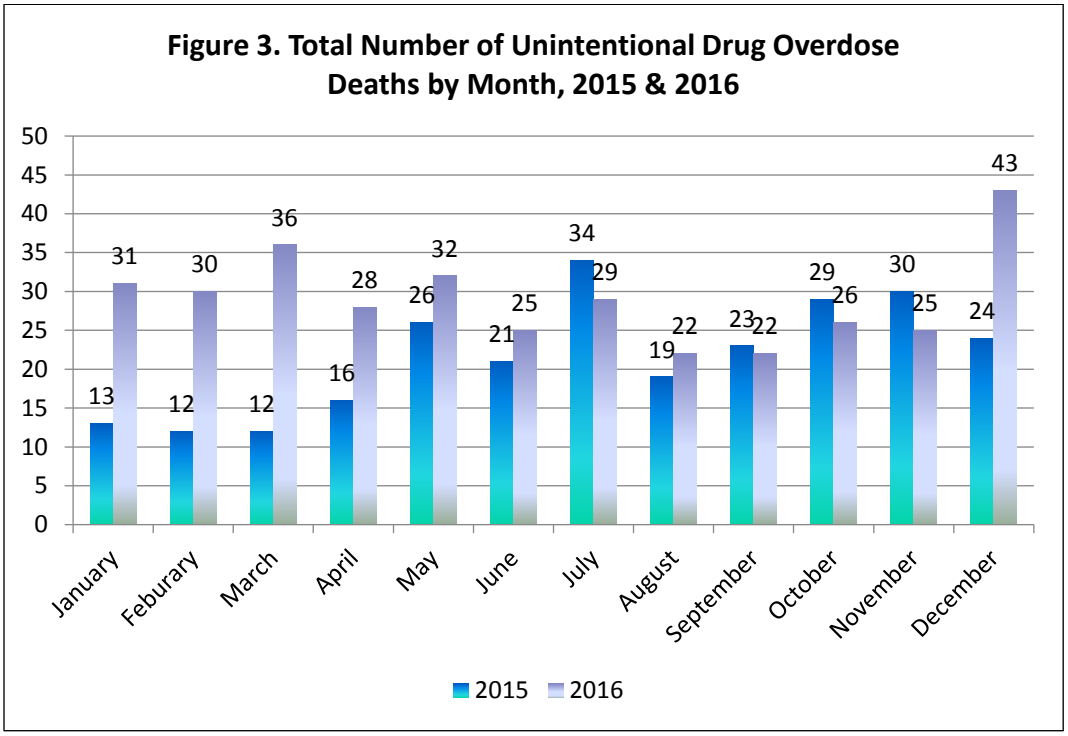
Unintentional Drug Overdose Deaths by Quarter and Month

Generally, the number of unintentional drug overdose deaths in each Quarter of 2016 increased, compared to 2015. (see Figure 2) Quarter 3 was an exception with 76 drug overdose deaths in 2015, compared to 73 in Quarter 3, 2016. Overdose deaths in Quarter 1, 2016, increased 162.2% from 37 in Quarter 1, 2015, to 97 in Quarter 1, 2016.

Drug overdose death trends by month are shown in Figure 3. The number of deaths through the first three months of 2016 are almost three times higher, compared to the same months in 2015. The number of drug overdose deaths were higher in 8 of 12 months in 2016, compared to 2015, and peaked with 43 overdose deaths in December 2016, compared to 24 in December 2015. The mean

number of overdose deaths per month in 2015 was 21.6 (SD=7.4). **The mean number of overdose deaths per month increased to 29.1 (SD=6.0) in 2016**.





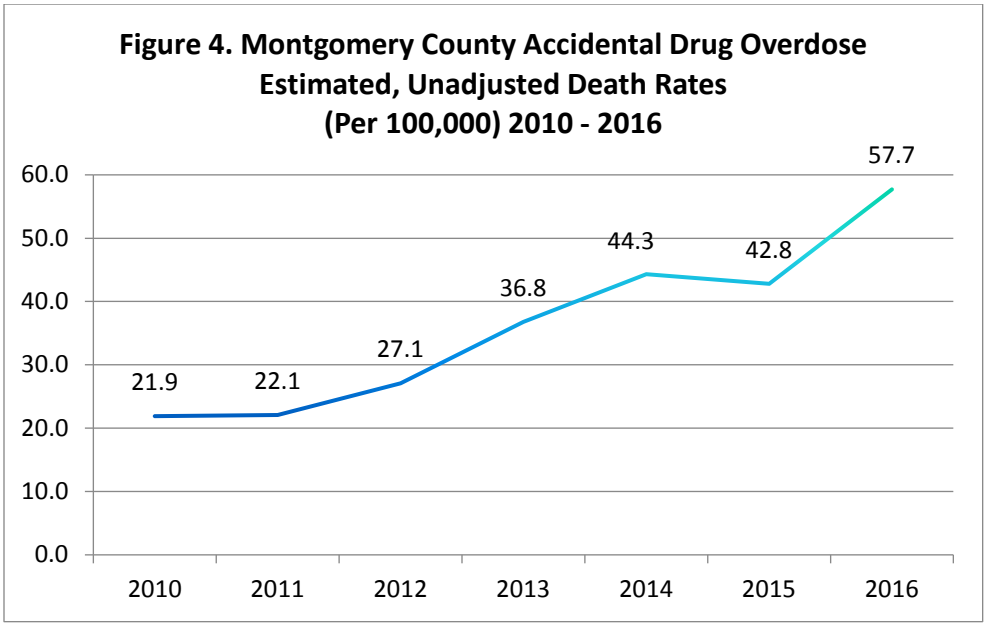
Residence of Decedents

Of the 349 decedents in 2016, **89% (309) were Montgomery County residents**, and this percentage has been fairly consistent since 2010. Residence was completely unknown for one person.

Among the remaining 39 decedents, **31 were residents of 15 other Ohio counties** (7 – Miami; 5 -- Greene; 3 – Butler, Clark, and Warren; and 1 each for Champaign, Clermont, Darke, Franklin, Highland, Madison, Mercer, Preble, Richland, and Shelby). **Among the remaining 8 decedents**, one each was a resident in: Alleghany County, PA; Campbell County, KY; Guilford County, NC; Leslie County, KY; Oklahoma County, OK, Palm Beach County, FL; Wayne County, IN; and Warren County, NJ. Importantly, the total number of Montgomery County deaths does not include Montgomery County residents who died in other Ohio counties (or states); these data were unavailable at the time the Report was prepared.

Unintentional Drug Overdose Estimated, Unadjusted Death Rates per 100,000

Based on the Montgomery County 2010 (U.S. Census Bureau) population of 535,141, the 309 drug overdose deaths among residents in **2016 represent an estimated unadjusted rate of 57.7 per 100,000**, the highest on record. In comparison, the estimated unadjusted drug overdose death rate per 100,000 in 2015 was 42.8, and it was 44.3 in 2014. (see Figure 4) In comparison, the overdose death rate in Ohio per 100,000 for 2015 (the latest figure available) was 29.9 (CDC. https://www.cdc.gov/drugoverdose/data/statedeaths.html) Importantly, the calculations do not include Montgomery County residents who died outside of the county, so the rates are approximations.



V. Demographic and Health Characteristics of Decedents

Race. Eighty-two percent of the decedents were white, the lowest percentage since 2010. In contrast, the percentage of Blacks was the highest (16%) since 2010. (see Figure 5) **Gender**. The percentage of male decedents was 64%, compared to 68% in 2015. Overall, the percentage of male decedents has increased since 2010 from 57% in 2010 to highs of 67% in 2013 and 68% in 2015. (see Figure 6) The percentage of females increased from 32% in 2015 to 36% in 2016. Overall, the percentage of female decedents has declined from a high of 43% in 2010 to lows of 33% in 2013 and 32% in 2015.

Education. In 2016, 63% of overdose decedents had a high school diploma or GED, compared to 67% in 2015. Overall, **the percentage of decedents with a high school diploma has declined from a high of 76% in 2010 to the current low of 63%**. (see Figure 7). The percentage of decedents who have less than a high school education has increased over time from a low of 20% in 2010 to highs of 29% in 2013 and 2016. The percentage of college graduates increased to 7% in 2016, compared to 2% in 2010.

Age. The mean age was 40.6 years in 2016, compared to 40.7 in 2015. The three age groups with the highest proportion of deaths were 25-34 year olds (29%), 35-44 year olds (28%), and 45-54 year olds (19%), together accounting for 76% of the 2016 decedents--essentially unchanged from 2015. (see Figure 8). **The percentage of overdose deaths among 25-34 year-olds has increased from 22% in 2010 to 29% in 2016**.

Marital Status. The percentage of decedents who were single was 52% in 2016, compared to 57% in 2015. Since 2010, the percentage of single decedents has increased from 41% in 2010 to a high of 57% in 2015. (see Figure 9) The percentage of married participants has declined over time from 29% in 2010 and 31% in 2011 to 16% in 2016.

Military Veterans. Seven percent of decedents were military veterans, virtually the same in 2013, 2014, and 2015.

Figure 5 . Montgomery County Accidental Drug Overdose Deaths by Race, 2010 - 2016

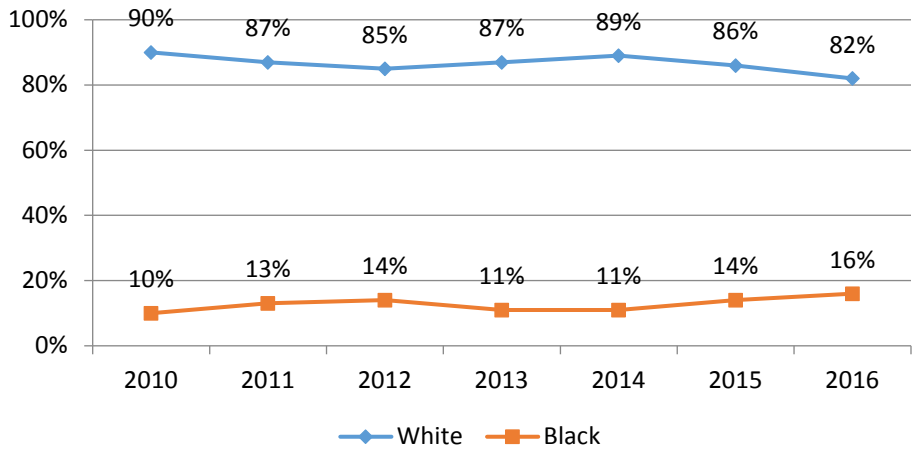


Figure 6 . Percentage of Males & Females in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

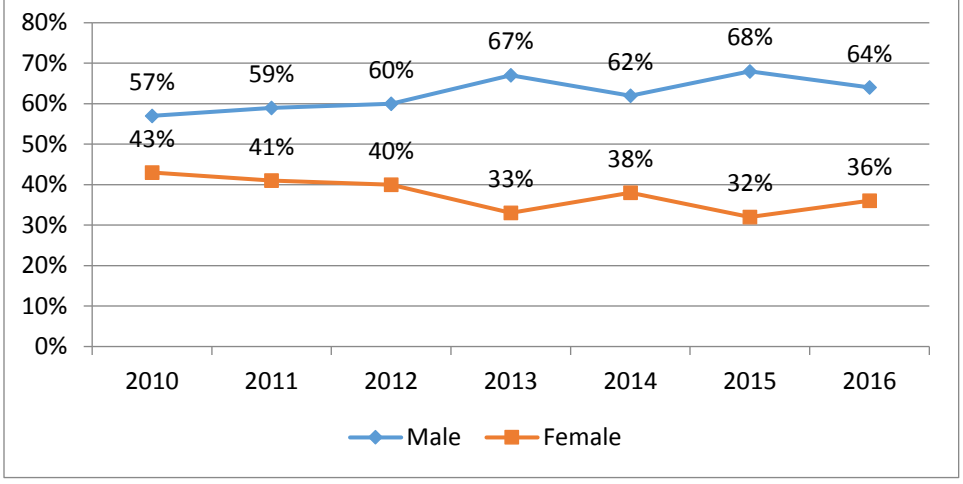


Figure 7. Level of Education among Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

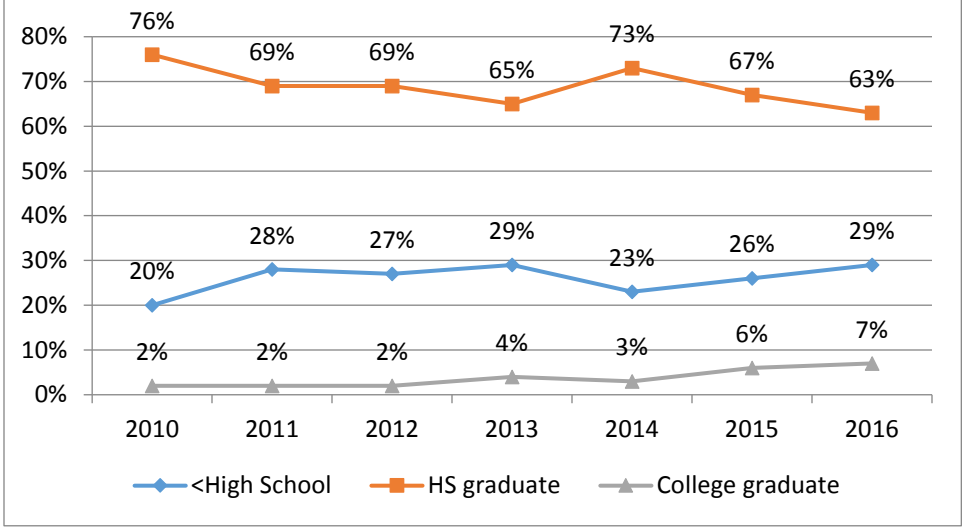
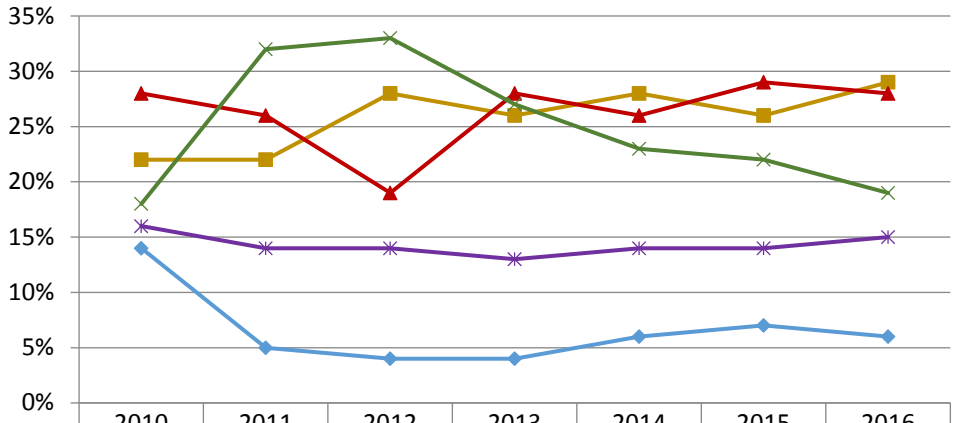
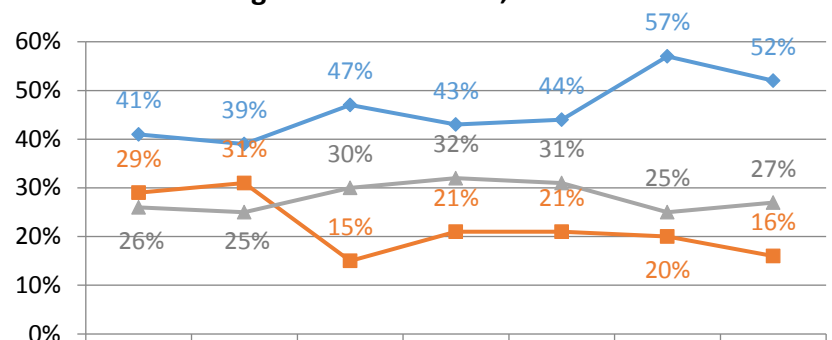


Figure 8. Percentage of Selected Age Groups in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016



	2010	2011	2012	2013	2014	2015	2016
15-24 years	14%	5%	4%	4%	6%	7%	6%
25-34 years	22%	22%	28%	26%	28%	26%	29%
35-44 years	28%	26%	19%	28%	26%	29%	28%
45-54 years	18%	32%	33%	27%	23%	22%	19%
55-64 years	16%	14%	14%	13%	14%	14%	15%

Figure 9. Marital Status (selected) in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

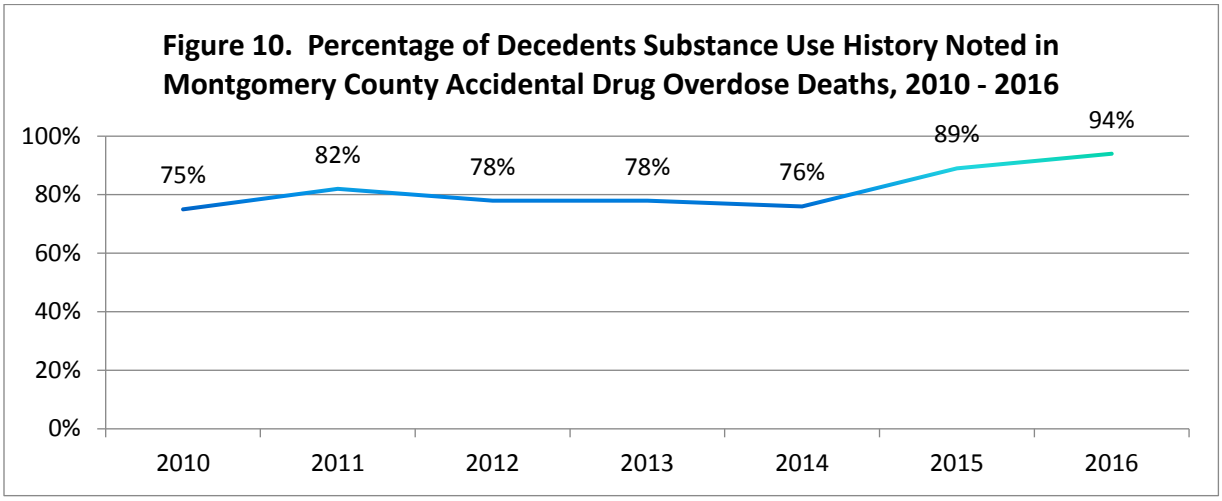


	2010	2011	2012	2013	2014	2015	2016
Single	41%	39%	47%	43%	44%	57%	52%
Married	29%	31%	15%	21%	21%	20%	16%
Divorced	26%	25%	30%	32%	31%	25%	27%

Physical Disability/Illness, Heart Disease, History of Substance Abuse, and Location of Death

Autopsy results revealed that 65% of the decedents had a history of physical illness or disability. Generally, **physical illness/disability has declined** from highs of 79% in 2010, 74% in 2011, 81% in 2012, 78% in 2013 to lows of 68%, 66% and 65% in 2014, 2015, 2016, respectively. In 2016, the percent of decedents with heart disease was 43%, virtually the same as 2015.

History of Substance Abuse. In 2016, 94% of decedents had a history of substance abuse, the highest percent since 2010. Trends in substance abuse history are shown in Figure 10. Since the "history of substance abuse" was assessed from reports made by family, friends, or witnesses, there may be additional instances of a history of substance abuse that were not recorded. **Location of Death**. In 2016, the majority of overdose deaths (54%) occurred at home, followed by in the hospital (19%), friend's home (9%), and relative's home (2%).



VI. Heroin

The number of heroin mentions in overdose death cases declined substantially from 117 in 2015 to 73 in 2016, a 38% decline. (see Figure 11) **The percentage of heroin mentions in overdose deaths declined from 45% in 2015 to 21% in 2016.** (see Figure 12) This is the lowest percentage of heroin mentions since the PDR was initiated in 2010 when heroin was present in 31% of the cases. The percentage of heroin mentions peaked at about 59% in 2012 and 2013, before declining to 48% in 2014, 45% in 2015, and 21% in 2016.

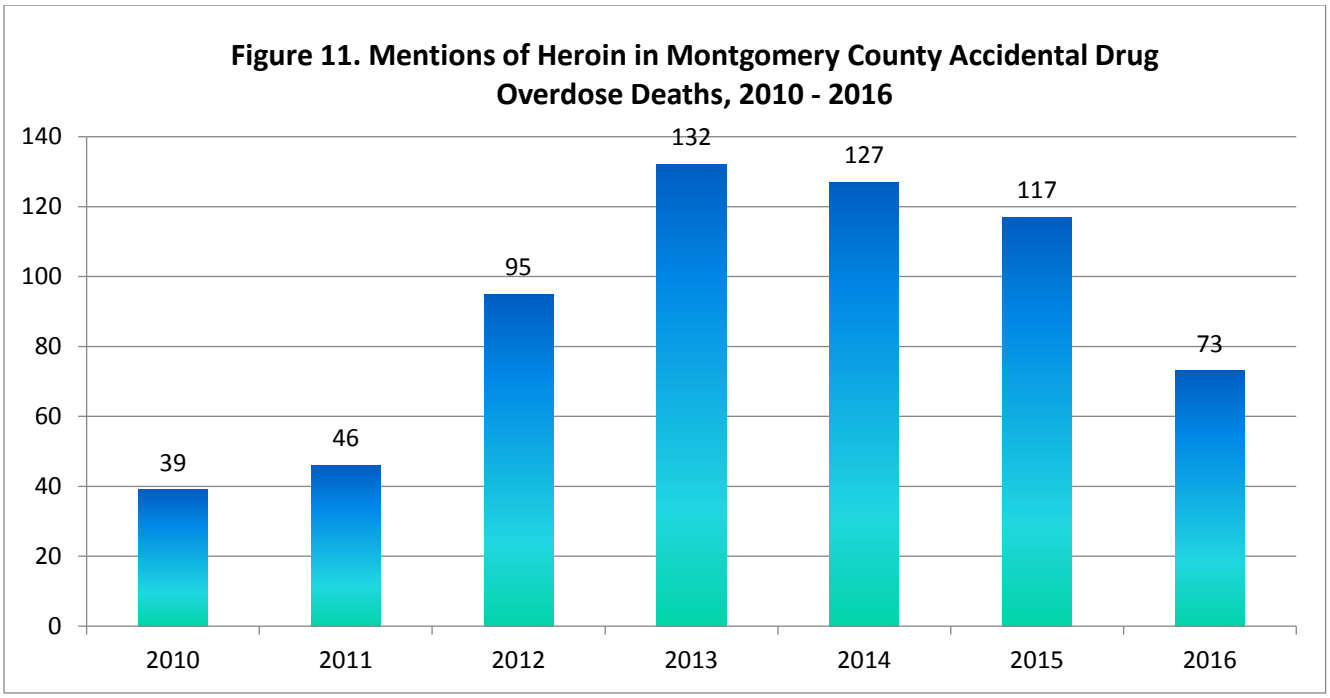


Figure 11. Mentions of Heroin in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016
140
120
100
80
60
40
20
0
39
46
95
132
127
117
73
2010
2011
2012
2013
2014
2015
2016

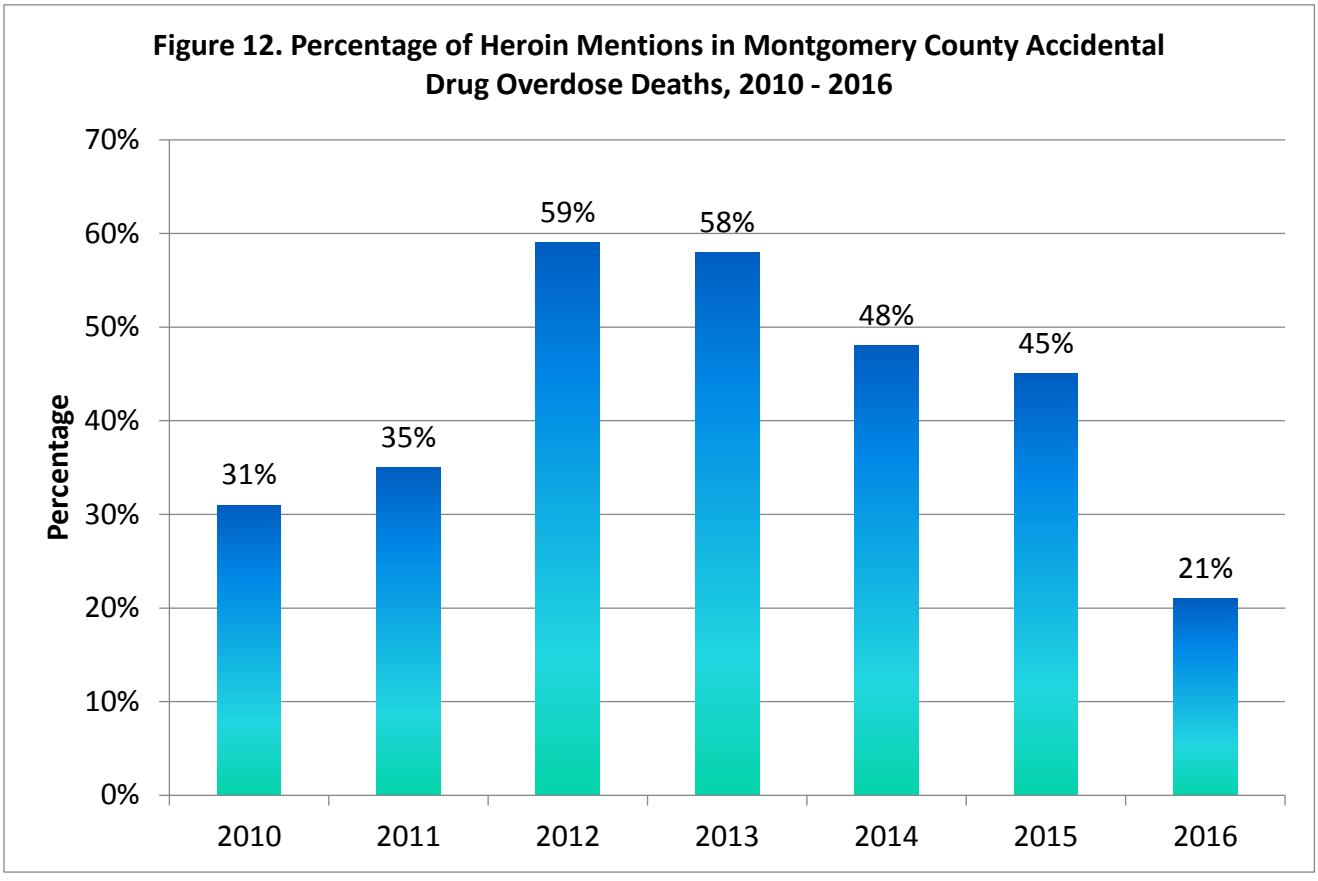


Figure 12. Percentage of Heroin Mentions in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016
Percentage
70%
60%
50%
40%
30%
20%
10%
0%
31%
35%
59%
58%
48%
45%
21%
2010
2011
2012
2013
2014
2015
2016

VII. Illicit /Clandestinely Manufactured Fentanyl, Fentanyl Analogues/Metabolites & Other Synthetic Opioids

The presence of illicit fentanyl played an increasingly predominant role in unintentional drug overdose deaths in Montgomery County in 2016. In this report we make the following comparisons: 1) Illicit fentanyl mentions and/or fentanyl analogue/metabolite mentions; 2) Illicit fentanyl without analogues/ metabolites; 3) Fentanyl analogue/metabolite mentions with or without illicit fentanyl; 4) Fentanyl analogues/ metabolites and illicit fentanyl; and 5) Fentanyl analogues/ metabolites only. (see Figure 13) **(Note that mentions and percentages of illicit fentanyl analogues/metabolites are under-reported because testing for them was not initiated until late Quarter III and IV. The following is based on the data available, recognizing it is incomplete.**

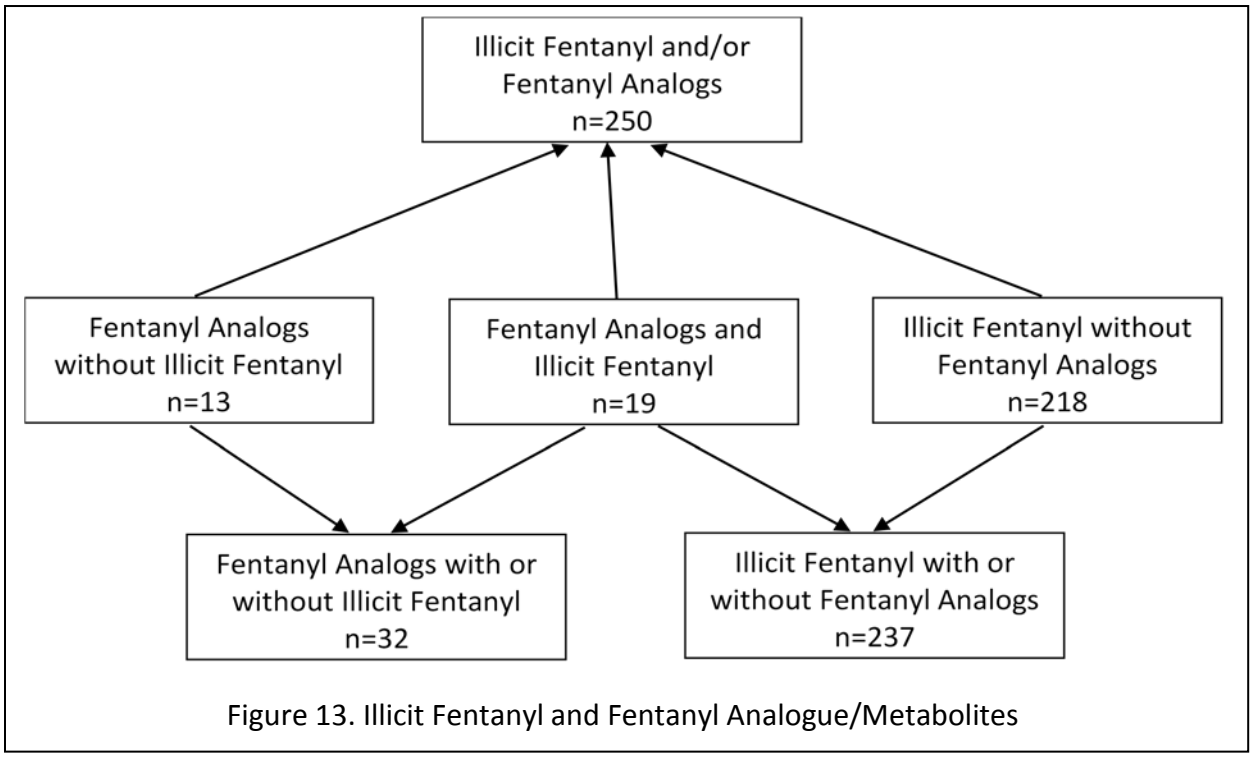


Figure 13. Illicit Fentanyl and Fentanyl Analogue/Metabolites

1) In 2016, there were 250 mentions of illicit fentanyl and/or fentanyl analogues/metabolites, compared to 107 mentions of illicit fentanyl in 2015, a 134% increase. (see Figures 14 and 15) The **percentage of illicit fentanyl and/or analogue mentions** among all 349 deaths increased from 41% (illicit fentanyl only) in 2015 to 72% (illicit fentanyl and/or analogues) in 2016. *Although this comparison is not equivalent, it does provide some indication of the tremendous increases in the impact of illicit fentanyls in the community.* (see Figure 16)

2). There were 218 mentions of illicit fentanyl without analogues in 2016, compared to 107 in 2015. (see Figure 14) **The percentage of illicit fentanyl without analogue mentions increased 51.2% from 41% in 2015 to 66% in 2016.** *It is acknowledged that the comparison is problematic because analogues/metabolites were not tested for prior to late 2016.*

3). There were 32 (9.2%) fentanyl analogue/metabolite mentions with or without illicit fentanyl in 2016. In other words, 32 decedents had at least one fentanyl analogue/metabolite mention. (see Figure 14)

4). In 2016, 19 (5.4%) decedents had fentanyl analogues/ metabolites and illicit fentanyl present. (see Figure 14)

5). In 2016, there were 13 (3.7%) overdose death cases in which fentanyl analogues/metabolites were present without illicit fentanyl. (see Figure 14)

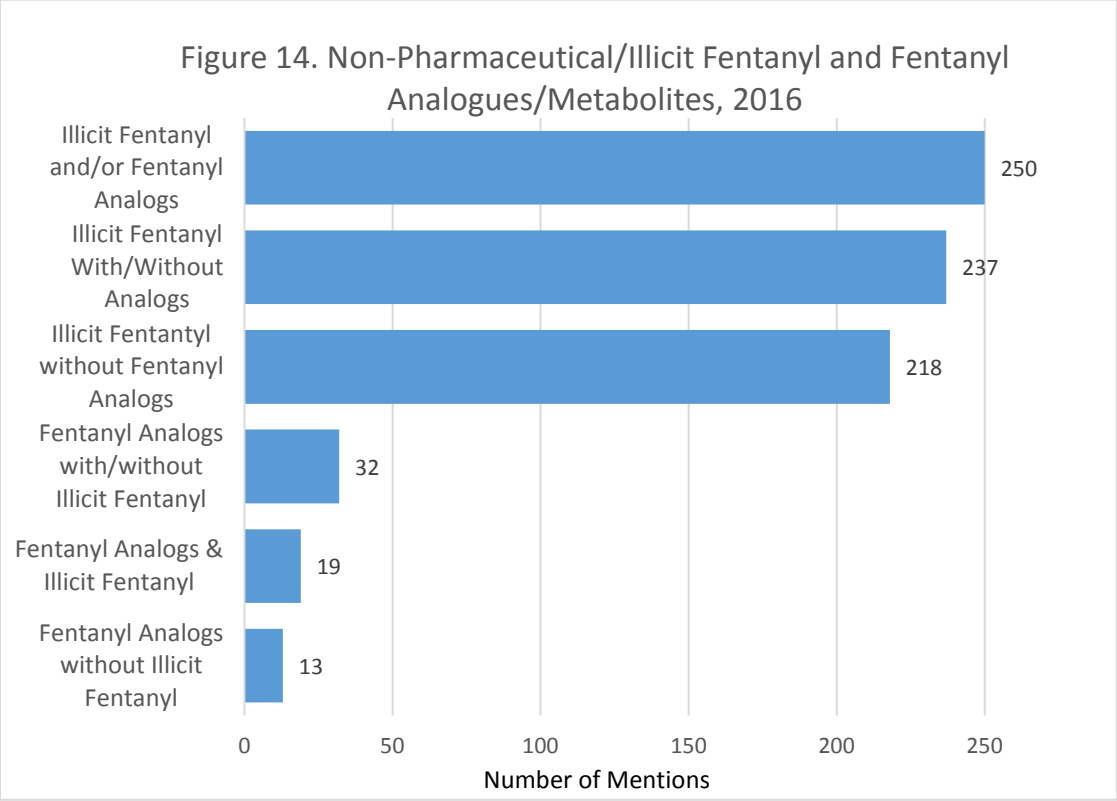
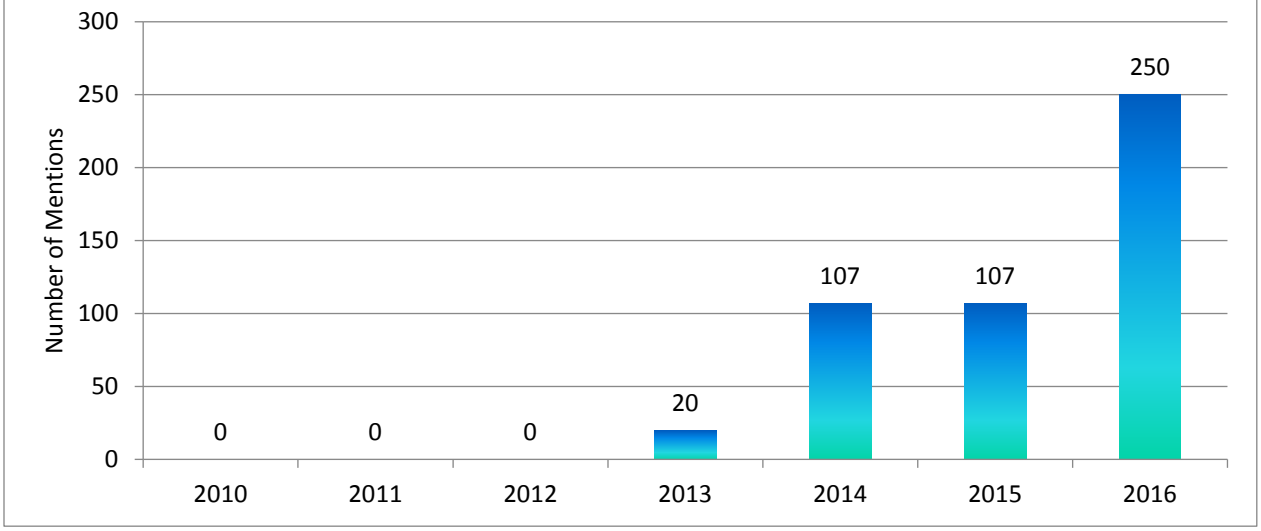
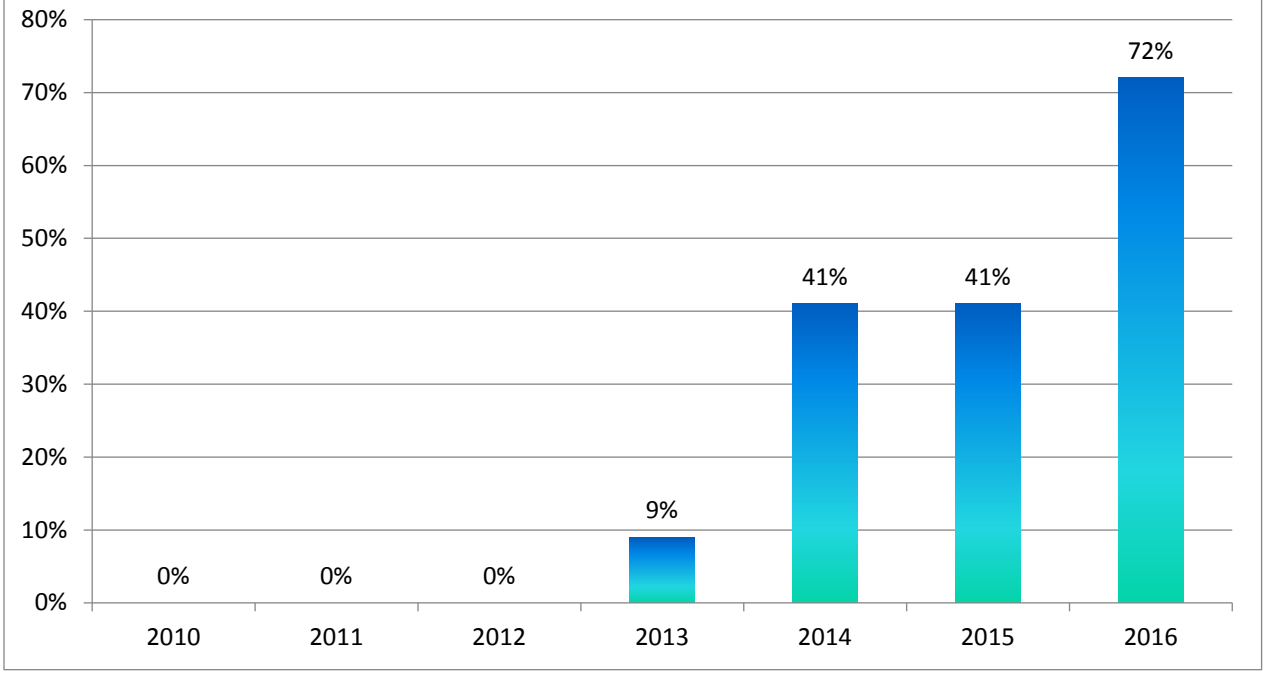


Figure 15. Mentions of Illicit Fentanyl and/or Analogues/Metabolites in Montgomery County Accidental Overdose Deaths, 2010 - 2016



*Note that illicit fentanyl analogues/metabolites were not screened for prior to Quarters III and IV 2016.

Figure 16. Percentage of Illicit Fentanyl and/or Analogues/Metabolites Mentions in Montgomery County Accidental Overdose Deaths, 2010 - 2016



*Note that illicit fentanyl analogues/metabolite were not screened for prior to Quarters III and IV 2016.

VIII. Demographic Characteristics of Decedents Who Tested Positive For Illicit Fentanyl and/or Fentanyl Analogue/Metabolites Compared to Those Who Died Without Them Present

The mean age of decedents who tested positive for Illicit fentanyl and/or analogues (illicit fentanyls) was 39.1 years, compared to 44.4 years among decedents who tested negative; decedents who had **not used illicit fentanyls** were significantly older. The distribution of age was also significantly different between illicit fentanyl positive and negative decedents. For example, 32.8% of the decedents who tested positive for fentanyls were 25-34 years of age, compared to 19.2% of those who did not test positive. (see Table 1) Significantly more decedents who tested positive for illicit fentanyls were male (67.6%), compared to decedents who did not test positive (55.6%). There was no differences between the two groups in race/ethnicity, education, or marital status (see Table 1).

Table 1. Demographic Characteristics of Decedents Who Tested Positive for Illicit Fentanyl and/or Analogues/Metabolites Compared to Those Who Did Not Test Positive.

		Positive for Illicit Fentanyl and/or Analogues (n=250)		Negative for Illicit Fentanyl and/or Analogues (n=99)	
	Category	N	%	N	%
Age Group	<15 years	1	0.4	0	0.0
	15-24 years	16	6.4	4	4.0
	25-34 years	82	32.8	19	19.2
	35-44 years	75	30.0	24	24.2
	45-54 years	37	14.8	30	30.3
	55-64 years	35	14.0	19	19.2
	65-74 years	3	1.2	3	3.0
	75+ years	1	0.4	0	0.0
Gender	Male	169	67.6	55	55.6
	Female	81	32.4	44	44.4
Race	White	201	80.4	85	85.9
	Black	45	18.0	11	11.1
	Other	4	1.6	3	3.0
Education	<High School	69	27.6	33	33.3
	HS graduate	163	65.2	57	57.6
	College graduate	17	6.8	7	7.1
	Post-graduate	0	0.0	0	0.0
	Unknown	1	0.4	2	2.0
Marital Status	Single	138	55.2	45	45.5
	Married	34	13.6	22	22.2
	Divorced	67	26.8	27	27.3
	Separated	1	0.4	0	0.0
	Widowed	9	3.6	5	5.1

Fentanyl Analogues/Metabolites

Ten fentanyl analogues/metabolites were identified among 32 decedents in 2016. (see Figure 17) Among these, furanylfentanyl mentions were the most common (23), followed by despropionyl fentanyl mentions (20). (We note again the number of illicit fentanyl analogs/metabolites are likely significantly under-reported because testing started late in the 2016. Given, the limited data, we do not explore combinations of illicit fentanyl and fentanyl analogues/metabolites).

Figure 17. Fentanyl Analogue/Metabolite Mentions among 32 Decedents, 2016.

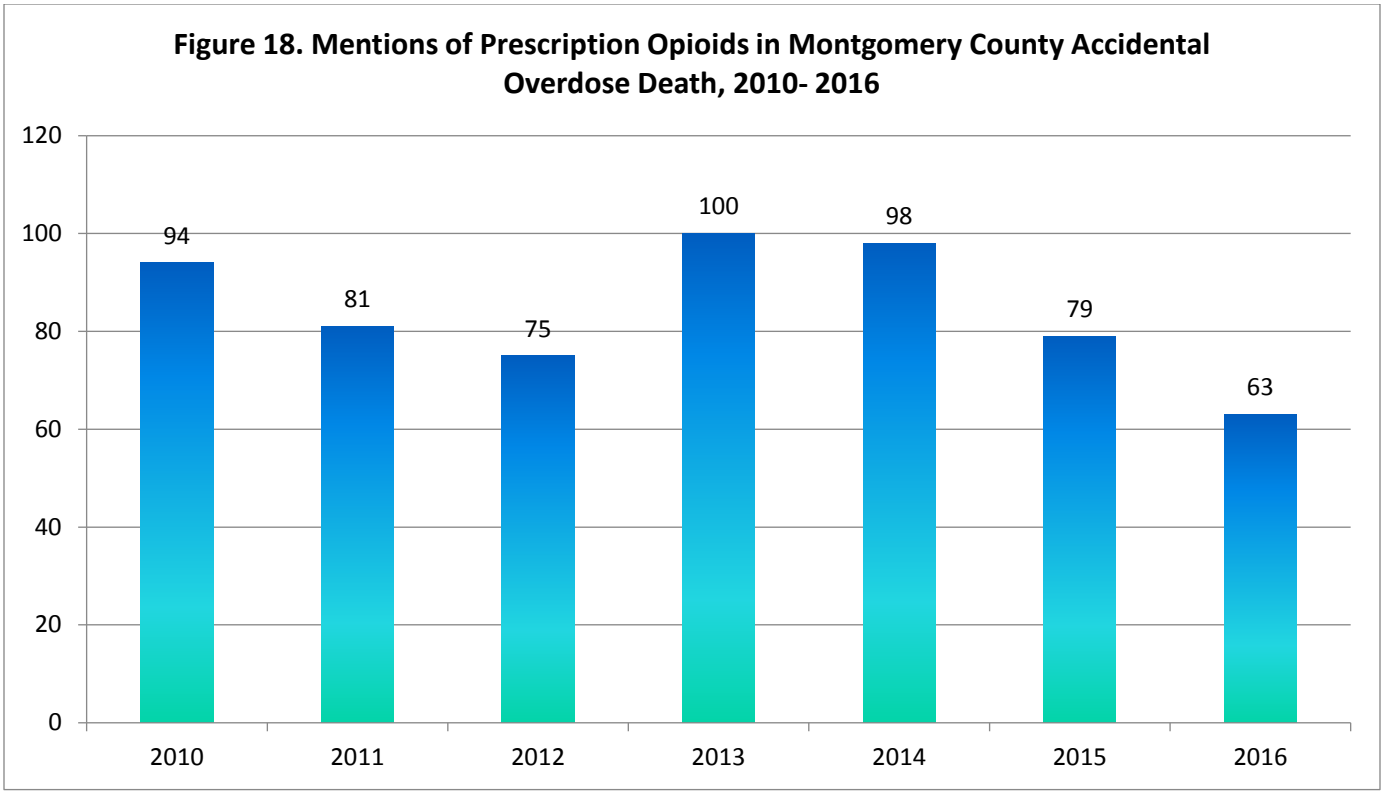
	Category	n	%
1.	Acetyl Fentanyl	2	6.3
2.	Acryl Fentanyl	1	3.1
3.	Butyryl/Isobutyryl Fentanyl	1	3.1
4.	Butyryl Norfentanyl	1	3.1
5.	Carfentanil	2	0.6
6.	Despropionyl Fentanyl	20	62.5
7.	Despropionyl Fluorofentanyl	1	3.1
8.	Fluorobutyrylfentanyl / Fluoroisobutyrylfentanyl	1	3.1
9.	Furanylfentanyl	23	71.9
10.	Furanyl Norfentanyl	3	9.4

Other Synthetic Opioids

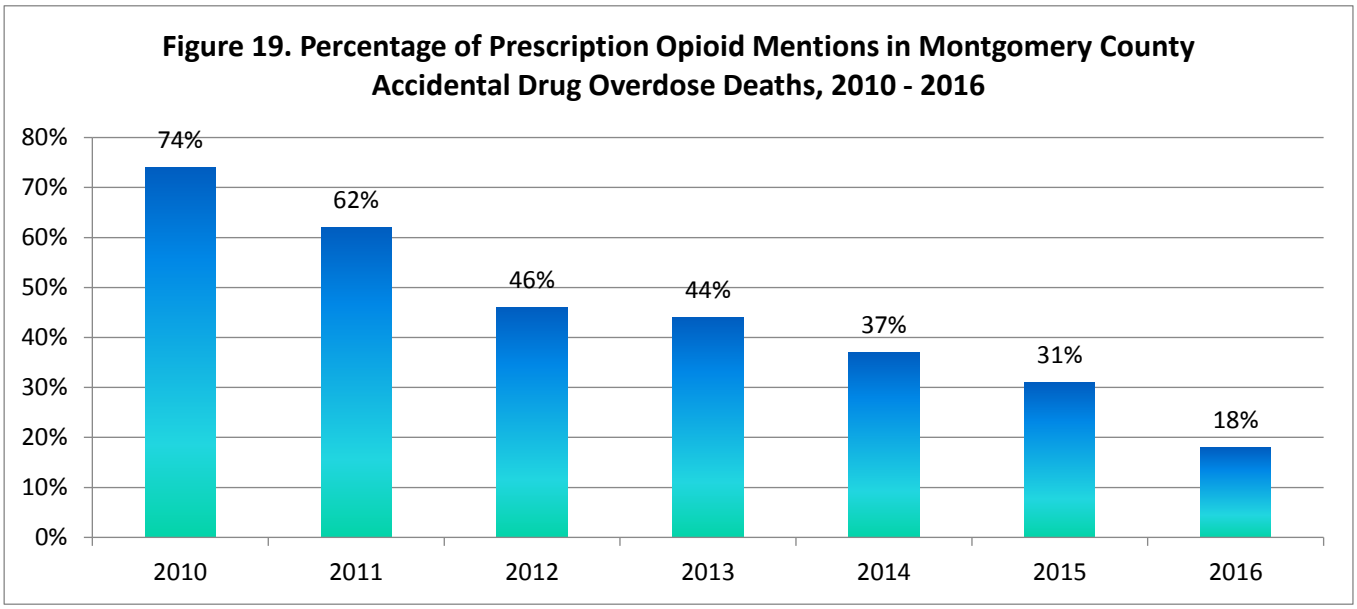
U47700. Four decedents had mentions of U47700 present in their toxicology reports. U47700 is an opioid analgesic developed at Upjohn in the 1970s. It has no medical use. It is made in clandestine labs, and it is sold on the Dark Web.

IX. Prescription Opioids

Pharmaceutical opioids (drugs such as hydrocodone, fentanyl, oxycodone, or methadone used to treat pain) continue to be a significant, but declining, factor in unintentional drug overdose deaths in Montgomery County. At least one prescription opioid was mentioned in 63 cases in 2016, dropping 20.3% from 79 mentions in 2015 (See Figure 18). The 63 cases with pharmaceutical opioids present in 2016 is the lowest recorded since 2010.

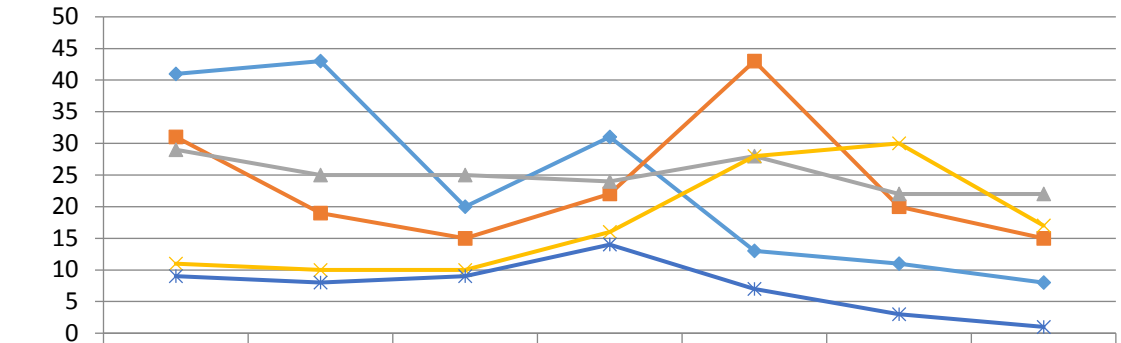


The *percentage* of prescription opioid mentions in Montgomery County's overall accidental drug overdose deaths decreased for the sixth straight year, decreasing from 31% in 2015 to 18% in 2016 (see Figure 19). The presence of pharmaceutical opioids in unintentional drug overdose cases dropped by 33%, from 94 mentions in 2010 to 63 mentions in 2016.



Mentions of selected pharmaceutical opioids in toxicology reports all declined from 2015 to 2016, except for oxycodone that remained the same at 22. (see Figure 20) The largest decrease was for morphine which declined from 30 mentions in 2015 to 17 in 2016. Only one mention of prescription fentanyl was noted, the lowest number recorded.

Figure 20. Mentions of Selected Pharmaceutical Opioids in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

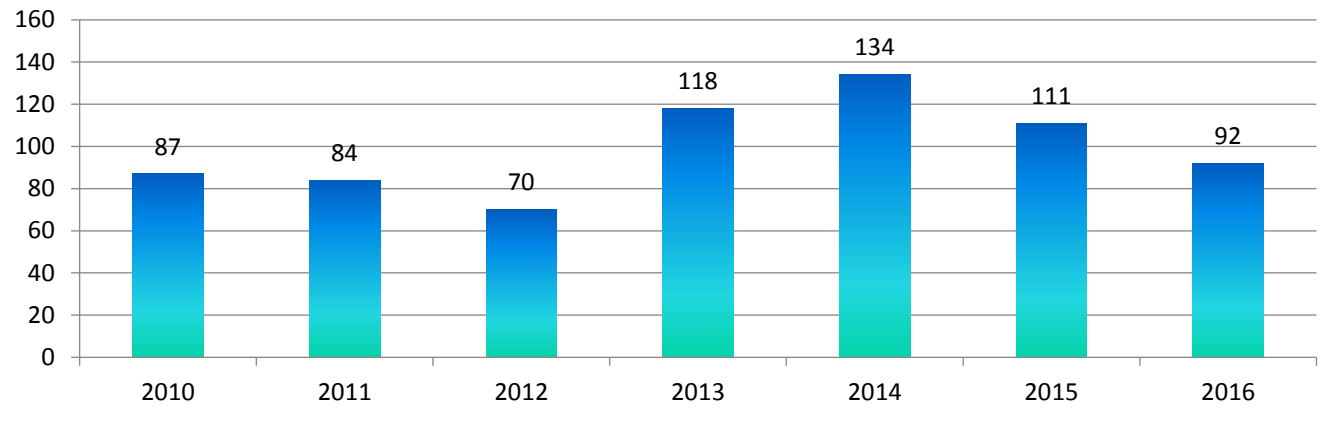


	2010	2011	2012	2013	2014	2015	2016
methadone	41	43	20	31	13	11	8
hydrocodone	31	19	15	22	43	20	15
oxycodone	29	25	25	24	28	22	22
morphine	11	10	10	16	28	30	17
rx fentanyl	9	8	9	14	7	3	1

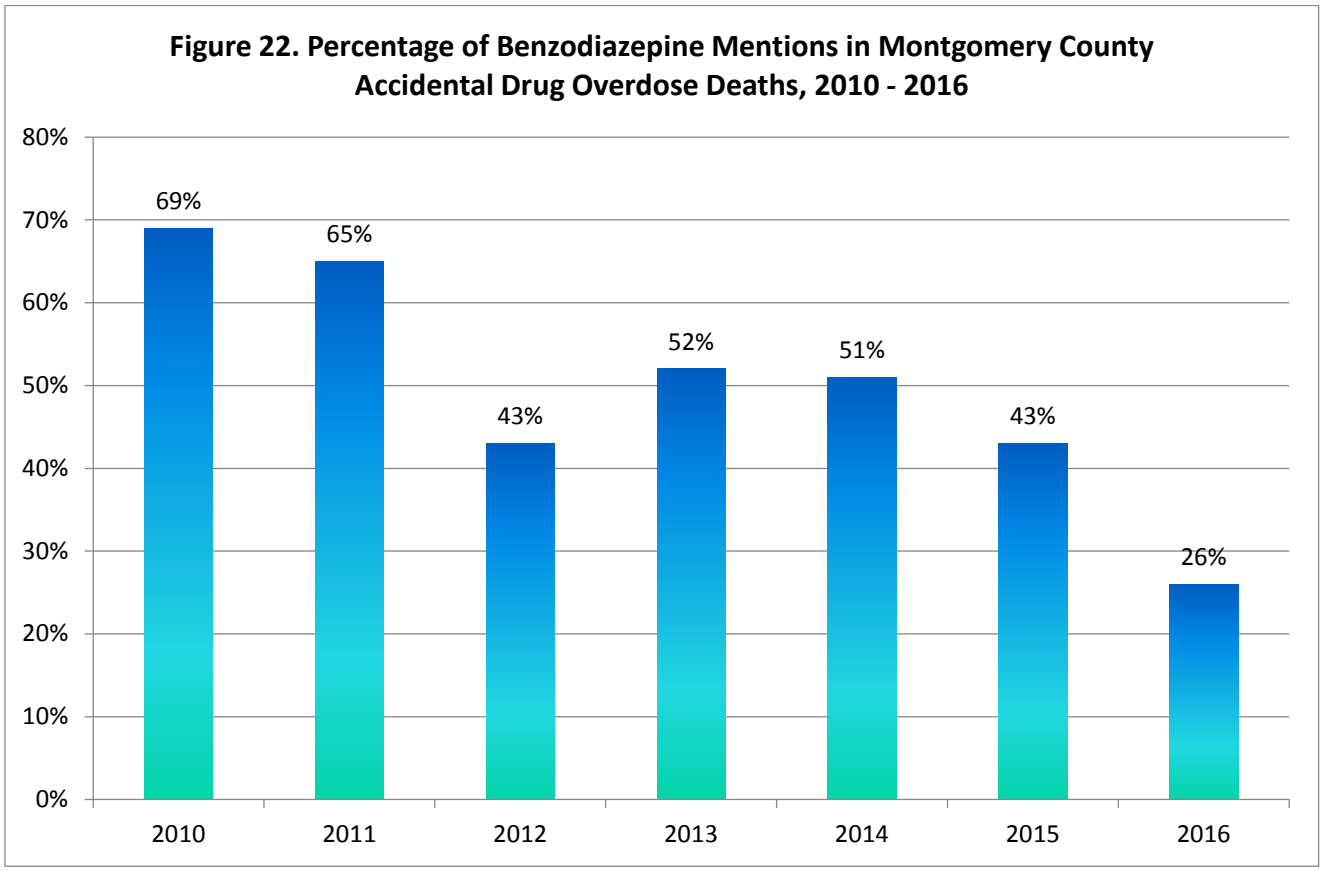
X. Benzodiazepines

The number of mentions of benzodiazepines (drugs used to treat anxiety) dropped from 111 in 2015 to 92 in 2015. (see Figure 21)

Figure 21. Mentions of Benzodiazepines in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

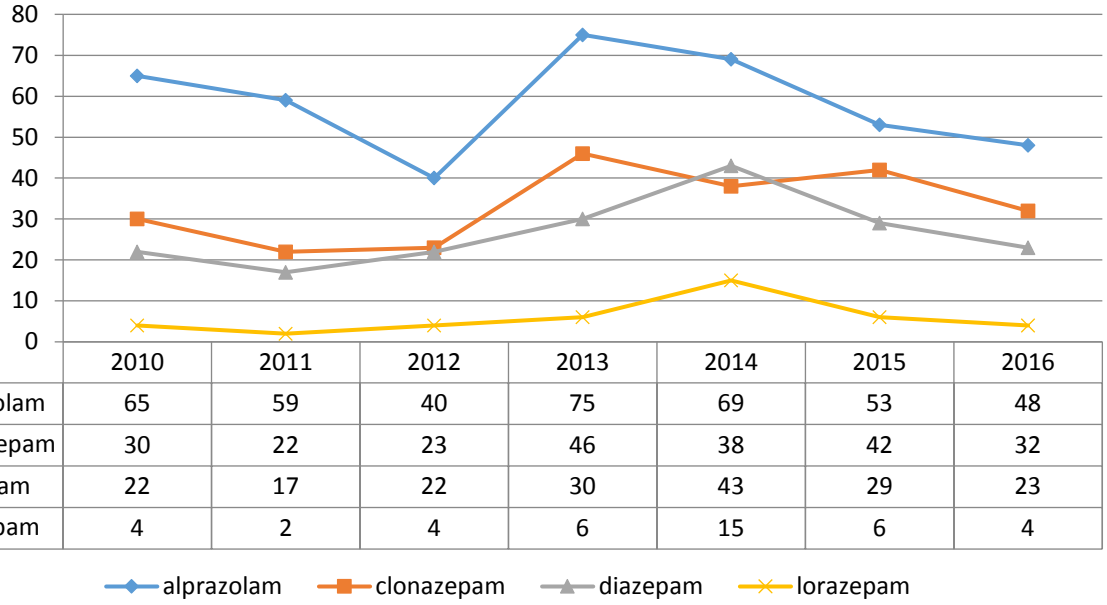


In 2016, the *percentage* of benzodiazepine mentions in Montgomery County's overall accidental drug overdose deaths decreased from 43% in 2015 to 26% in 2016. (see Figure 22) Overall, the percentage of benzodiazepine mentions decreased from 69% in 2010 to 26% in 2016.



Mentions of specific benzodiazepines decreased from 2015 to 2016. (see Figure 23) Alprazolam remained the most commonly mentioned, ranging from a high of 75 mentions in 2013 to a lows of 40 in 2012 and 48 in 2016, followed by clonazepam, diazepam, and lorazepam.

Figure 23. Mentions of Selected Benzodiazepines in Montgomery County Accidental Overdose Deaths, 2010 - 2016

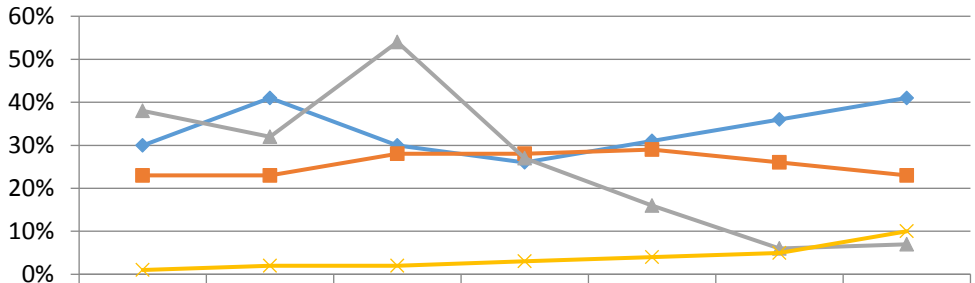


	2010	2011	2012	2013	2014	2015	2016
alprazolam	65	59	40	75	69	53	48
clonazepam	30	22	23	46	38	42	32
diazepam	22	17	22	30	43	29	23
lorazepam	4	2	4	6	15	6	4

XI. Cocaine, Alcohol, Methamphetamine, and Anti-Depressants

Cocaine mentions increased from 36% in 2015 to 41% in 2016. (see Figure 24) The percentage of **alcohol** mentions decreased from 26% in 2015 to 23% in 2016. Since 2010, **anti-depressants** (such as citalopram (Celexa) and amitriptyline (Elavil), etc.), have generally fluctuated from 38% in 2010 to a high of 54% in 2012, to lows of 6% in 2015 and 7% in 2016. The percentage of **methamphetamine** mentions has been low since 2010 with 1% of decedents testing positive, but has increased slowly. Methamphetamine mentions increased from 5% in 2015 to 10% in 2016.

Figure 24. Percentage Mentions of Cocaine, Alcohol, and Anti-Depressants in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

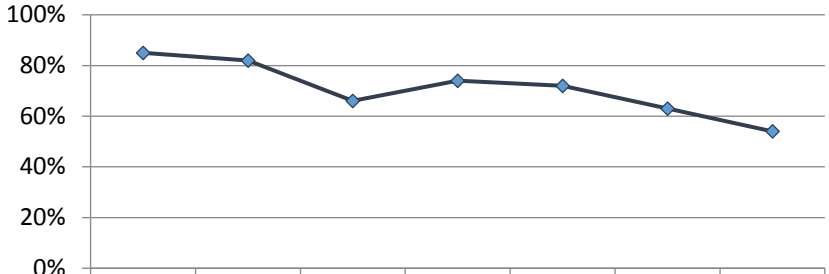


	2010	2011	2012	2013	2014	2015	2016
cocaine	30%	41%	30%	26%	31%	36%	41%
alcohol	23%	23%	28%	28%	29%	26%	23%
anti depressants	38%	32%	54%	27%	16%	6%	7%
Methamphetamine	1%	2%	2%	3%	4%	5%	10%

XII. Multiple CNS Depressants

More than one CNS depressant: Percents. The concurrent or simultaneous use of drugs that depress the CNS, such as alcohol, prescription opioids, sedatives (including benzodiazepines), illicit fentanyl and/or heroin, increases the risk of overdose death from respiratory depression. In 2016 the percent of decedents who had two or more CNS depressant drugs in their systems at the time of death decreased to 54%--the lowest since 2010. (see Figure 25) **Since 2010, the percent of decedents who had two or more CNS depressant drugs in their systems at the time of death decreased from 85% in 2010 to 54% in 2016.** This decrease should be interpreted in the context of increases in illicit fentanyl related overdose deaths.

Figure 25. Percentage Mentions of Cases with More Than One Central Nervous System Depressant, 2010 - 2016

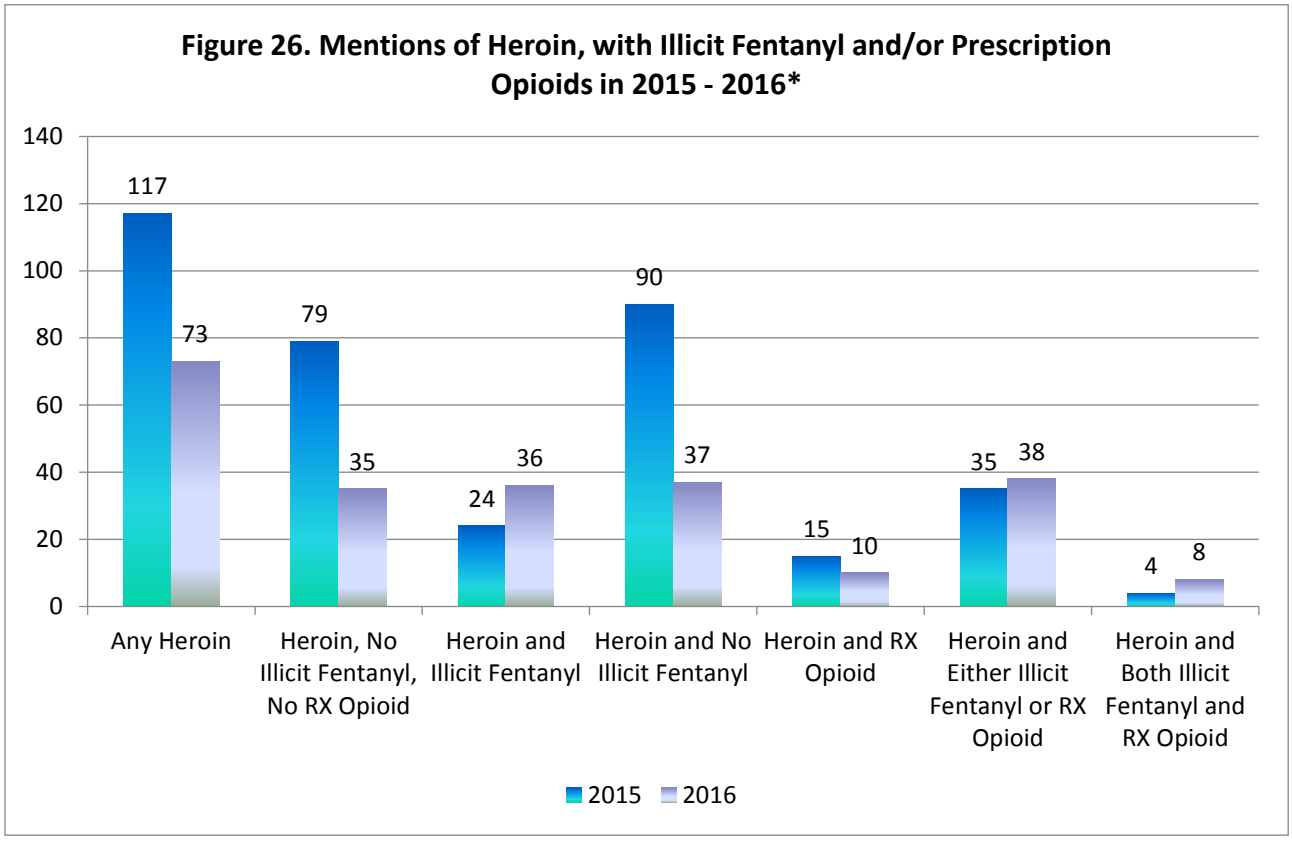


	2010	2011	2012	2013	2014	2015	2016
Multiple Central Nervous System Depressants	85%	82%	66%	74%	72%	63%	54%

XIII. Heroin, Illicit Fentanyl, and Prescription Opioid Combinations*

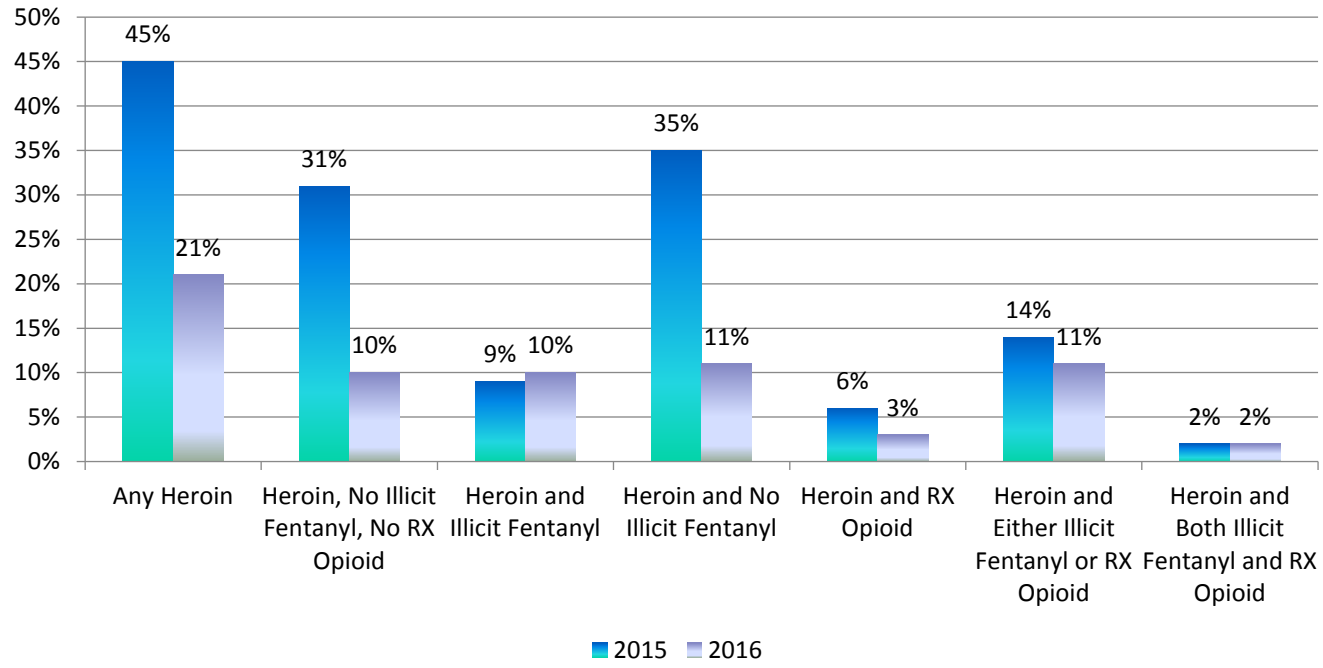
Heroin, illicit fentanyl or prescription opioid combinations: Mentions. Figure 26 shows several heroin/illicit fentanyl combinations in 2015 and 2016. **The number of heroin mentions with no illicit fentanyl or prescription opioids decreased from 79 in 2015 to 35 in 2016. The number of heroin plus illicit fentanyl mentions increased from 24 in 2015 to 36 in 2016.** Heroin plus prescription opioid mentions combined declined from 15 in 2015 to 10 in 2016. Heroin and either illicit fentanyl and/or prescription opioid combinations increased slightly from 35 in 2015 to 38 in 2016. Heroin with no illicit fentanyl cases declined dramatically from 90 in 2015 to 37 in 2016, a decline of 60%.

***Note "Illicit fentanyl" in this Section refers to "Illicit fentanyl and/or fentanyl analogues/metabolites."**



Heroin, illicit fentanyl or prescription opioid combinations: Percentages. The percentage of heroin mentions with no illicit fentanyl or prescription opioids decreased from 31% in 2015 to 10% in 2016. (See Figure 27) The percentage of heroin and no illicit fentanyl cases also declined substantially, from 35% in 2015 to 11% in 2016. Heroin and illicit fentanyl cases increased one percent from 9% in 2015 to 10% in 2016, and heroin with both illicit fentanyl and prescription opioids stayed the same at 2%.

Figure 27. Percentage of Mentions of Heroin, Illicit Fentanyl, and Prescription Opioid Combinations in 2015 - 2016*

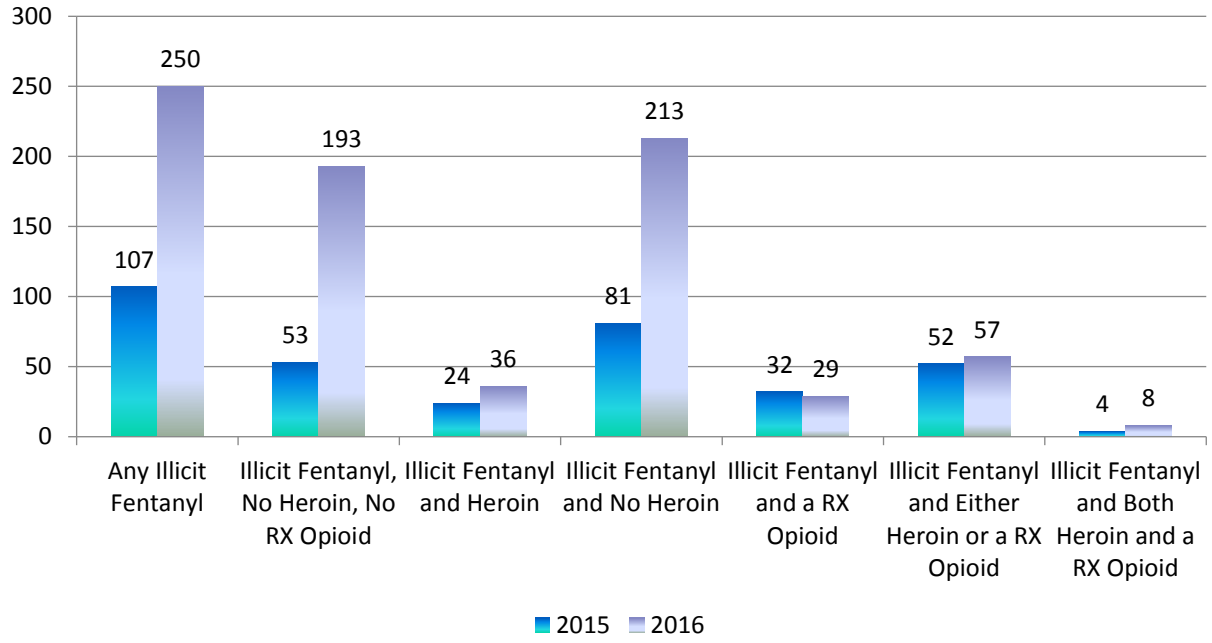


XIV. Illicit Fentanyl, Heroin, and Prescription Opioid Combinations*

***Note "illicit fentanyl" in this Section refers to "Illicit fentanyl and/or fentanyl analogues/metabolites."**

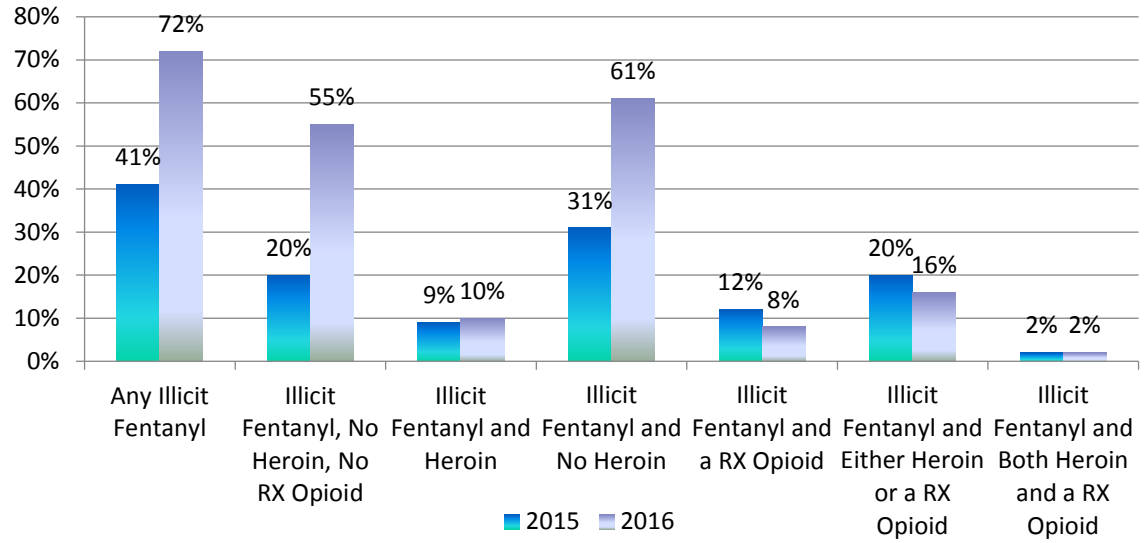
Illicit fentanyl, heroin and prescription opioid combinations: Mentions. Illicit fentanyl with no heroin or prescription opioid mentions increased substantially from 53 in 2015 to 193 in 2016, a 264% increase (see Figure 28). Cases with illicit fentanyl and no heroin also increased substantially from 81 in 2015 to 213 in 2016, a 163% increase. Illicit fentanyl plus heroin mentions increased from 24 in 2015 to 36 in 2016.

Figure 28. Mentions of Illicit Fentanyl with Heroin and Prescription Opioids in 2015 - 2016



Illicit fentanyl, heroin and prescription opioid combinations: Percentages. The percentage of **illicit fentanyl and/or fentanyl analogue/metabolite mentions — with no heroin or prescription opioid mentions present — increased from 20% in 2015 to 55% in 2016.** (see Figure 29) Similarly, the percentage of illicit fentanyl and/or fentanyl analogue/metabolite mentions and no heroin mentions increased from 31% in 2015 to 61% in 2016. Cases with illicit fentanyl and heroin present stayed about the same: 2015, 9%; 2016, 10%. Overall, these data suggest an increasing role of illicit fentanyl, that has not been combined with use of heroin or prescription opioids, in unintentional drug overdose deaths.

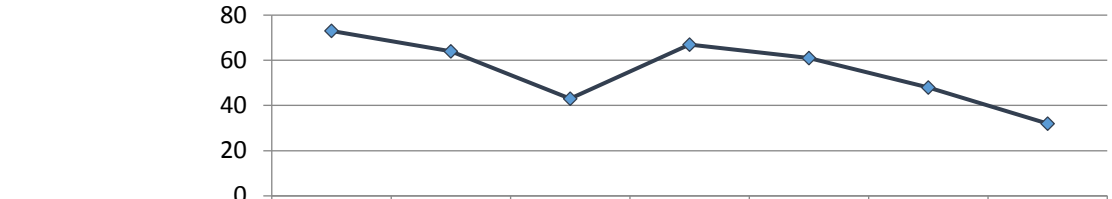
Figure 29. Percentage of Mentions of Illicit Fentanyl with Heroin and Prescription Opioids in 2015 - 2016



XV. Benzodiazepines in Combination with Other Drugs

Figure 30 shows the trend for decedents who had mentions of both a prescription opioid and a benzodiazepine. This combination dropped to its lowest level from 73 mentions in 2010 to 32 mentions in 2016.

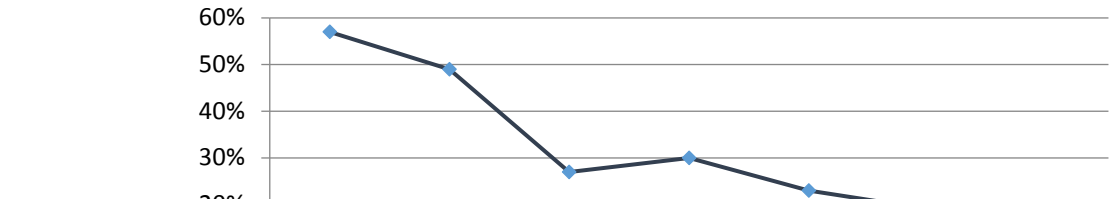
Figure 30. Cases with Prescription Opioid and a Benzodiazepine Mention in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016



	2010	2011	2012	2013	2014	2015	2016
Prescription Opioid and Benzodiazepine	73	64	43	67	61	48	32

The percentage of cases with both a prescription opioid and a benzodiazepine present declined to 9% of all deaths—its lowest level since 2010. (see Figure 31) The percentage of cases with both a benzodiazepine and a prescription opioid present in toxicology reports declined from 57% in 2010 to 9% in 2016. This is a positive finding.

Figure 31. Percentage of Cases with Both a Prescription Opioid and a Benzodiazepine in Montgomery County Accidental Drug Overdose Deaths, 2010 - 2016

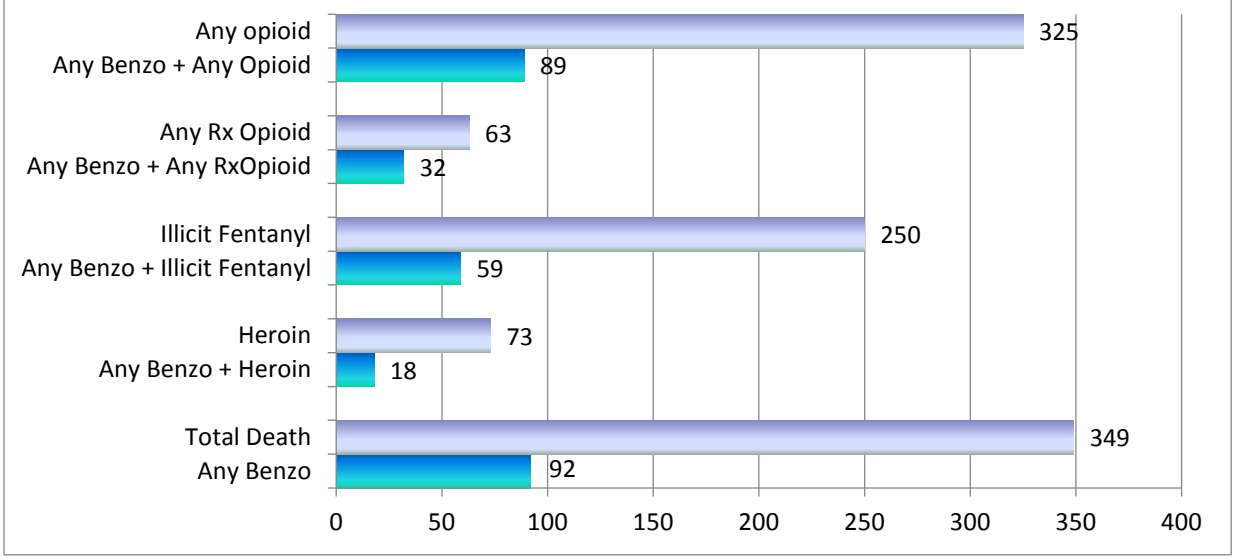


	2010	2011	2012	2013	2014	2015	2016
Prescription Opioid and Benzodiazepine	57%	49%	27%	30%	23%	19%	9%

Combinations of Benzodiazepines With Other Opioids: Mentions.

Figure 32 shows the numbers of decedents who tested positive for any benzodiazepine (92) and benzodiazepines plus opioid combinations. Out of the 325 deaths with any opioid present, 89 had a benzodiazepine present as well. Among the 63 decedents with a prescription opioid present, 32 also had a benzodiazepine mention. Among the 73 decedents with heroin mentions, 18 also had at least one benzodiazepine mention, and 59 of the 250 decedents with illicit fentanyl mentions also had a benzodiazepine present. Note that 96.7% of the decedents who died with a benzodiazepine present (92) also had at least one opioid present (89).

Figure 32. Mentions of Benzodiazepines in Combination with Heroin, Illicit Fentanyl , Prescription Opioids and Any Opioids. 2016

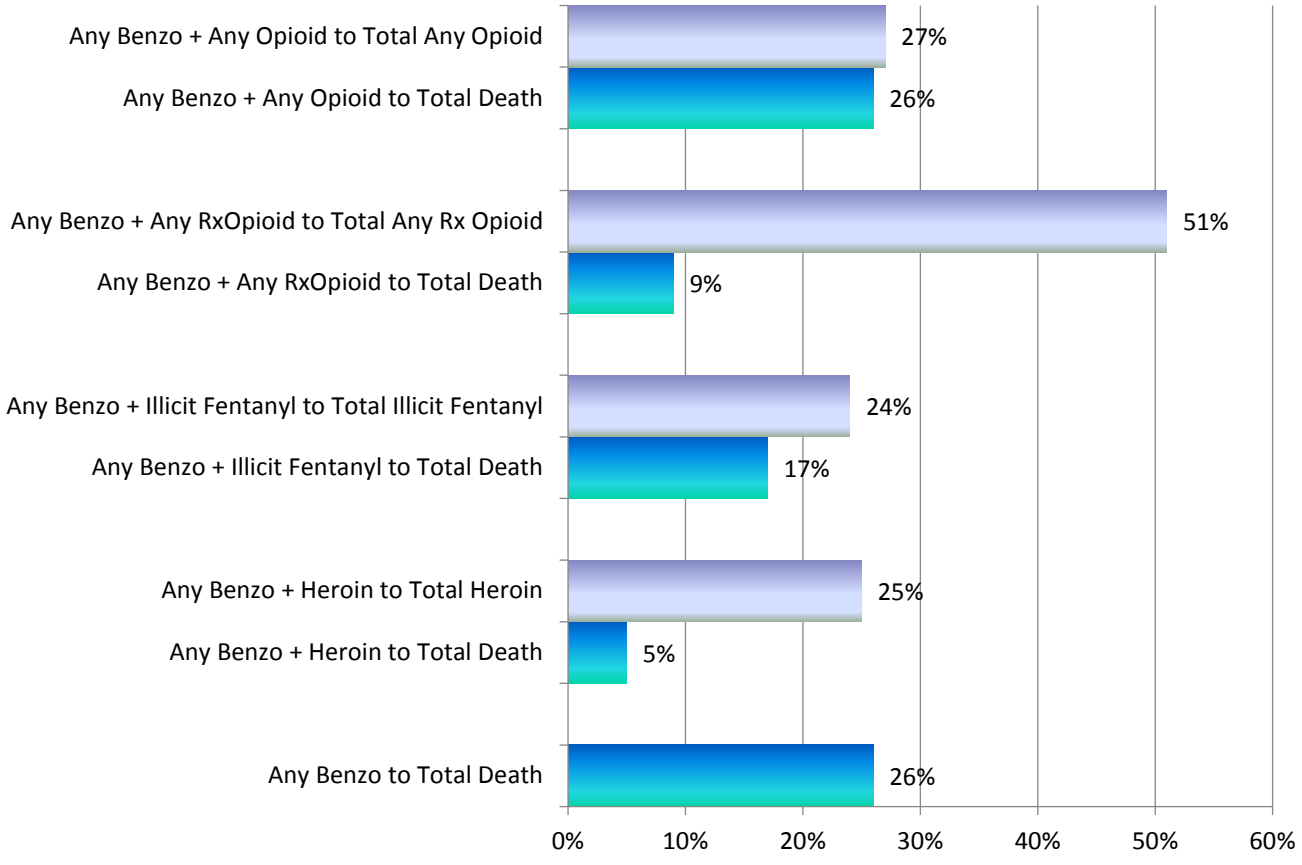


Combinations of Benzodiazepines with Other Opioids: Percentages

Figure 33 shows percentages of benzodiazepine mentions in combination with other drugs based on: 1) the total number of unintentional drug overdose deaths; and 2) percentages calculated in terms of the total number of specific drug mentions. For example, benzodiazepines and any opioid mentions appeared in 26% of all 349 overdose deaths. The percent increases slightly to 27% when calculating the percentage based on the number of deaths involving any opioid (325). Among decedents with any prescription opioid present (63), 51% (32) also had a benzodiazepine present, but the percent declines to 9% of all overdose deaths. Among cases where illicit fentanyl was present (250), about a fourth (59) (24%) also had a benzodiazepine present. Similarly, 25% (18) of decedents who had heroin mentioned (73) also had a benzodiazepine present, although this percent declines to 5%, relative to all overdose deaths.

Examining benzodiazepine mentions in combination with major opioid categories and calculating relative percentages by opioid category (in comparison with percentages based on the total number of deaths) provides an alternative way to describe the significance of this drug in unintentional drug overdose deaths. Benzodiazepine abuse remains an important contributor in many drug overdose deaths. Preventing use of multiple central nervous system depressants continues to be an urgent priority.

Figure 33. Percentage of Mentions of Benzodiazepines with Heroin, Illicit Fentanyl, Prescription Opioids or Any Opioids: Percents by Overall Deaths and by Drug Category. 2016



XVI. Opioid and Stimulant Combinations

Heroin and cocaine or methapmhetamine combined: Mentions. The number of decedents who had mentions of both cocaine and heroin (referred to as "speedball" among users), increased from a low of 15 in 2010 to highs of 50 in 2014 and 47 in 2015, but has decreased to 33 mentions in 2016. (see Figure 34) Methamphetamine plus heroin mentions increased from 5 in 2015 to 12 in 2016.

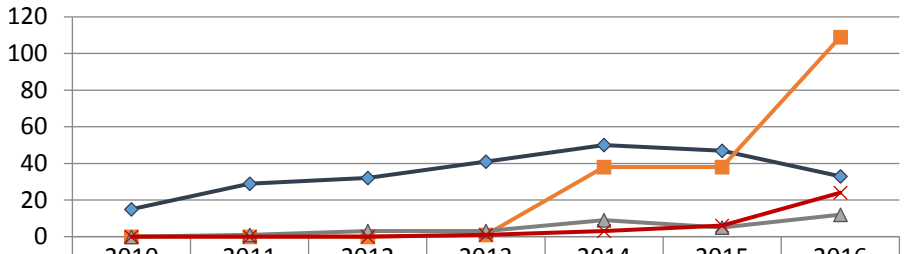
Heroin and cocaine or methamphetamine combined: Percents. Examining the *percentage* of cases in which cocaine and heroin were both present, there was an increase from 12% in 2010 to 22% in 2011 and 20% in 2012. (see Figure 35) The percent of methamphetamine plus heroin mentions has remained low ranging from 1% in 2011 to 3% in 2016.

Illicit Fentanyl (and/or analogues) and cocaine or methapmhetamine combined: Mentions. The number of decedents with both cocaine and illicit fentanyl and/or analogues increased from 38 in 2015 to 109 in 2016, a 187% increase. (see Figure 34) Metamphetamine plus illicit fentanyl mentions increased four times from 6 in 2015 to 24 in 2016.

Illicit Fentanyl (and/or analogues) and cocaine or methapmhetamine combined: Percents. The percentage of mentions of both cocaine and illicit fentanyl increased from 15% in 2015 to 31% in

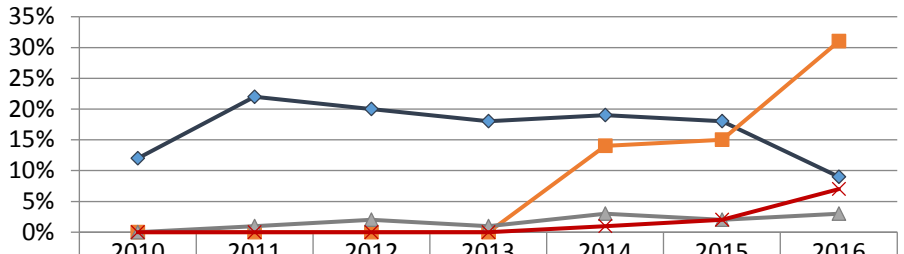
2016. The percent of mentions of illicit fentanyl plus methamphetamine increased from 2% in 2015 to 7% in 2016. (see Figure 35)

Figure 34. Mentions of Cocaine and Methamphetaminee with Heroin or Illicit Fentanyl in Montgomery County Overdose Deaths, 2010 - 2016



	2010	2011	2012	2013	2014	2015	2016
Cocaine and Heroin	15	29	32	41	50	47	33
Cocaine and Illicit Fentanyl	0	0	0	1	38	38	109
Methamphetamine and Heroin	0	1	3	3	9	5	12
Methamphetamine and Illicit Fentanyl	0	0	0	1	3	6	24

Figure 35. Percentage of Mentions of Cocaine and Methamphetamine with Heroin or Illicit Fentanyl in Montgomery County Overdose Deaths, 2010 - 2016



	2010	2011	2012	2013	2014	2015	2016
Cocaine and Heroin	12%	22%	20%	18%	19%	18%	9%
Cocaine and Fentanyl	0%	0%	0%	0%	14%	15%	31%
Methamphetamine and Heroin	0%	1%	2%	1%	3%	2%	3%
Methamphetamine and Illicit Fentanyl	0%	0%	0%	0%	1%	2%	7%

XVII. Geocoded Unintentional Drug Overdose Deaths 2010 - 2016

We prepared choropleth maps to display the rates of overdose deaths by decedent's residence zip code for years 2010 through 2016. We also prepared one map for 2016 based on zip code where event occurred to illustrate the differences between rates based on zip code of residence and zip code of event location.

To produce these maps, the decedent's residence address and the address where the overdose occurred were first geoprocessed using ArcGIS 10.3 (ESRI, 2014) to locate the addresses inside their corresponding zip code. Based on these geolocated data, the rate of overdose deaths per 1,000 habitants for each Montgomery County zip code were calculated based on the 2015 U.S. Census data.

Concerning Map 2 (rates based on event location), some cases were geolocated in hospitals, which creates a bias in the spatial analysis. To address this issue, we searched through case investigation notes for indications regarding the location where the decedents were found unresponsive. If such indications were found, we modified the Overdose Event Address accordingly; if not, the cases were removed from our analysis. On the 67 individuals who died in a hospital, we were able to recover the location of 43 cases. The remaining 24 cases were discarded as the investigation notes were too vague or imprecise to locate them accurately.

Rates for years 2010 through 2016 based on rates by residence zip code are shown in Maps 1 (2016 data) and 3 (2015 data) through Map 8 (2010 data), and are based on the residence address of the decedents (Residence Address). Comparison of rates in each zip code over the years shows the evolution of the opioid epidemics in space over time. Geospatial data also provides a range of opportunities for analysis.

Tables 2 and 3 show rates of overdose death per 1000 ranked by zip code in 2016 and 2010. In 2010, overdose deaths among Montgomery County residents occurred in 23 zip codes, compared to 29 zip codes in 2016. In 2010, the highest overdose death rate per 1000 was .907912, compared to a high of 1.3718318 in 2016.

Table 2. Overdose Death Rate per 1,000 by Zip Code of Residence, 2016. (n=306)

	Zip Code	Resident City	Population (2015)	OD Deaths	Death Rate per 1,000
1.	45417	Dayton	30616	42	1.3718318
2.	45403	Dayton	15420	21	1.3618677
3.	45404	Dayton	10473	14	1.3367708
4.	45402	Dayton	11631	15	1.2896570
5.	45405	Dayton	19482	24	1.2319064
6.	45410	Dayton	16394	14	0.8539709
7.	45420	Dayton	23602	19	0.8050165
8.	45439	Dayton	11364	9	0.7919747
9.	45345	New Lebanon	6573	5	0.7606876
10.	45449	Dayton	19137	13	0.6793123
11.	45342	Miamisburg	35795	24	0.6704847
12.	45414	Dayton	21408	14	0.6539611
13.	45406	Dayton	20193	12	0.5942653
14.	45431	Dayton	27221	15	0.5510451
15.	45415	Dayton	12281	6	0.4885596
16.	45426	Dayton	15700	7	0.4458599
17.	45416	Dayton	5663	2	0.3531697
18.	45322	Englewood	20286	7	0.3450656
19.	45424	Dayton	49873	16	0.3208149
20.	45419	Dayton	16014	5	0.3122268
21.	45327	Germantown	8754	2	0.2284670
22.	45315	Clayton	4918	1	0.2033347
23.	45377	Vandalia	14786	3	0.2028946
24.	45429	Dayton	25064	5	0.1994893
25.	45440	Dayton	20848	3	0.1438987
26.	45459	Dayton	26918	3	0.1114496
27.	45458	Dayton	31723	3	0.0945686
28.	45309	Brookville	11535	1	0.0866927
29.	45432	Dayton	14781	1	0.0676544

(Zip code of residence unknown for 3 decedents.)

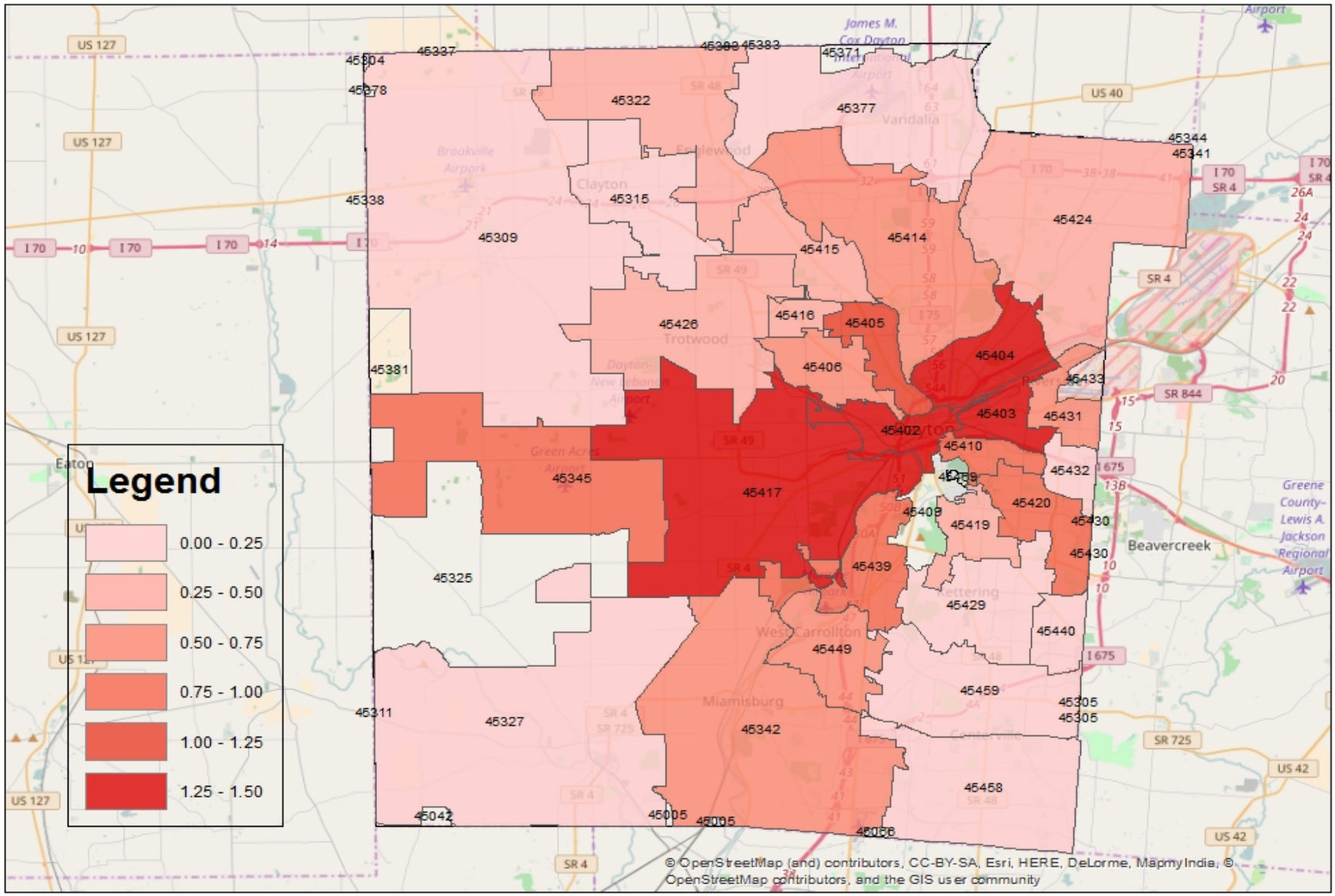
Table 3. Overdose Death Rate per 1,000 by Zip Code, 2010 (n=112)

	Zip Code	Resident City	Population (2015)	OD Deaths	Death Rate per 1,000
1.	45403	Dayton	15420	14	0.907912
2.	45325	Farmersville	2663	2	0.751033
3.	45410	Dayton	16394	11	0.670977
4.	45377	Vandalia	14786	5	0.338158
5.	45449	Dayton	19137	6	0.313529
6.	45420	Dayton	23602	7	0.296585
7.	45322	Englewood	20286	6	0.295771
8.	45404	Dayton	10473	3	0.286451
9.	45402	Dayton	11631	3	0.257931
10.	45405	Dayton	19482	5	0.256647
11.	45414	Dayton	21408	5	0.233558
12.	45327	Germantown	8754	2	0.228467
13.	45342	Miamisburg	35795	8	0.223495
14.	45431	Dayton	27221	6	0.220418
15.	45424	Dayton	49873	10	0.200509
16.	45419	Dayton	16014	3	0.187336
17.	45417	Dayton	30616	5	0.163313
18.	45429	Dayton	25064	4	0.159592
19.	45406	Dayton	20193	2	0.099044
20.	45459	Dayton	26918	2	0.0743
21.	45432	Dayton	14781	1	0.067654
22.	45426	Dayton	15700	1	0.063694
23.	45458	Dayton	31723	1	0.031523

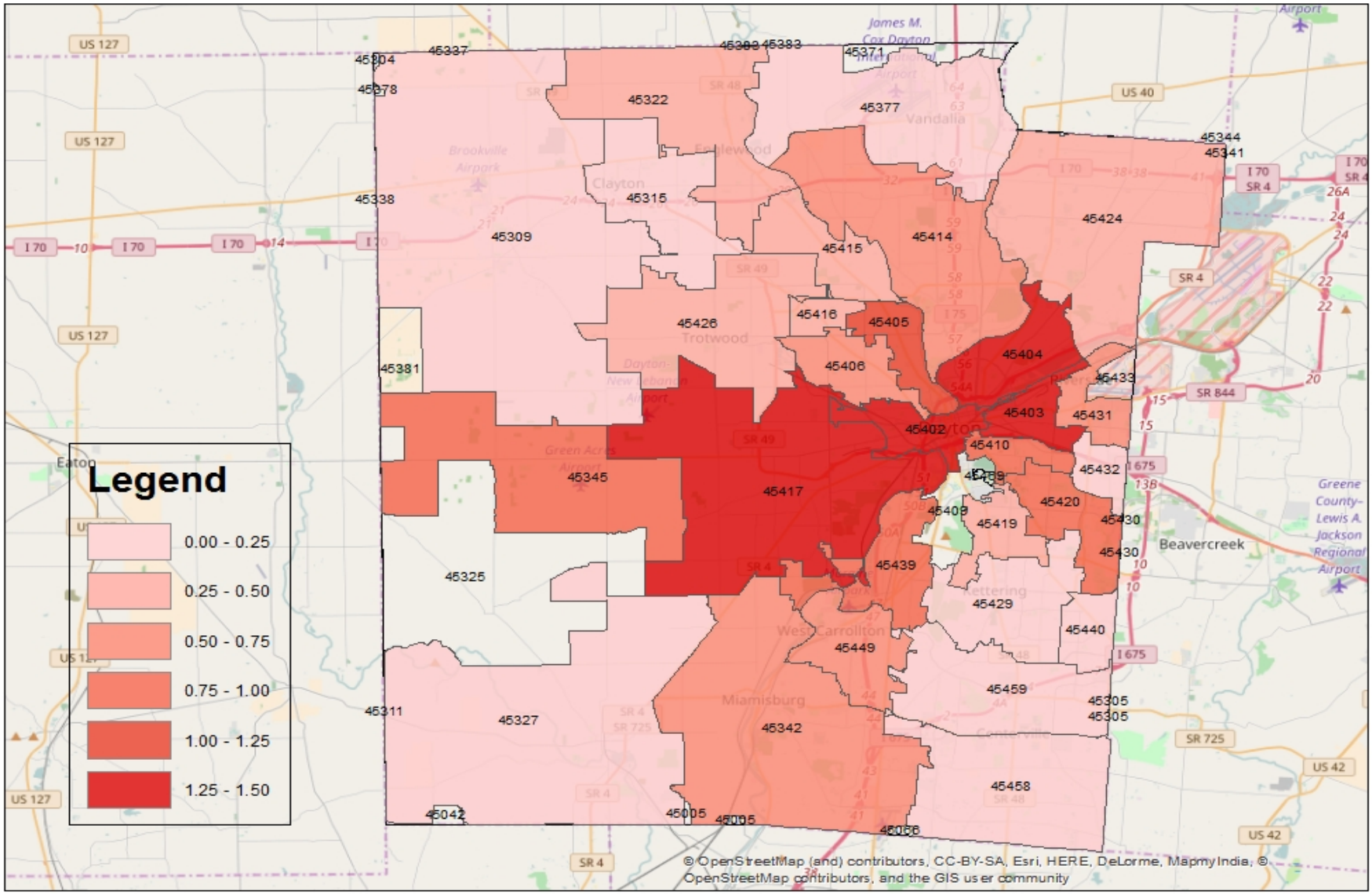
Table 4 shows the five zip codes with the highest overdose death rates per 1000 (45417, 45402, 45403, 45404 45405) in 2016 with corresponding rates in 2010. Together, the overdose deaths in these zip codes account for 38% (116) of the overdose deaths among Montgomery County residents in 2016 (n=306). The same zip codes account for 24% (30) of the overdose deaths among Montgomery County residents in 2010 (n=126). The highest overdose death rate per 1000 in 2010 was .907912 in zip code 45403, compared to 1.3618677 in 2016. In 2016, the zip code with the highest overdose death rate per 1000 was 45417 (1.3718318), compared to .163313 in 2010.

Table 4. Comparison of rates of overdose deaths based on residence among top five zip codes in 2016 with corresponding rates in 2010.

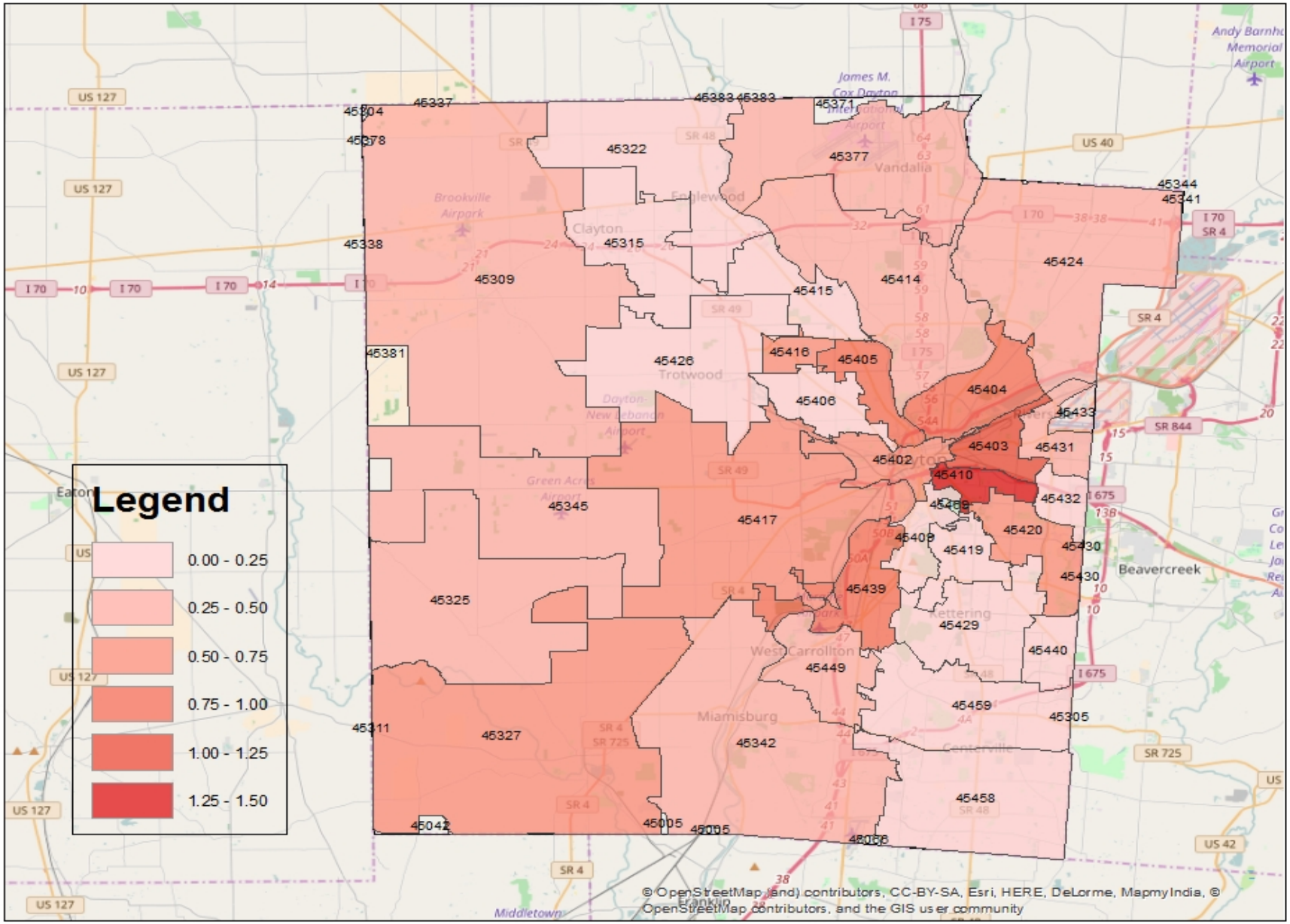
Zip	2016	OD Deaths	2010	OD Deaths
45517	1.3718318	42	.163313	5
45403	1.3618677	21	.907912	14
45404	1.3367708	14	.286451	3
45402	1.2896570	15	.257931	3
45405	1.2319064	24	.256647	5



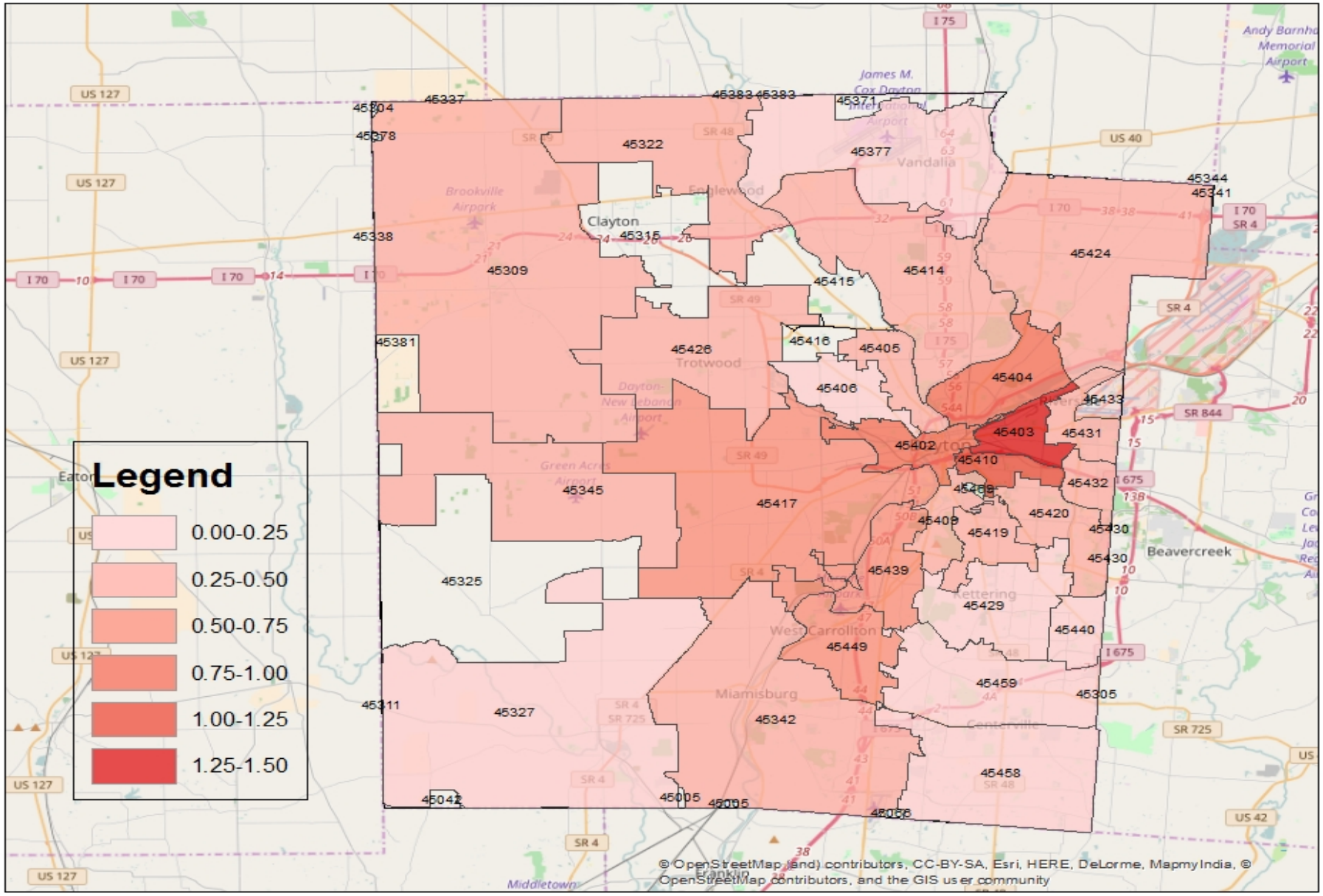
Map 1. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2016.



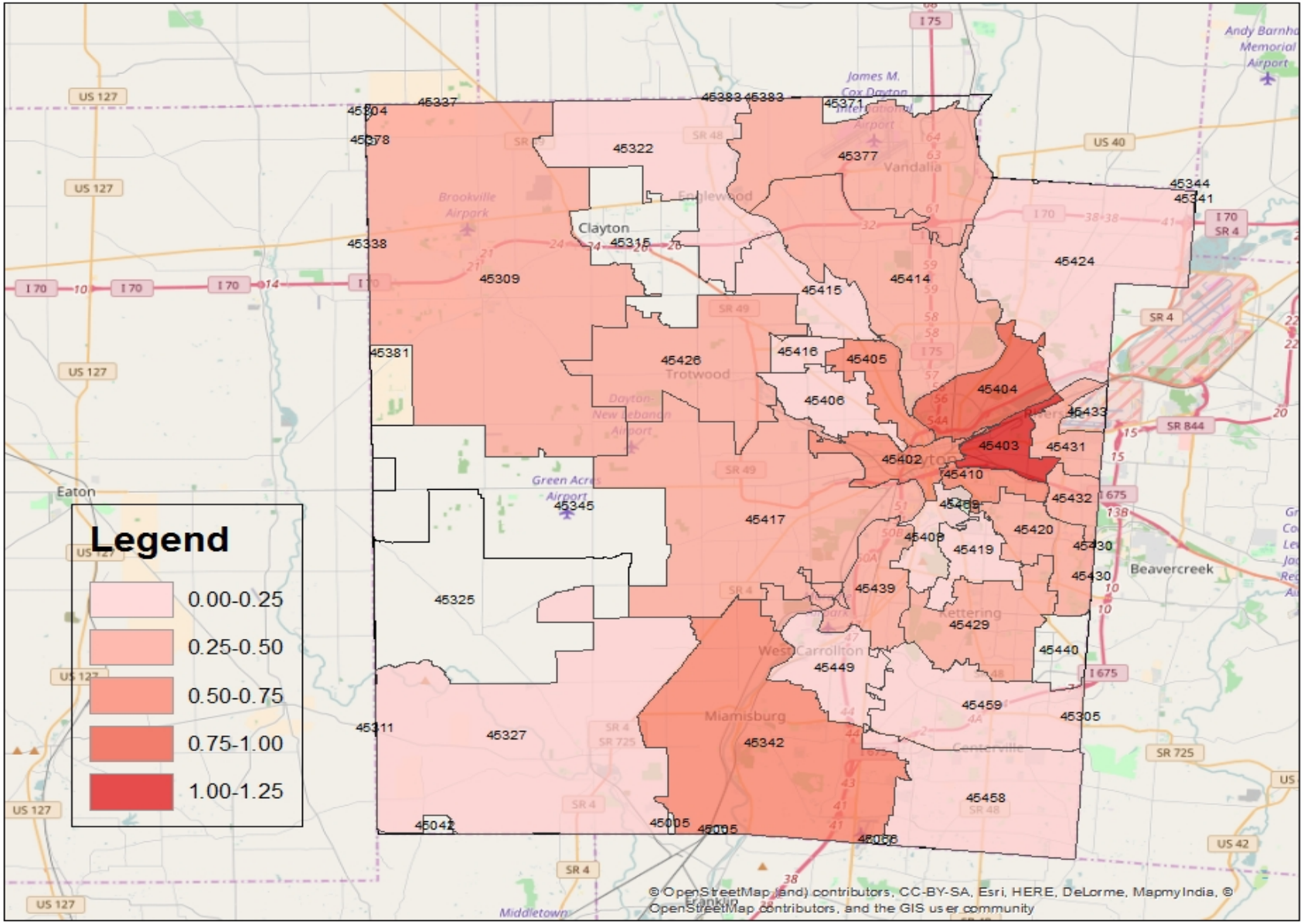
Map 2. Rate of Drug Overdose Deaths Based on Overdose Event Address per 1,000 Inhabitants, 2016



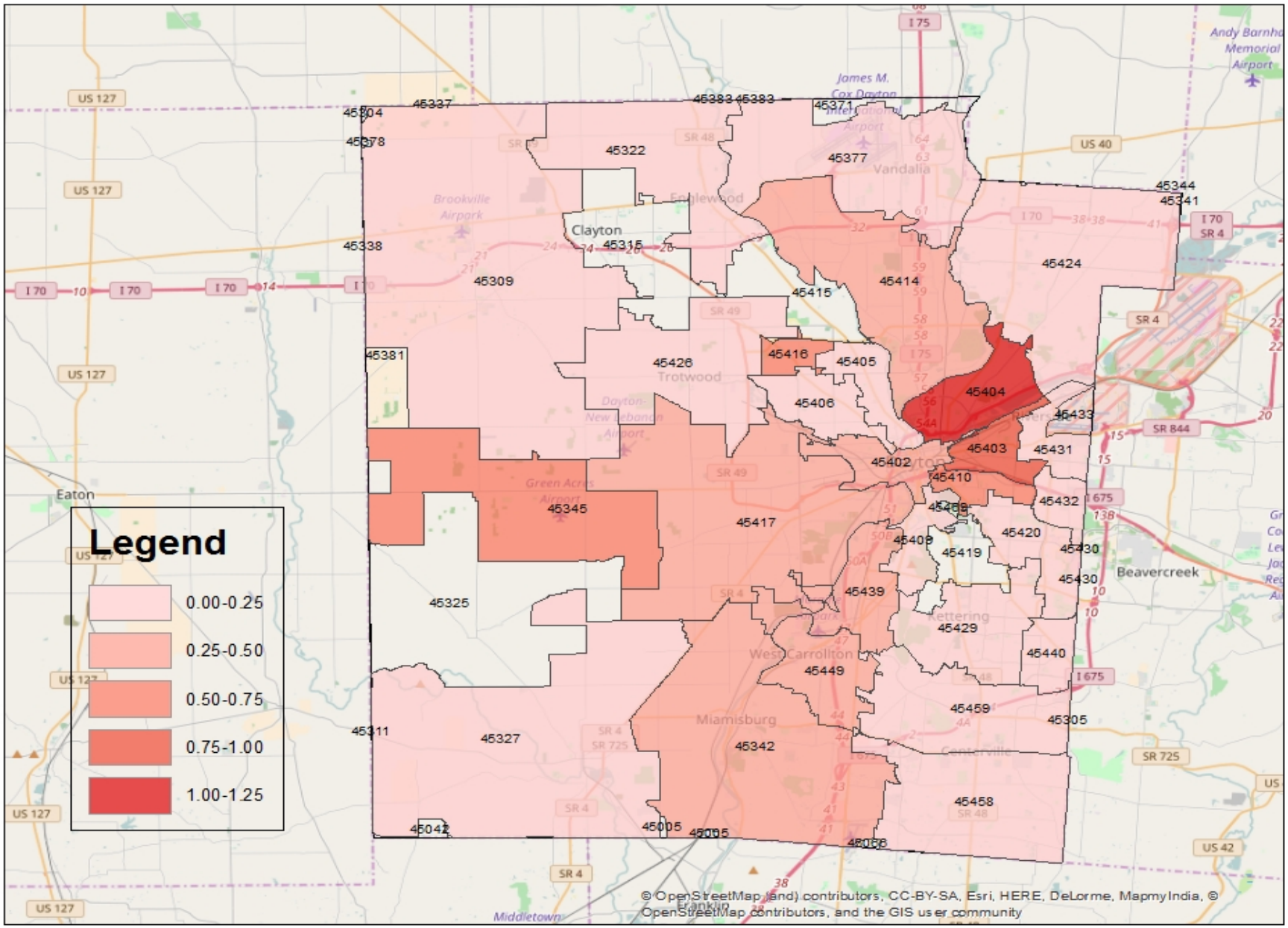
Map 3. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2015.



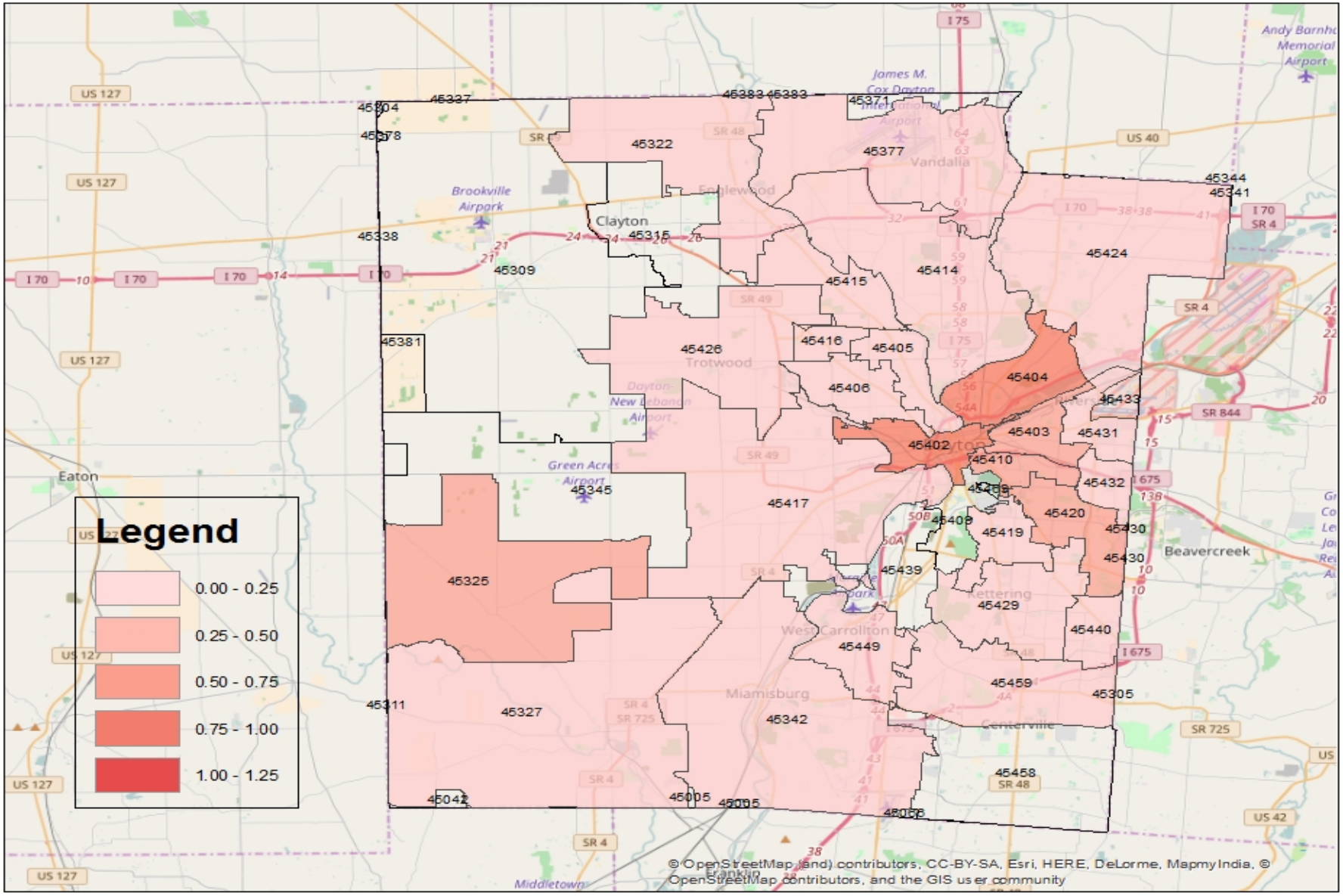
Map 4. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2014.



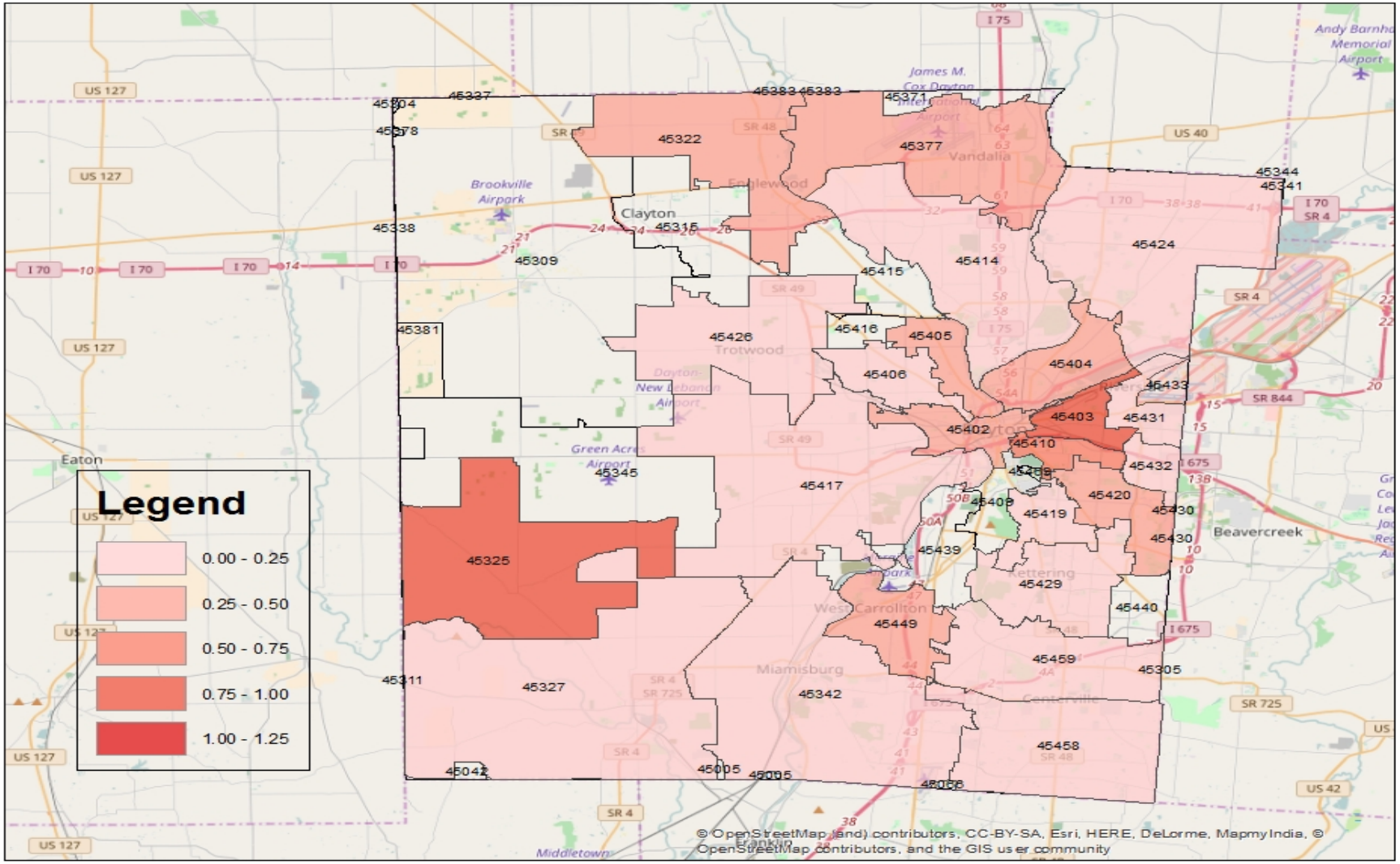
Map 5. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2013.



Map 6. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2012.



Map 7. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2011.



Map 8. Rate of Drug Overdose Deaths Based on Residence Address per 1,000 Inhabitants, 2010.

XVIII. Naloxone (Narcan) Administration Data Compared to Drug Overdose Deaths

Naloxone (Narcan) is one of the most important public health, short-term interventions available to address the opioid epidemics. By reversing the effects of an opioid overdose, lives can be saved and opportunities can be provided to survivors to seek drug abuse treatment. The Montgomery County community has taken multiple steps to increase the availability and use of naloxone.

Sources of naloxone administration data. Naloxone data were obtained from three sources: 1). The Dayton Police Department (DPD) (Lieutenant James Mullins); 2). The Ohio Department of Public Safety, Division of Emergency Medical Services, EMS Incident Reporting System. Research Request ID # DCR 16-083 (Ryan Frick); and 3) the Dayton Fire Department (David Gerstner). **The number of naloxone administrations reported here are only for drug overdoses in Montgomery County in 2016**. In addition, only Naloxone administrations clearly indicated for drug overdoses are included.

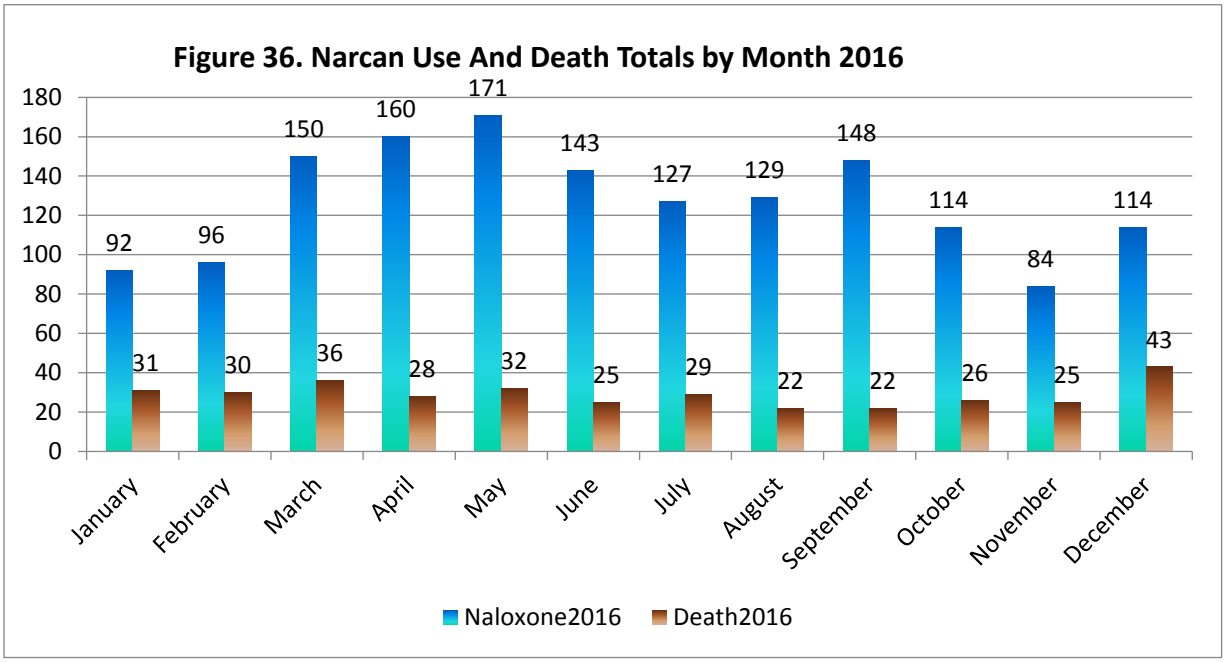
Limitations. The naloxone administration data from the Ohio Department of Publc Safety EMS reporting system are incomplete due to data collection and computer system issues. Data are complete for the first three Quarters of 2016. Data were received initially in January; in April, there was no change in status. The three main sources of data have some variations in data collection. For example, Dayton Police Department and EMS provide zip code of event while the Dayton Fire Department provides location by neighborhood. Number of naloxone doses was available from the Dayton Fire Department and the EMS. EMS will only provide a certain number of variables by individual to protect anonymity. As a result, race/ethnicity is aggregated so that the datasets cannot be combined. The Dayton Fire Department includes a variable on "suspected overdose" and a variable on number of "naloxone doses." There were cases where overdose was suspected, but zero doses of naloxone were administered. To be counted as a case of naloxone administration, only cases that were positive for suspected overdose and where the number of narcan doses was greater than one, were included in this Report.

Results

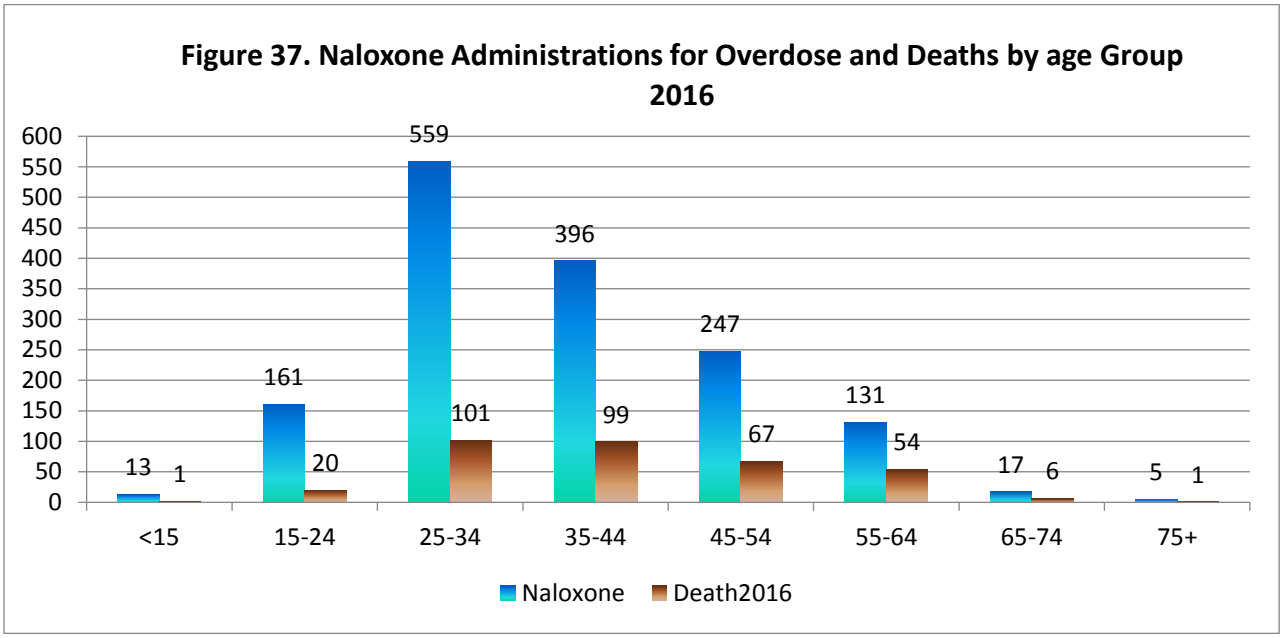
Overall, in 2016, the Dayton Police Department administered naloxone on 222 occasions for drug overdose, the EMS administered naloxone 487 times for overdose, and the Dayton Fire Department administered naloxone to 820 overdose victims, **totaling 1529 naloxone administration occasions**. Among these, 62% of the overdose victims were male, and the mean age was 37.1 years of age.

Among naloxone administrations by the DPD, 86.9% were white, 12.6% were African American, and 0.5% were Other. Among Dayton Fire Department naloxone administrations, 84.1% were white patients, 14.4% were African American, 0.8% were Hispanic, and 0.8% were Other. (42 cases were missing race/ethnicity.) Among EMS naloxone administrations, 88.3% were among whites, 10.2% African Americans, and 1.5% are Other (n=600; 207 unknown). [Note: due to data acquisition issues, the EMS race data is based on all naloxone administrations, not just unintentional overdoses.]

Naloxone Administrations By Month. Figure 36 displays the number of naloxone administrations and accidental drug overdose deaths by month. The mean number of naloxone administrations per month was 127.3 (SD=28.0). There is no apparent relationship between the number of naloxone administrations per month and the number of unintentional drug overdose deaths.



Naloxone Administrations By Age Groups. Figure 37 shows the number of naloxone administrations and the number of overdose deaths by age group. Similar to 2015, there was a high number of naloxone administrations among those aged 15 – 24 years of age, compared to the number of deaths (8.1:1 ratio). In addition, the highest numbers of naloxone administration occurred among those aged 25 – 34 years (559 naloxone administrations), 35 – 44 years of age (396 naloxone administrations), and 45-54 years of age (247) naloxone administrations.



Naloxone Doses Per Event. Table 4 shows the number and percent of naloxone doses administered by the Dayton Fire Department and EMS. Among both responders the most frequent dose was 1. Two doses was next common (37.9%) among DFD administrations and 32.4% among EMS administrations.

Table 4. Nalaxone doses administrated by Dayton Fire Department & EMS, 2016

	DFD		EMS	
# of Nalaxone Doses	n	%	n	%
1	490	59.8	216	44.4
2	311	37.9	158	32.4
3	8	1.0	74	15.2
4	11	1.3	29	6.0
5	--	--	3	0.6
6	--	--	2	0.4
8	--	--	4	0.8
16	--	--	1	0.2

Project DAWN Naloxone Kit Distribution

In 2016, Project DAWN distributed 1,725 naloxone kits in Montgomery County, an average of 143.8 per month (SD=58.4). In addition,1,885 people were trained how to use naloxone. The number of known reversals was 134. It is likely this later number is much higher as tracking of reversals is limited by self-reporting.

Interpreting the relationship between the number of naloxone administrations and drug overdose deaths is complicated for many reasons, including: 1) The number of accidental overdoses over time is unknown; and 2) The number of naloxone administrations for drug overdoses in Montgomery County is incomplete. Nevertheless, naloxone administration is one of the most powerful public health interventions available to prevent unintentional opioid overdose deaths, and obtaining some indication of its use is important.

XIX. Unintentional Drug Overdose Deaths without Opioids

In 2016, 24 people who died from unintentional drug overdoses in Montgomery County had no opioids (heroin, illicit fentanyl, pharmaceutical opioids) present in toxicological analyses. (see Appendix II). This represents 6.9% of the total number (349) of unintentional drug overdose deaths in 2016, compared to 8% of overdose deaths in 2015.

Over half (63%) of the 24 overdose decedents were male, and the majority were white (71%; African American 21%). The mean age was 47.8 years, and the majority (58%) had a high-school education. Thirty-three percent were single, 29% were divorced, 25% were married. The majority (96%) had a history of substance abuse. Fifty percent died in a hospital, and 42% died at home.

The toxicology report revealed that cocaine was present in 38% of these overdose deaths, followed by alcohol (17%), benzodiazepines, (13%) and anti-depressants (13%), and methamphetamine (8%).

XX. Conclusions

In 2016, 349 people died in Montgomery County, Ohio, compared to 259 in 2015. Similar to previous years, about 93% of the overdose deaths involved an opioid (prescription opioids, heroin, illicit fentanyl). Of the 349 decedents in 2016, 309 (89%) were Montgomery County residents. This percentage has remained fairly consistent around 90% since 2010. The data indicate that unintentional drug overdose deaths escalated in Montgomery County in 2016 in which the estimated unadjusted overdose rate per 100,000 rose to 57.5, the highest on record since 2010.

The percentage of prescription opioid mentions in toxicology reports has decreased every year since 2010, from a high of 74% in 2010 to 31% in 2015, and 18% in 2016.

The relative impact of primary opioids involved in unintentional drug overdoses in Montgomery County has shifted over time from prescription opioids, which appeared in 74% of overdose deaths in 2010, to heroin that appeared in 59% of overdose deaths in 2012 in combination with prescription opioids, which appeared in 46% of overdose deaths. Since late 2013, the relative impact of illicit fentanyl

has escalated from being identified in 9% of overdose deaths, to 41% in 2014 and 2015, jumping to 72% in 2016 (when considering illicit fentanyl and/or analogues/metabolites).

Overall, the increasing high number of unintentional drug overdoses in Montgomery County in 2016 indicates that it remains an urgent public health problem that calls for increasing collaborative interventions by the system of community partners.

APPENDIX I. Unintentional Drug Overdose Deaths: 2010-2016

POISONING DEATH REVIEW SUMMARY REPORT, 2016. All DEATHS									
	Total Cases Jan 1- Dec 31	**349**		2015 Cases : 259	2014 Cases: 264	2013 Cases: 226	2012 Cases: 162	2011 Cases: 130	2010 Cases: 127
DEMOGRAPHICS									
Characteristic									
	Category	**Freq**	%	2015 %	2014 %	2013 %	2012 %	2011 %	2010 %
Average Age			**40.6**	40.7	41.2	42.5	42.8	42.1	40.0
Age Group	<15 years	1	**0%**	0%	0%	0%	0%	0%	0%
	15-24 years	20	**6%**	7%	6%	4%	4%	5%	14%
	25-34 years	101	**29%**	26%	28%	26%	28%	22%	22%
	35-44 years	99	**28%**	29%	26%	28%	19%	26%	28%
	45-54 years	67	**19%**	22%	23%	27%	33%	32%	18%
	55-64 years	54	**15%**	14%	14%	13%	14%	14%	16%
	65-74 years	6	**2%**	2%	2%	3%	2%	1%	2%
	75+ years	1	**0%**	0%	0%	0%	0%	0%	0%
Gender	Male	224	**64%**	68%	62%	67%	60%	59%	57%
	Female	125	**36%**	32%	38%	33%	40%	41%	43%
Race	White	286	**82%**	86%	89%	87%	85%	87%	90%
	Black	56	**16%**	14%	11%	11%	14%	13%	10%
	Other	7	**2%**	1%	0%	2%	1%	0%	0%
Education	<High School	102	**29%**	26%	23%	29%	27%	28%	20%
	HS graduate	220	**63%**	67%	73%	65%	69%	69%	76%
	College graduate	24	**7%**	6%	3%	4%	2%	2%	2%
	Post-graduate	0	**0%**	0%	0%	1%	1%	1%	1%
	Unknown	3	**1%**	1%	0%	2%	1%	0%	0%
Marital Status	Single	183	**52%**	57%	44%	43%	47%	39%	41%
	Married	56	**16%**	20%	21%	21%	15%	31%	29%
	Divorced	94	**27%**	25%	31%	32%	30%	25%	26%
	Separated	1	**0%**	1%	0%	2%	0%	3%	2%
	Widowed	14	**4%**	2%	2%	3%	7%	2%	2%
	Unknown	1	**0%**	1%	0%	0%	0%	0%	0%
Military	Ever in Military	24	**7%**	7%	8%	7%	9%	4%	13%
Residence	Montgomery Co	309	**89%**	88%	90%	87%	90%	91%	92%
HEALTH									
Characteristic									
		Freq	%	2015 %	2014 %	2013 %	2012 %	2011 %	2010 %

Physical Disability/Illness		226	**65%**	66%	68%	78%	81%	74%	79%
Heart Disease		151	**43%**	42%	52%	58%	58%	56%	65%
HISTORY OF SUBSTANCE ABUSE									
	Total Cases	**349**		2015 Cases : 259	2014 Cases: 264	2013 Cases: 226	2012 Cases: 162	2011 Cases: 130	2010 Cases: 127
Substance Abuse									
		Freq	%	2015 %	2014 %	2013 %	2012 %	2011 %	2010 %
Any history		327	**94%**	89%	76%	78%	78%	82%	75%
DEATH INVESTIGATION									
Characteristic	**Category**								
		Freq	%	2015 %	2014 %	2013 %	2012 %	2011 %	2010 %
Location of death	Home	187	**54%**	57%	55%	58%	50%	53%	68%
	Relative's home	8	**2%**	2%	1%	1%	1%	0%	2%
	Friend's home	33	**9%**	8%	12%	15%	11%	16%	14%
	Work place	1	**0%**	0%	0%	0%	0%	0%	0%
	Hospital	68	**19%**	20%	22%	15%	30%	22%	9%
	Drug Trt facility	0	**0%**	<1%	0%	0%	0%	0%	0%
	Public area	3	**1%**	1%	3%	4%	2%	2%	2%
	Other	49	**14%**	11%	6%	8%	4%	6%	4%

TOXICOLOGY REPORT															
This section of the summary includes all substances found in the decedent's body or bodily fluids. There may be multiple drug mentions for each case.	**Total Cases 2016**	**349**		2015 Cases: 259		2014 Cases: 264		2013 Cases: 226		2012 Cases: 162		2011 Cases: 130		2010 Cases: 127	
Characteristic	**Category**	**Freq**	**%**	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
	Alcohol	79	**23%**	67	26%	77	29%	63	28%	46	28%	30	23%	29	23%
	Cocaine	143	**41%**	92	36%	83	31%	59	26%	49	30%	53	41%	38	30%
	Methamphetamine	36	**10%**	14	5%	11	4%	6	3%	4	2%	2	2%	1	1%
Illicit Opioids	Heroin	73	**21%**	117	45%	127	48%	132	58%	95	59%	46	35%	39	31%
	Illicit Fentanyl and/or Fentanyl analogs	250	**72%**	--	--	--	--	--	--	--	--	--	--	--	--
	Illicit Fentanyl with or without Analogs	237	**68%**	--	--	--	--	--	--	--	--	--	--	--	--
	Illicit Fentanyl without Analogs	218	**62%**	107	41%	107	41%	20	9%	0	0%	0	0%	0	0%
	Fentanyl Analogs with or without Illicit Fentanyl	32	**9%**	--	--	--	--	--	--	--	--	--	--	--	--
	Fentanyl Analogs and Illicit Fentanyl	19	**5%**	--	--	--	--	--	--	--	--	--	--	--	--
	Fentanyl Analogs without Illicit Fentanyl	13	**4%**	--	--	--	--	--	--	--	--	--	--	--	--
Other Synthetic Opioids	U47700	4	**1%**	--	--	--	--	--	--	--	--	--	--	--	--
Prescription Opioids	**Any**	63	**18%**	79	31%	98	37%	100	44%	75	46%	81	62%	94	74%
	Oxycodone	22	**6%**	22	9%	28	11%	24	11%	25	15%	25	19%	29	23%
	Hydrocodone	15	**4%**	20	8%	43	16%	22	10%	15	9%	19	15%	31	24%
	Methadone	8	**2%**	11	4%	13	5%	31	14%	20	12%	43	33%	41	32%
	Pharmaceutical Fentanyl	1	**0%**	3	1%	7	3%	14	6%	9	6%	8	6%	9	7%
	Tramadol	4	**1%**	5	2%	5	2%	15	7%	9	6%	5	4%	8	6%

	Hydromorphone	1	**0%**	5	2%	4	2%	1	0%	0	0%	0	0%	1	1%
	Morphine	17	**5%**	30	12%	28	11%	16	7%	10	6%	10	8%	11	9%
Anti-Depressants	**Any**	24	**7%**	16	6%	41	16%	61	27%	88	54%	41	32%	48	38%
Sedatives (Including Benzos)	**Any**	101	**29%**	112	43%	146	55%	133	59%	88	54%	96	74%	96	76%
Benzodiazepines	**Any**	92	**26%**	111	43%	134	51%	118	52%	70	43%	84	65%	87	69%
Any Rx Opioid + Any Benzo		32	**9%**	48	19%	61	23%	67	30%	43	27%	64	49%	73	57%
Two or more CNS Depressants		190	**54%**	164	63%	181	72%	167	74%	107	66%	107	82%	108	85%
Heroin with No Other CNS Depressant		16	**5%**	30	12%	20	8%	21	9%	30	19%	6	5%	5	4%
Illicit Fentanyl with No Other CNS Depressant		104	**30%**	34	13%	19	8%	1	0%	0	0%	0	0%	0	0%
Heroin + Any Rx Opioid		10	**3%**	15	6%	29	11%	25	11%	22	14%	13	10%	16	13%
Any Opioid (Heroin/Rx Opioid/Illicit Fentanyl)		325	**93%**	239	92%	245	93%	204	90%	148	90%	114	88%	117	92%
Any Rx Opioid + No Heroin		53	**15%**	64	25%	65	25%	74	33%	50	31%	66	51%	77	61%
Illicit Fentanyl + Heroin		36	**10%**	24	9%	36	14%	13	6%	0	0%	0	0%	0	0%
Illicit Fentanyl + No Heroin		214	**61%**	81	31%	71	27%	7	3%	0	0%	0	0%	0	0%
Methamphetamine + (Heroin or Illicit Fentanyl)		31	**9%**	11	4%	9	3%	4	2%	3	2%	1	1%	0	0%
Cocaine + (Heroin or Illicit Fentanyl)		128	**37%**	77	30%	72	27%	41	18%	32	20%	29	22%	15	12%
Heroin + No Illicit Fentanyl		37	**11%**	90	35%	89	34%	119	53%	95	59%	46	35%	39	31%
Any Benzo + Heroin		18	**5%**	53	20%	65	25%	65	29%	35	22%	28	22%	24	19%
Any Benzo + Illicit Fentanyl		59	**17%**	39	15%	54	20%	8	4%	0	0%	0	0%	0	0%
Any Benzo + Any Opioid		89	**26%**	110	42%	128	48%	115	51%	64	40%	80	62%	84	66%
Cocaine + Heroin		33	**9%**	47	18%	50	19%	41	18%	32	20%	29	22%	15	12%
Cocaine + Illicit Fentanyl		109	**31%**	38	15%	38	14%	1	0%	0	0%	0	0%	0	0%
Other Prescription	Any	22	**6%**	3	1%	36	14%	62	27%	49	30%	48	37%	49	39%
Over-The-Counter	Any	25	**7%**	13	5%	19	7%	32	14%	32	20%	25	19%	26	20%

APPENDIX II. Overdose Deaths with No Opioids (Heroin, Illicit Fentanyl, Prescription Opioids).

POISONING DEATH REVIEW SUMMARY REPORT, 2016			
	Total Cases Jan 1- Dec 31	**N=24**	
DEMOGRAPHICS			
Characteristic			
	Category	**Freq**	**%**
Average Age			**47.8**
Age Group	<15 years	0	**0%**
	15-24 years	1	**4%**
	25-34 years	3	**13%**
	35-44 years	4	**17%**
	45-54 years	10	**42%**
	55-64 years	3	**13%**
	65-74 years	3	**13%**
	75+ years	0	**0%**
Gender	Male	15	**63%**
	Female	9	**38%**
Race	White	17	**71%**
	Black	5	**21%**
	Other	2	**8%**
Education	<High School	7	**29%**
	HS graduate	14	**58%**
	College graduate	1	**4%**
	Post-graduate	0	**0%**
	Unknown	2	**8%**
Marital Status	Single	8	**33%**
	Married	6	**25%**
	Divorced	7	**29%**
	Separated	0	**0%**
	Widowed	3	**13%**
	Unknown	0	**0%**
Military	Ever in Military	1	**4%**
Residence	Montgomery Co	24	**100%**
HEALTH			
Characteristic			
		Freq	**%**
Physical Disability/Illness		19	**79%**
Heart Disease		13	**54%**

HISTORY OF SUBSTANCE ABUSE			
	Total Cases Jan 1-Dec 31	**24**	
Substance Abuse			
		Freq	**%**
Any history		23	**96%**
DEATH INVESTIGATION			
Characteristic	**Category**		
		Freq	**%**
Location of death	Home	10	**42%**
	Relative's home	0	**0%**
	Friend's home	1	**4%**
	Hospital	12	**50%**
	Drug Trt facility	0	**0%**
	Public area	0	**0%**
	Other	1	**4%**
TOXICOLOGY REPORT			
This section of the summary includes all substances found in the decedent's body or bodily fluids. There may be multiple drug mentions for each case.	**Total Cases 2015**	**24**	
Characteristic	**Category**	**Freq**	**%**
	Alcohol	4	**17%**
	Cocaine	9	**38%**
	Methamphetamine	2	**8%**
	Benzodiazepines (Any)	3	**13%**
	Anti-Depressants (Any)	3	**13%**
	Sedative (Any)	4	**17%**