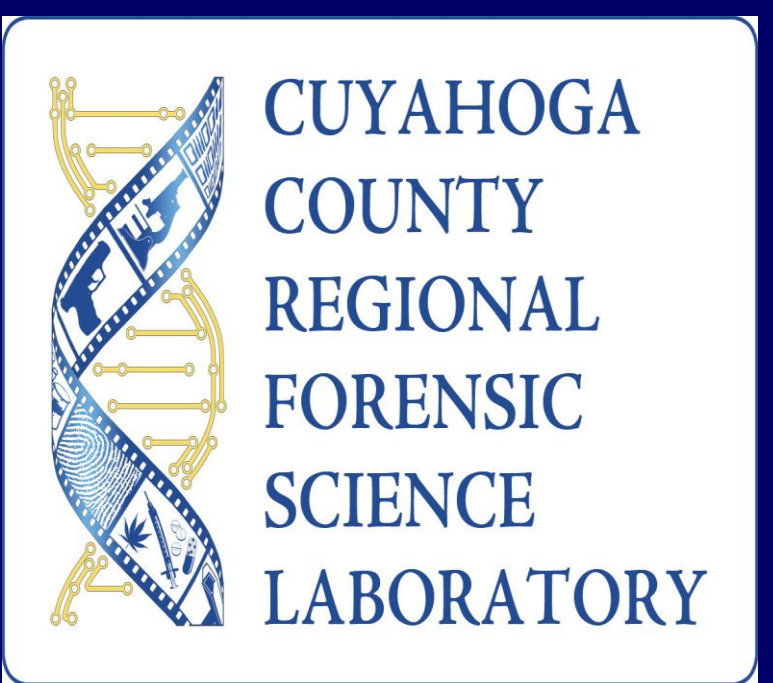




# An Outbreak of Heroin Related Deaths in a Major Midwest Metropolitan City - The Cleveland Experience Over a 6-Year Period, (2006-2011)



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## Abstract

**Introduction:** The Toxicology Department at The Cuyahoga County Medical Examiner's Office (CCMEO) observed a dramatic increase in heroin positive cases over the past year and a half. Statistical data generated from postmortem cases received at the CCMEO over the past six years indicate there were 52 heroin related deaths in Cuyahoga County in 2006 (3.98 deaths per 100,000 people), in contrast to 105 heroin related deaths in 2011 (8.20 deaths per 100,000 people). This represents a two-fold increase in heroin fatalities during the six-year study period.

**Objective:** To present the incidence of heroin deaths from 2006 to 2011 in Cleveland, Ohio (population 396,815) and Cuyahoga County as a whole (population 1,280,122). This information may help curb this alarming trend by creating awareness for public health officials, law enforcement, and other agencies dealing with drugs of abuse issues.

**Methods:** In the 6-year time frame there were 16,344 autopsies or death investigations performed at CCMEO with 7,965 requests for full Toxicology analysis. Results for this study were obtained by a statistical package which is part of the Toxicology Department's Pathways<sup>®</sup> program. This database is a centrally managed, interactive, real-time, data sharing environment program that allows the intra- and interdepartmental access to common data. The CCMEO Toxicology Department performed testing on the decedents by running Volatiles, a 13-panel (ELISA) screen, Color tests, and Basic and Acidic/Neutral drug analysis. The Opiate Confirmation analysis utilized UCT (United Chemical Technologies) Clean Screen ZSDAU020 extraction columns from a previously published UCT method for Opiates. Analysis was performed by GC/MS operated in the SIM mode. A multipoint calibration was utilized. Analytes were separated, detected, and quantitated by an Agilent GC/MS with a Restek Rxi-5ms capillary column.

**Results:** There has been a dramatic epidemiological change in the number of heroin related deaths in greater metropolitan Cleveland, Ohio. In 2006, 17.27% of poisoning related deaths were due to heroin related intoxications. By 2011, 35.96% of poisoning deaths were heroin related. This statistic is reversed with regards to cocaine poisonings, 47.84% in 2006 versus 23.97% in 2011. Levels of polypharmacy have remained high over the years (present in over 50% of heroin deaths per year), while heroin only deaths have doubled since 2006. Although there has been a statistically significant increase in usage by females, demographics show decedents positive for heroin typically are single, white, males between the ages of 20-30 and 50-60. During this period of time heroin related deaths increased by 77% in the city of Cleveland and 176% in the suburbs.

**Conclusions:** This study demonstrates that there has been an increase in heroin related deaths in the City of Cleveland and the surrounding suburbs. These findings are consistent with other reports that heroin is a major cause of concern throughout the Midwest and Northeastern regions of the United States. A possible explanation for this increase could be the changing formulations of prescription Opiates, which make abuse more difficult. Another explanation could be the low cost and high availability of heroin relative to prescription Opiates.

**Keywords:** Heroin, Opiates, Medical Examiner, Demographics, Ohio

## Objectives

- The objective of this study was to present the incidence of heroin deaths in Cuyahoga County from 2006-2011.
- To determine whether heroin usage was isolated in the city of Cleveland or if it was also prevalent in the surrounding suburbs.
- To gather demographic and toxicological information on this population of decedents.

## Introduction

- Detection of 6-Acetylmorphine (6-AM) in postmortem samples collected from the Cuyahoga County Medical Examiner's Office (CCMEO) indicate that heroin overdose deaths have **increased** over the past six years.
- CCMEO is located in Cleveland, Ohio, the most populated city in Cuyahoga County.
- Based on 2010 census records<sup>(1)</sup>:
  - City of Cleveland, Ohio has a population of ~ 396,815
  - Cuyahoga County, Ohio has a population of ~ 1,280,122
    - 63.6% White; 29.7% Black; 6.7% Other
    - 47.4% Male and 52.6% Female
- Drug overdose deaths in Ohio have increased 372% between 1999-2010<sup>(2)</sup>.
- In 2010, 22% of all overdose cases in Ohio were heroin related compared to 16% in 2008<sup>(2)</sup>.
- Heroin overdose deaths are becoming more frequent across the Midwest and Northeast portions of the United States<sup>(3)</sup>.
- Previous studies have indicated that Rx opiate overdoses were becoming more prevalent<sup>(4)</sup>.
- In the past two years both OxyContin<sup>®(5)</sup> and Opana<sup>®(6)</sup> have been reformulated (crush-resistant formulations to discourage abuse) which may lead to an increase in heroin deaths across the country.

## Methods

### Cases:

- All cases containing 6-AM during 2006 to 2011 were identified through a Toxicology Database (Pathways<sup>®</sup>).
- Only cases classified as Cuyahoga County cases were included in this study.
- All cases accepted for this study were further analyzed to gather data on various demographics and toxicological results.

### Toxicological Analyses:

- Cases were screened for opiates using either an ELISA (Blood) or EMIT (Blood, Bile, Urine) screen.
- Positive opiate screens were confirmed by GC/MS in SIM mode using a Restek Rxi-5ms capillary column and a previously published UCT method for opiates.

## Results

Table 1— Total Heroin Cases per 100,000 population

|                        | 2006         | 2007         | 2008         | 2009         | 2010          | 2011          |
|------------------------|--------------|--------------|--------------|--------------|---------------|---------------|
| All of Cuyahoga County | 3.98<br>[52] | 3.48<br>[45] | 4.99<br>[64] | 4.94<br>[63] | 6.80<br>[87]  | 8.20<br>[105] |
| Cleveland              | 7.69<br>[34] | 6.62<br>[29] | 7.37<br>[32] | 9.04<br>[39] | 11.84<br>[47] | 13.61<br>[54] |
| Suburbs                | 2.09<br>[18] | 1.87<br>[16] | 3.77<br>[32] | 2.84<br>[24] | 4.53<br>[40]  | 5.77<br>[51]  |

NOTE: [ ] - Raw Data Obtained by CCMEO

Table 2— Total Poisonings Ruled at CCMEO

|                     | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   |
|---------------------|--------|--------|--------|--------|--------|--------|
| Total Poisonings    | 292    | 282    | 284    | 278    | 262    | 278    |
| % Heroin Poisonings | 17.27% | 14.50% | 21.94% | 21.83% | 30.50% | 35.96% |

Figure 1— Demographics: Race 2006 - 2011

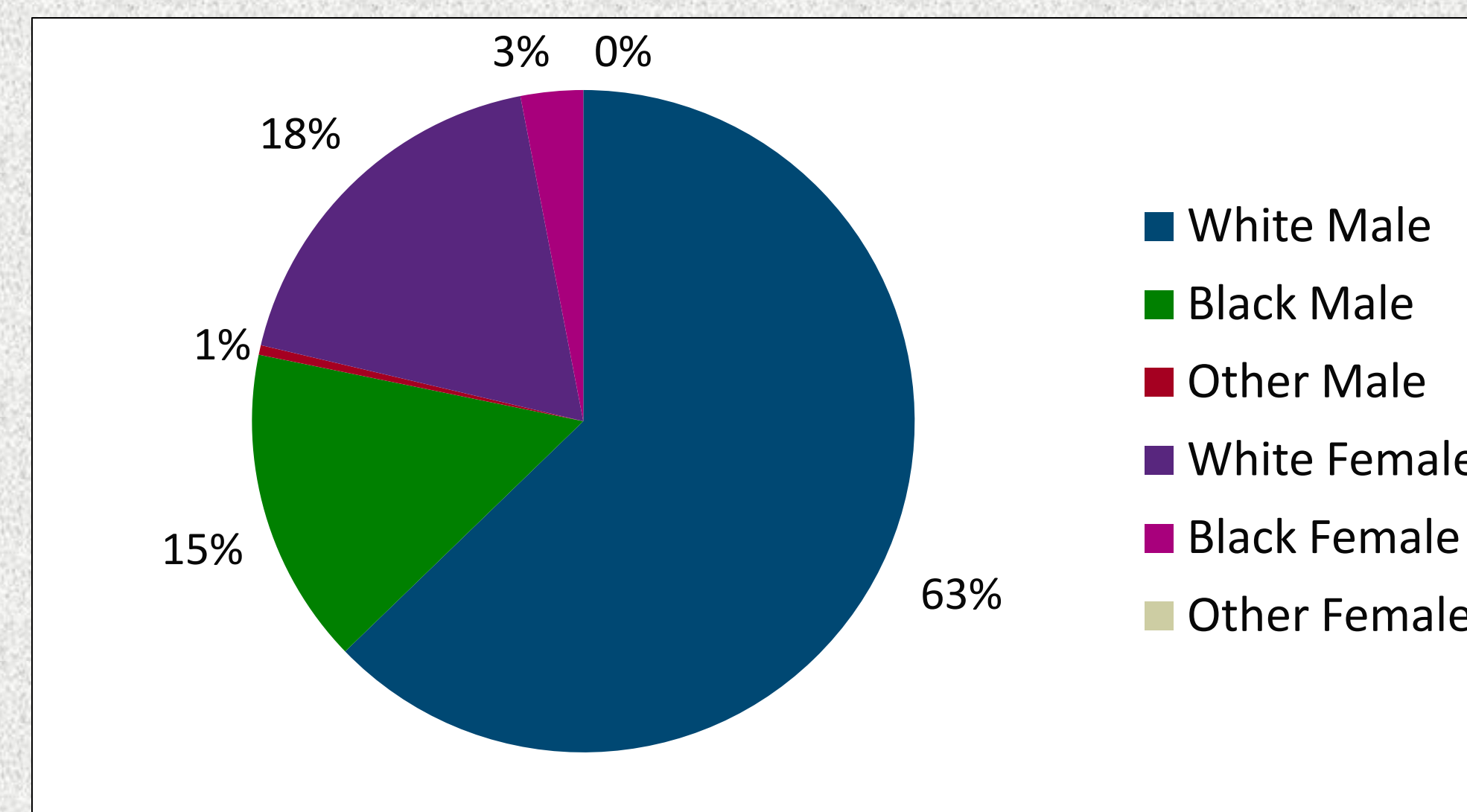


Figure 2— Demographics: Gender 2006 - 2011

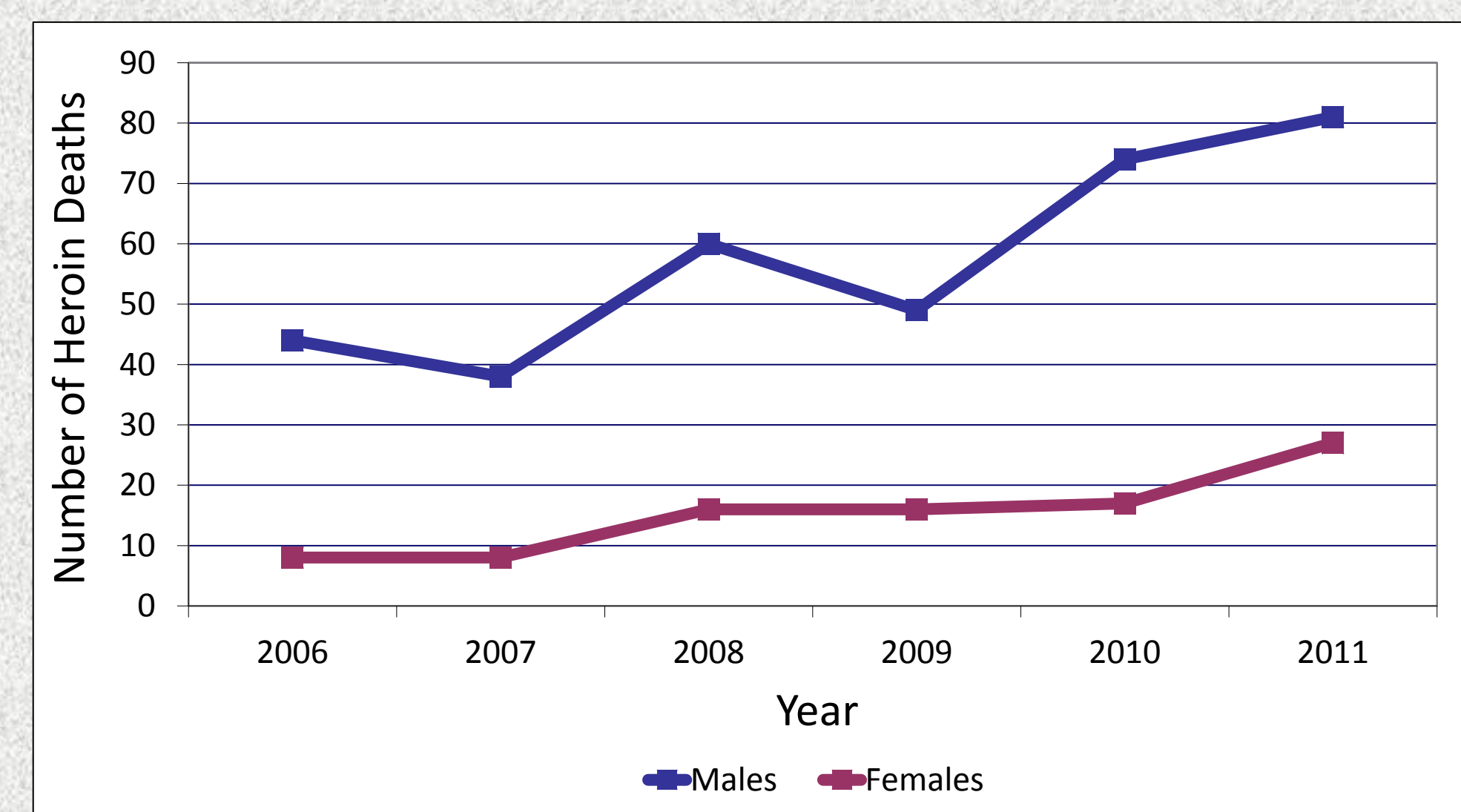
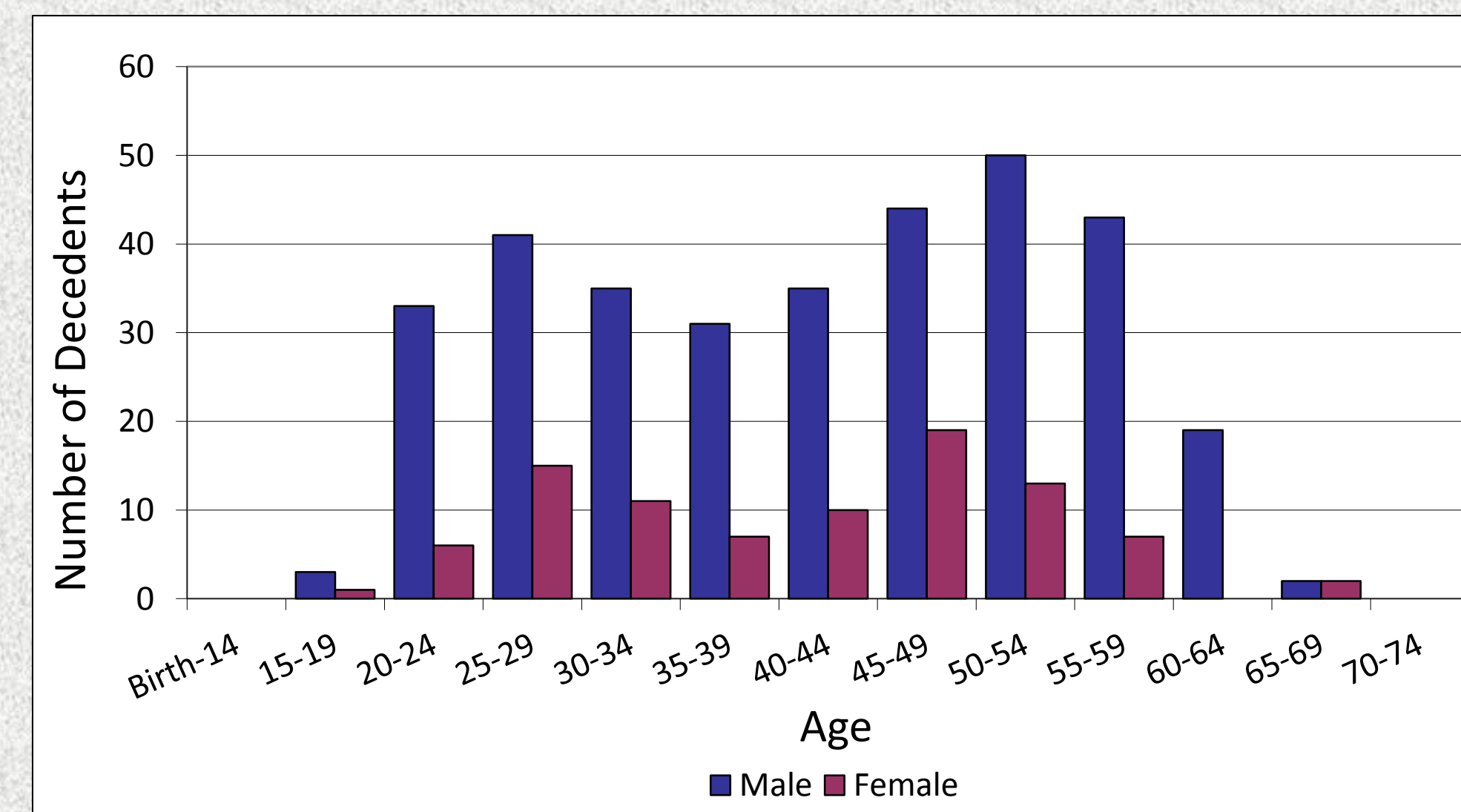


Figure 3— Demographics: Age 2006 - 2011



## Results

Figure 4— Demographics: Marital Status 2006 - 2011

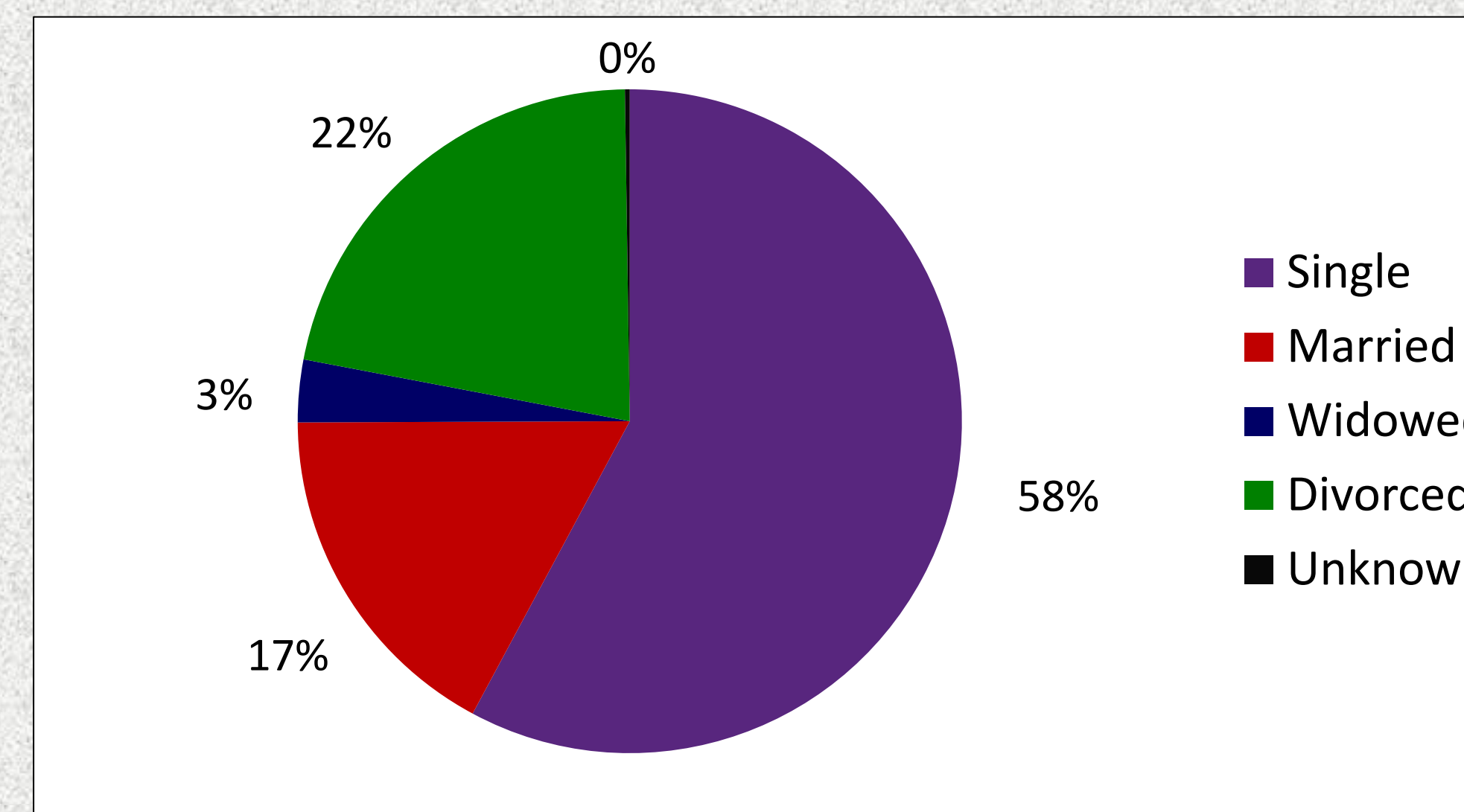


Table 3— Manner of Death 2006 - 2011

|              |        |
|--------------|--------|
| Accident     | 95.55% |
| Suicide      | 2.34%  |
| Homicide     | 0.47%  |
| Natural      | 0.94%  |
| Undetermined | 0.70%  |

Table 4— Cause of Death 2006 - 2011

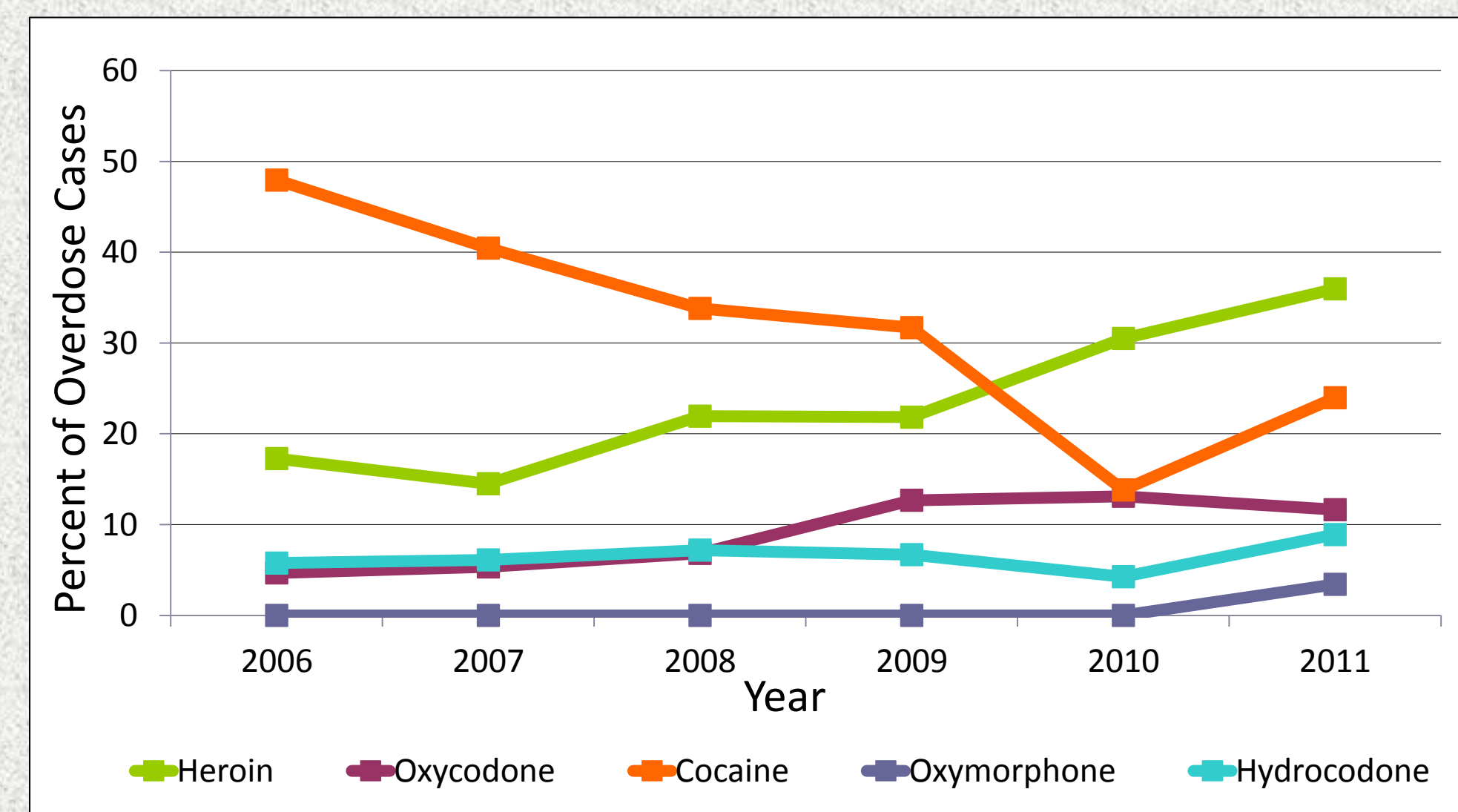
|          |        |
|----------|--------|
| Overdose | 92.97% |
| Other    | 7.03%  |

\*Other\* includes cases ruled as: Hanging, MVA, GSW, Drowning, Stabbing, and Asphyxia

Table 5— Polypharmacy-Drugs of Interest

|                            | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   |
|----------------------------|--------|--------|--------|--------|--------|--------|
| Heroin Only                | 22.92% | 28.95% | 49.18% | 35.48% | 44.14% | 47.62% |
| Heroin and Other Drugs     | 77.08% | 71.05% | 50.82% | 64.52% | 55.81% | 52.38% |
| Heroin and Ethanol Only    | 6.25%  | 10.53% | 9.84%  | 11.29% | 12.79% | 8.57%  |
| Heroin and Ethanol         | 18.75% | 28.95% | 21.31% | 20.97% | 23.25% | 23.81% |
| Heroin and Cocaine Only    | 22.92% | 18.42% | 13.11% | 16.13% | 9.30%  | 6.67%  |
| Heroin and Cocaine         | 45.83% | 47.37% | 27.87% | 27.42% | 20.93% | 20.00% |
| Heroin and Meth/Amp        | 2.08%  | 0.00%  | 0.00%  | 0.00%  | 1.16%  | 0.00%  |
| Heroin and Benzodiazepines | 18.75% | 18.42% | 1.64%  | 22.58% | 19.77% | 23.81% |
| Heroin and Antidepressants | 6.25%  | 0.00%  | 6.55%  | 11.29% | 4.65%  | 2.86%  |
| Heroin and Fentanyl        | 20.83% | 0.00%  | 0.00%  | 0.00%  | 1.16%  | 0.00%  |
| Heroin and THC             | 0.00%  | 0.00%  | 0.00%  | 0.00%  | 0.00%  | 1.90%  |
| Heroin and Other Opiates   | 2.08%  | 10.53% | 8.19%  | 9.68%  | 4.65%  | 7.62%  |

Figure 5— Drug Trends 2006 - 2011



## Conclusions

- Our study found the heroin decedents to most likely be **single, white, males** whose ages ranged from **20-50 years**. A Connecticut study found similar demographics, although the age range found in that study was younger<sup>(4)</sup>.
- Heroin deaths increased from 2006-2011 in the city of Cleveland by **77%** and in the suburbs of Cuyahoga County by **176%**. Indicating the heroin problem has been spreading into the smaller cities surrounding Cleveland.
- Comparison of total heroin deaths/100,000 population in a number of areas in the United States show Cleveland to have one of the highest rates<sup>(3)</sup>. **Cleveland, OH: 7.37, 9.04, 11.84** in 2008, 2009, 2010; **Albuquerque, NM: 12.00, 8.50** in 2008, 2009; **Wayne Co., MI: 13.46, 9.34** in 2009, 2010; **State of Colorado 0.90, 1.40** in 2008, 2009.
- Cuyahoga County heroin deaths have increased while other areas rates have decreased or stayed steady over the same time frame, indicating it is not currently a nationwide epidemic<sup>(3)</sup>.
- Possible causes for the increase in heroin deaths in Cuyahoga County:
  - Higher Purity**- areas east of the Mississippi River are primarily shipped heroin from South America, which appears to be more pure than the Mexican heroin<sup>(3)</sup>.
  - Formulation Changes**- OxyContin<sup>®</sup> (Aug. 2010) Opana<sup>®</sup> (Mar. 2012)
  - Ohio Automated Rx Reporting System (OARRS)**- established in 2006 to help healthcare providers detect drug seeking behaviors<sup>(5)</sup>.
- Heroin mortality data should continue to be monitored to detect trends. Education should be provided to law enforcement, public health officials and the general public on issues such as signs and consequences of opiate addiction and overdose.

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