Heroin: A Brain Disease

Rick Ryan, MD, FACEP
Professor and Vice Chairman, Department of Emergency Medicine
University of Cincinnati
Objectives: Heroin

• To understand common misconceptions about addiction
• To comprehend the scale of local and national opiate use
• To understand how we arrived at this epidemic
• To understand cardinal features and contributing factors of addiction and how this effects the brain and other organs
• Recall the basic drugs used to “treat” heroin/opiate addiction
• State a few strategies on “what can be done”
Addiction

• Addiction is a **chronic, often relapsing brain disease** that causes compulsive drug seeking and use, despite harmful consequences to the addicted individual and to those around him or her.

• Although the initial decision to take drugs is voluntary for most people, the brain changes that occur over time challenge an addicted person’s self-control and hamper his or her ability to resist intense impulses to take drugs.
Why Do Some People Become Addicted While Others Do Not?

• No single factor can predict whether a person will become addicted to drugs.
• Risk for addiction is influenced by a combination of factors that include individual biology, social environment, and age or stage of development.
• The more risk factors an individual has, the greater the chance that taking drugs can lead to addiction.
Biology/Genetics

• Genes
  • No single gene
  • Genetics accounts for about half of one's addiction vulnerability
  • Twin study

• Gender, ethnicity, and the presence of other mental disorders may influence risk for drug abuse and addiction.
Environment

• Family and friends
• Socioeconomic status and quality of life in general
• Peer pressure, physical and sexual abuse, stress, and quality of parenting can greatly influence the occurrence of drug abuse and the escalation to addiction in a person’s life.
Development

- The earlier that drug use begins, the more likely it will progress to more serious abuse, which poses a special challenge to adolescents.
- Because areas in their brains that govern decision making, judgment, and self-control are still developing, adolescents may be especially prone to risk-taking behaviors, including trying drugs of abuse.
Misconceptions
Misconceptions: Moral vs. Disease

• Moral
  • “Choice”
  • “weak self-will”

• Disease
  • Activated by a “choice”
    • Cancers: smoke
    • Diabetes: food
  • Nobody chooses addiction
Misconceptions: Moral vs. Disease

• Moral model leads to the stigma associated with addiction, alcoholism
  • Afraid

• Influences care providers actions also
  • “treat and street”
  • empathy
Table 1. Misconceptions Regarding Opioids and Addiction

<table>
<thead>
<tr>
<th>Misconception</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Addiction is the same as physical dependence and tolerance.</strong> This miscon-</td>
</tr>
<tr>
<td>ception leads some clinicians to avoid prescribing opioids to patients who</td>
</tr>
<tr>
<td>would benefit from them and many patients to be afraid of taking opioids</td>
</tr>
<tr>
<td>as prescribed.</td>
</tr>
<tr>
<td><strong>Addiction is simply a set of bad choices.</strong> This misconception contributes</td>
</tr>
<tr>
<td>to the discrimination against patients with addiction and to the willful</td>
</tr>
<tr>
<td>ignorance by many in the health care system about modern treatment methods.</td>
</tr>
<tr>
<td>It also promotes mistrust of patients by clinicians and prevents affected</td>
</tr>
<tr>
<td>patients from seeking help for their addiction.</td>
</tr>
<tr>
<td><strong>Pain protects patients from addiction to their opioid medications.</strong> This</td>
</tr>
<tr>
<td>misconception can lead to overconfidence and overprescribing among clini-</td>
</tr>
<tr>
<td>cians as well as failure to monitor and recognize addictive behaviors or to</td>
</tr>
<tr>
<td>intervene properly when they emerge. Research has shown that patients who</td>
</tr>
<tr>
<td>are prescribed opioid medications for pain can become addicted to them even</td>
</tr>
<tr>
<td>when the drugs are taken as prescribed.</td>
</tr>
<tr>
<td><strong>Only long-term use of certain opioids produces addiction.</strong> The misconcep-</td>
</tr>
<tr>
<td>tion that addiction is simply the property of certain opioid drugs promotes</td>
</tr>
<tr>
<td>over-prescribing of certain types of opioids that may be as risky as types</td>
</tr>
<tr>
<td>that are well known to be associated with addiction. An improved prescribing</td>
</tr>
<tr>
<td>practice in the management of acute pain is a necessary step in the control</td>
</tr>
<tr>
<td>of opioid diversion and overdose, since the overprescription of opioids for</td>
</tr>
<tr>
<td>acute pain is the main source of drug diversion.</td>
</tr>
<tr>
<td><strong>Only patients with certain characteristics are vulnerable to addiction.</strong></td>
</tr>
<tr>
<td>Certain conditions do increase the vulnerability to addiction. These include</td>
</tr>
<tr>
<td>substance-use disorder (including abuse of alcohol, nicotine, and illicit</td>
</tr>
<tr>
<td>drugs), developmental stage (adolescents are more vulnerable than adults),</td>
</tr>
<tr>
<td>and certain mental illnesses (e.g., attention deficit–hyperactivity disorder</td>
</tr>
<tr>
<td>and major depressive disorder). Although some patients are more vulnerable</td>
</tr>
<tr>
<td>than others, no patient is immune to addiction.</td>
</tr>
<tr>
<td><strong>Medication-assisted therapies are just substitutes for heroin or opioids.</strong></td>
</tr>
<tr>
<td>The use of opioid-agonist medications such as methadone and buprenorphine</td>
</tr>
<tr>
<td>for opioid addiction has led to the misconception that such drugs are just</td>
</tr>
<tr>
<td>substitutes for the opioid being abused. Although these medications are</td>
</tr>
<tr>
<td>opioid agonists, their slower brain pharmacokinetics along with their more</td>
</tr>
<tr>
<td>stable concentrations help to stabilize physiologic processes that are</td>
</tr>
<tr>
<td>disrupted by intermittent abuse of opioids. The use of these drugs also pro-</td>
</tr>
</tbody>
</table>
| tects against risks associated with opioid abuse while facilitating recovery.

* These misconceptions were drawn directly from questions submitted by physi- |
| cians to two major websites for pain-management specialists (the American   |
Stats
CDC GUIDELINE FOR PRESCRIBING OPIOIDS FOR CHRONIC PAIN

Promoting Patient Care and Safety

THE US OPIOID OVERDOSE EPIDEMIC

The United States is in the midst of an epidemic of prescription opioid overdoses. The amount of opioids prescribed and sold in the US quadrupled since 1999, but the overall amount of pain reported by Americans hasn’t changed. This epidemic is devastating American lives, families, and communities.

40

More than 40 people die every day from overdoses involving prescription opioids.

165K

Since 1999, there have been over 165,000 deaths from overdose related to prescription opioids.

4.3M

4.3 million Americans engaged in non-medical use of prescription opioids in the last month.

PRESCRIPTION OPIOIDS HAVE BENEFITS AND RISKS

Many Americans suffer from chronic pain. These patients deserve safe and effective pain management. Prescription opioids can help manage some types of pain in the short term. However, we don’t have enough information about the benefits of opioids long term, and we know that there are serious risks of opioid use disorder and overdose—particularly with high dosages and long-term use.

249M

prescriptions for opioid pain medications were written by healthcare providers in 2013

enough prescriptions were written for every American adult to have a bottle of pills

[Source: National Center for Health Statistics, 2013]

Learn more | cdc.gov/drugoverdose/prescribingguideline.html
Opioid overdoses driving increase in drug overdoses overall

Drug overdose deaths involving opioids, by type of opioid, United States, 2000-2014

SOURCE:
www.cdc.gov/drugoverdose
Heroin Stats

• More people died from drug overdoses in 2014 than in any year on record
  • 6 of 10 from opioids
• 2014: 2,000,000 Americans abused or dependent
• 2002-2013: 18-25 yo highest increase in heroin use
• Studies suggest that regional variation in use of prescription opioids cannot be explained by the underlying health status of the population.
Some states have more painkiller prescriptions per person than others.

Number of painkiller prescriptions per 100 people
- 52.71
- 72-82.1
- 82.2-95
- 96-143

Statistically significant drug overdose death rate increase from 2013 to 2014, US states

SOURCE: IMS, National Prescription Audit (NPA™), 2012.
Sources of Prescription Painkillers Among Past-Year Non-Medical Users

- Given by a friend or relative for free
- Prescribed by ≥1 physicians
- Stolen from a friend or relative
- Bought from a friend or relative
- Bought from a drug dealer or other stranger
- Other

Number of Days of Past-Year Non-Medical Use

Percent of Users
Cross-addiction

Who is most at risk of heroin addiction?

Heroin use is part of a larger substance abuse problem.

Nearly all people who used heroin also used at least 1 other drug.

Most used at least 3 other drugs.

Heroin is a highly addictive opioid drug with a high risk of overdose and death for users.

People who are addicted to...

- Alcohol
  - 2x more likely to be addicted to heroin.

- Marijuana
  - 3x more likely to be addicted to heroin.

- Cocaine
  - 15x more likely to be addicted to heroin.

- Rx Opioid Painkillers
  - 40x more likely to be addicted to heroin.

CDC VitalSigns
Why do we have a heroin problem?
A few reasons why the heroin problem exists:

- **Bad research: 1950 Boston University**
  - 12,000 patients, 4 addictions
  - “Addictions rare in patients treated with narcotics”
    - NEJM 1980

- **Medical Pharmaceutical Marketing**
  - Direct advertisings: medical mags
  - “Drug Reps”
  - CME: trips, dinners
  - Ex) Valium
    - 1st million/billion dollar drug

- **JCAHO, VA**
  - 5th Vital Sign; 1998
A few reasons why the heroin problem exists:

• “Undertreating pain”
  • Chronic pain

• Patient surveys
  • If no Rx=low score=no job and decreased reimbursement

• Medicare reimbursement
  • Based on satisfaction surveys

• HMO’s
  • Increased pts/hr
  • Less time with patient (13 minutes)
A few reasons why the heroin problem exists:

- “Pill Mills”
  - Portsmouth, OH
- Programs to reduce pill availability
- Heroin is “cheap”, available
  - 2008: 500 kg seized at border
  - 2013: 2196 kg seized at border
Features and Factors of Addiction
Cardinal Features of Addiction

• Craving for the drug
• Obsessive thinking about the drug
• Erosion of inhibitory control over efforts to refrain from drug use
• Compulsive drug taking

• These behavioral changes in turn are associated with structural and functional changes in the reward, inhibitory, and emotional circuits of the brain
• Genetics accounts for at least 40% of the risk associated with addiction
Contributing Factors Associated with OD

• Type
• Dose
• Potency
• Duration of action
The Brain (and other organs)
What Happens to Your Brain When You Take Drugs?

• Drugs contain chemicals that tap into the brain’s communication system and disrupt the way nerve cells normally send, receive, and process information.

• There are at least two ways that drugs cause this disruption:
  • (1) by imitating the brain’s natural chemical messengers and
  • (2) by overstimulating the “reward circuit” of the brain.

• Drugs of abuse bind to the neural circuitry of REWARD
The Brain: Endorphins

- “endogenous morphine”
  - Opioid neuropeptides
    - Released from pituitary gland
      - Exercise
      - Emotional stress
      - Pain
      - Sex
      - Feelings of pleasure or euphoria
Drugs of Abuse Such as Heroin Target the Brain’s Pleasure Center

Brain reward (dopamine) pathways

Drugs of abuse increase dopamine.

Typically, dopamine increases in response to natural rewards such as food. When heroin is taken, however, dopamine increases are exaggerated, and communication is altered.
What Happens to Your Brain When You Take Drugs?

• As a person continues to abuse drugs, the brain adapts to the overwhelming surges in dopamine by producing less dopamine or by reducing the number of dopamine receptors in the reward circuit.

• The result is a lessening of dopamine’s impact on the reward circuit, which reduces the abuser’s ability to enjoy not only the drugs but also other events in life that previously brought pleasure.

• This decrease compels the addicted person to keep abusing drugs in an attempt to bring the dopamine function back to normal, but now larger amounts of the drug are required to achieve the same dopamine high—an effect known as tolerance.
What Happens to Your Brain When You Take Drugs?

• Long-term abuse causes changes in other brain chemical systems and circuits as well.

• Brain imaging studies of drug-addicted individuals show changes in areas of the brain that are critical to judgment, decision making, learning and memory, and behavior control.

• These changes can drive an abuser to seek out and take drugs compulsively despite adverse, even devastating consequences—that is the nature of addiction.
Location of Mu-Opioid Receptors.
Long-term effects of Heroin

Central
- Addiction
- Tolerance
- Dependence

Respiratory
- Pneumonia

Heart
- Infection of heart lining and valves

Circulatory
- Collapsed veins

Liver
- Decreased function

Systemic
- Abscesses
Opiate overview/examples
## Opiate examples

<table>
<thead>
<tr>
<th>Kinetic Parameters (Chart)</th>
<th>oral bio-availability (avg)</th>
<th>onset of effect</th>
<th>average half life (hr.)</th>
<th>plasma protein binding</th>
<th>typical duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>codeine</td>
<td>70-90%</td>
<td>45-60m</td>
<td>prodrug</td>
<td>7-25%</td>
<td>4-6h</td>
</tr>
<tr>
<td>pethidine</td>
<td>40-60%</td>
<td>20-40m</td>
<td>3-5h</td>
<td>60-80%</td>
<td>2-4h</td>
</tr>
<tr>
<td>morphine</td>
<td>30-40%</td>
<td>30-45m</td>
<td>2-4h</td>
<td>35%</td>
<td>3-4h</td>
</tr>
<tr>
<td>oxycodone</td>
<td>60-80%</td>
<td>45-60m</td>
<td>3.5h</td>
<td>45%</td>
<td>4-6h</td>
</tr>
<tr>
<td>hydrocodone</td>
<td>60-80%</td>
<td>45-60m</td>
<td>3.5h</td>
<td>unknown</td>
<td>4-6h</td>
</tr>
<tr>
<td>hydromorphone</td>
<td>24%</td>
<td>30m</td>
<td>2.6h</td>
<td>8-19%</td>
<td>2-3h</td>
</tr>
<tr>
<td>oxymorphone</td>
<td>10%</td>
<td>20-40m</td>
<td>1.3h</td>
<td>10-12%</td>
<td>3-4h</td>
</tr>
<tr>
<td>levorphanol</td>
<td>~50%</td>
<td>20-40m</td>
<td>11-16h</td>
<td>40%</td>
<td>4-8h</td>
</tr>
<tr>
<td>methadone</td>
<td>60%</td>
<td>60-90m</td>
<td>22h</td>
<td>80-90%</td>
<td>6-12h</td>
</tr>
<tr>
<td>fentanyl</td>
<td>~10-15%</td>
<td>10-20m</td>
<td>3.5h</td>
<td>85%</td>
<td>1-2h</td>
</tr>
<tr>
<td>buprenorphine</td>
<td>~10-15%</td>
<td>60m</td>
<td>36h</td>
<td>96%</td>
<td>4-12h</td>
</tr>
<tr>
<td>tramadol</td>
<td>70%</td>
<td>60-90m</td>
<td>6.7h</td>
<td>20%</td>
<td>4-6h</td>
</tr>
<tr>
<td>tapentadol</td>
<td>30-40%</td>
<td>30-45m</td>
<td>4.5h</td>
<td>20%</td>
<td>2-4h</td>
</tr>
</tbody>
</table>
Classification of Opioids

**Full Agonists**
- Non-synthetic
  - opium
  - papaverine
  - morphine
  - codeine

**Semi-synthetic**
- heroin
- hydromorphone
- oxycodone

**Synthetic**
- LAAM
- fentanyl
- Meperidine / pethidine
- hydrocodone
- methadone
- pentazocine

**Partial Agonists**
- buprenorphine

**Antagonist**
- naltrexone
Pharmaceuticals used to “treat” opiate addiction
Agonists

Methadone
(Dolophine, Methadose, etc)

- Activates the opioid receptors
- Stimulates opioid effect

Partial Agonist

Buprenorphine
(Subutex or Suboxone)

- Partially blocks opioid receptors
- Reduces withdrawal symptoms

Antagonist

Naloxone

- Mostly blocks opioid receptors
- Alleviates cravings

© New Roads Behavioral Health - 2015 – This image has not been reviewed by a medical professional
Pharmaceuticals used for opiate addiction

• Naloxone (Narcan)
• Naltrexone (Vivitrol)
• Buprenorphine with naloxone (Suboxone)
  • Abuse potential
    • Treatment program
• Methadone
  • Abuse potential
    • Treatment program
Naloxone
How it works

A prescription nasal spray called naloxone, sold under the name Narcan, can counteract the effects of an overdose of heroin or other opioids. Narcan can also be injected.

An overdose

When receptors in the brain are overwhelmed by an opioid, like heroin, the receptors saw then stop the body's ability to breathe.

The reversal

Naloxone has a stronger attraction to the brain's receptors and displaces the opioids long enough to allow breathing to resume.
The number of patients with suspected overdose treated by EMS with naloxone has been rapidly increasing over the past decade. In 2014, EMS treated 12,847 overdose patients with naloxone. This is an increase of 127% over the number treated in 2004.
Who is Treated with Naloxone?

Men make up 63% of all overdoses treated by EMS with naloxone. Men between the ages of 25 and 34 years old are 23% of this population, while older adults - men and women between the ages of 35 and 54 - make up 25% of all overdose patients treated by EMS with naloxone.
### Top 20 Zip Codes for Rate of Naloxone Given to Overdose Patients by EMS - Rate per 1,000 People

<table>
<thead>
<tr>
<th>Zip Code</th>
<th>Area</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>45202</td>
<td>Cincinnati</td>
<td>8.65</td>
</tr>
<tr>
<td>44702</td>
<td>Canton</td>
<td>8.55</td>
</tr>
<tr>
<td>45204</td>
<td>Cincinnati</td>
<td>8.03</td>
</tr>
<tr>
<td>43222</td>
<td>Columbus</td>
<td>8.01</td>
</tr>
<tr>
<td>45205</td>
<td>Cincinnati</td>
<td>7.07</td>
</tr>
<tr>
<td>45214</td>
<td>Cincinnati</td>
<td>6.75</td>
</tr>
<tr>
<td>43721</td>
<td>Brownsville</td>
<td>6.71</td>
</tr>
<tr>
<td>44503</td>
<td>Youngstown</td>
<td>5.88</td>
</tr>
<tr>
<td>45225</td>
<td>Cincinnati</td>
<td>5.86</td>
</tr>
<tr>
<td>43005</td>
<td>Bladensburg</td>
<td>5.75</td>
</tr>
<tr>
<td>45001</td>
<td>Addyston</td>
<td>4.95</td>
</tr>
<tr>
<td>45378</td>
<td>Verona</td>
<td>4.91</td>
</tr>
<tr>
<td>43215</td>
<td>Columbus</td>
<td>4.61</td>
</tr>
<tr>
<td>45216</td>
<td>Elmwood Place</td>
<td>4.60</td>
</tr>
<tr>
<td>43203</td>
<td>Columbus</td>
<td>4.44</td>
</tr>
<tr>
<td>43136</td>
<td>Lithopolis</td>
<td>4.35</td>
</tr>
<tr>
<td>45131</td>
<td>Higginson</td>
<td>4.20</td>
</tr>
<tr>
<td>43529</td>
<td>Hoytville</td>
<td>3.91</td>
</tr>
<tr>
<td>43077</td>
<td>Unionville Center</td>
<td>3.88</td>
</tr>
</tbody>
</table>
Naltrexone

• Indications
  • Treat alcohol dependence
  • Prevent relapse to opioid dependence (after opioid detox)
• Must be used with alcohol or drug recovery programs
Buprenorphine and naloxone

• 2013
  • 2.4 million abused or dependent on opioids

• Treat opioid dependence
  • Part of a complete treatment plan
    • Counseling
    • Psychosocial
What can be done?
Nothing until “The Bottom”

• Definition varies per individual

• What may be your “bottom” may not be someone else's
  • Response may be anger, confusion, “sense of failure”
What can be done?

• Expand access to evidence-based substance abuse treatment, such as Medication-Assisted Treatment, for people already struggling with opioid addiction
• Expand access to treatment facilities
• Expand access and use of naloxone
• Promote the use of state prescription drug monitoring programs
• Implement and strengthen state strategies that help prevent high-risk prescribing and prevent opioid overdose.
• Improve detection of the trends of illegal opioid use by working with state and local public health agencies, medical examiners and coroners, and law enforcement.
| Table 2. Formulations for Deterrence of Abuse. |

When opioids are diverted because of their rewarding effects, they are typically taken at higher doses than were originally prescribed. In other cases, the pills are crushed so that the drug can be snorted, smoked, or injected. These routes of administration result in faster drug delivery into the brain, which in turn is associated with a rapid and more intense drug effect. Thus, strategies for abuse-deterrent formulations have been developed to minimize the likelihood that the opioids will be injected or snorted or taken at higher doses than prescribed.23,24 These strategies include the following:

**Combining the opioid agonist with an antagonist.** Mixing the opioid with naloxone or naltrexone will interfere with the opioid effects if the drug is injected but not if it is taken orally or sublingually. Examples include Embeda (morphine sulfate plus naltrexone hydrochloride) and Targiniq ER (oxycodeone plus naloxone).

**Delivering the opioid in a form that cannot be crushed and extracted.** Examples of such drug-delivery technologies include opioids approved by Food and Drug Administration (FDA) in abuse-deterrent formulations such as Hysingla (hydrocodone) and the new formulation of OxyContin (oxycodeone), as well as opioids not approved as abuse-deterrent formulations, including Exalgo (hydromorphone), Nucynta ER (tapentadol), Opana ER (oxymorphone), Oxecta (oxycodeone), and Xartemis (oxycodeone and acetaminophen).

**Combining the opioid with a substance that triggers an adverse response.** If the drug is tampered with or used at a higher dose than indicated, such formulations are designed to produce adverse results. Examples include Lomotil (diphenoxylate hydrochloride plus atropine) and Acurox (oxycodeone plus niacin).

**Developing prodrugs that require enzymatic activation.** Such formulations could provide a chemical barrier to in vitro conversion into the active opioid. There are currently no abuse-deterrent formulations approved by the FDA that use this strategy. Examples being developed include prodrugs for hydrocodone, oxycodeone, and hydromorphone that require molecular cleavage by trypsin in the digestive system to release the parent opioid.
Access to Care

• Detox
• Inpatient
  • Aftercare
• Intensive outpatient
• Psychosocial
• 12 step programs (AA, NA, CA)
Heroin Rehab

• Heroin detox.
• Counseling – either individually or in a group or both.
• Behavioral therapy.
• Addiction education.
• Dual diagnosis treatment and care for any additional medical conditions you may have.
• Relapse prevention skill training.
• Support group participation.
• Aftercare
Questions?
PRESCRIPTION DRUG MONITORING PROGRAMS (PDMPs)

Checking the PDMP: An Important Step to Improving Opioid Prescribing Practices

WHAT IS A PDMP?

A PDMP is a statewide electronic database that tracks all controlled substance prescriptions. Authorized users can access prescription data such as medications dispensed and dates.

PDMPs improve patient safety by allowing clinicians to:
- Identify patients who are obtaining opioids from multiple providers.
- Calculate the total amount of opioids prescribed per day (MME/day).
- Identify patients who are being prescribed other substances that may increase risk of opioids—such as benzodiazepines.

Improving the way opioids are prescribed will ensure patients have access to safer, more effective chronic pain treatments while reducing opioid misuse, abuse, and overdose. Checking your state’s PDMP is an important step in safer prescribing of these drugs.

WHEN SHOULD I CHECK THE PDMP?

State requirements vary, but CDC recommends checking at least once every 3 months and consider checking prior to every opioid prescription.

LEARN MORE | www.cdc.gov/drugoverdose/prescribing/guideline.html
51% of all overdoses treated with naloxone by EMS happened in the 8-hour period from 2:00 p.m. to 10:00 p.m.
Commonly Used Terms

• **Opioid use disorder**
  • A problematic pattern of opioid use that causes clinically significant impairment or distress. A diagnosis is based on specific criteria such as unsuccessful efforts to cut down or control use, as well as use resulting in social problems and a failure to fulfill obligations at work, school, or home. Opioid use disorder has also been referred to as “opioid abuse or dependence” or “opioid addiction.”

• **Physical dependence**
  • Adaptation to a drug that produces symptoms of withdrawal when the drug is stopped.

• **Tolerance**
  • Reduced response to a drug with repeated use.
Commonly Used Terms

• **Drug misuse**
  • The use of prescription drugs without a prescription, or in a manner other than as directed by the prescriber.

• **Overdose**
  • Injury to the body that happens when a drug is taken in excessive amounts. An overdose can be fatal or nonfatal.

• **Medication-assisted treatment (MAT)**
  • Treatment for opioid use disorder combining the use of medications (methadone, buprenorphine, or naltrexone) with counseling and behavioral therapies.
Heroin Use Has INCREASED Among Most Demographic Groups

<table>
<thead>
<tr>
<th></th>
<th>2002-2004*</th>
<th>2011-2013*</th>
<th>% CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEX</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.4</td>
<td>3.6</td>
<td>50%</td>
</tr>
<tr>
<td>Female</td>
<td>0.8</td>
<td>1.6</td>
<td>100%</td>
</tr>
<tr>
<td><strong>AGE, YEARS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-17</td>
<td>1.8</td>
<td>1.6</td>
<td>--</td>
</tr>
<tr>
<td>18-25</td>
<td>3.5</td>
<td>7.3</td>
<td>109%</td>
</tr>
<tr>
<td>26 or older</td>
<td>1.2</td>
<td>1.9</td>
<td>58%</td>
</tr>
<tr>
<td><strong>RACE/ETHNICITY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>1.4</td>
<td>3</td>
<td>114%</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>1.7</td>
<td>--</td>
</tr>
<tr>
<td><strong>ANNUAL HOUSEHOLD INCOME</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $20,000</td>
<td>3.4</td>
<td>5.5</td>
<td>62%</td>
</tr>
<tr>
<td>$20,000-$49,999</td>
<td>1.3</td>
<td>2.3</td>
<td>77%</td>
</tr>
<tr>
<td>$50,000 or more</td>
<td>1</td>
<td>1.6</td>
<td>60%</td>
</tr>
<tr>
<td><strong>HEALTH INSURANCE COVERAGE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>4.2</td>
<td>6.7</td>
<td>60%</td>
</tr>
<tr>
<td>Medicaid</td>
<td>4.3</td>
<td>4.7</td>
<td>--</td>
</tr>
<tr>
<td>Private or other</td>
<td>0.8</td>
<td>1.3</td>
<td>63%</td>
</tr>
</tbody>
</table>

Heroin Addiction and Overdose Deaths are Climbing

**Heroin-Related Overdose Deaths**
(per 100,000 people)

**Heroin Addiction**
(per 1,000 people)

Sources: National Survey on Drug Use and Health (NSDUH), 2002-2013.