Heroin Addiction and Overdose:
What Can We Do to Address This Growing Problem?

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Prescription Drug Misuse/Abuse is a Major Problem in the US

Current Drug Use Rates in Persons Ages 12+

<table>
<thead>
<tr>
<th>Illicit Drugs</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marijuana</td>
<td>19.8</td>
</tr>
<tr>
<td>Psychotherapeutics</td>
<td>6.5</td>
</tr>
<tr>
<td>Cocaine</td>
<td>1.5</td>
</tr>
<tr>
<td>Hallucinogens</td>
<td>1.3</td>
</tr>
<tr>
<td>Inhalants</td>
<td>0.5</td>
</tr>
<tr>
<td>Heroin</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Past Year Nonmedical Use of Psychotherapeutic Drugs Persons Ages 12+

<table>
<thead>
<tr>
<th>Year</th>
<th>Pain Relievers</th>
<th>Tranquilizers</th>
<th>Stimulants</th>
<th>Sedatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>4.7</td>
<td>2.1</td>
<td>1.2</td>
<td>0.3</td>
</tr>
<tr>
<td>2005</td>
<td>4.9</td>
<td>2.2</td>
<td>1.1</td>
<td>0.3</td>
</tr>
<tr>
<td>2006</td>
<td>5.1</td>
<td>2.1</td>
<td>1.2</td>
<td>0.4</td>
</tr>
<tr>
<td>2007</td>
<td>5</td>
<td>2.1</td>
<td>1.2</td>
<td>0.3</td>
</tr>
<tr>
<td>2008</td>
<td>4.8</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>2009</td>
<td>4.9</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>2010</td>
<td>4.8</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>2011</td>
<td>4.3</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>2012</td>
<td>4.8</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>2013</td>
<td>4.2</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

High Levels of Opioid Prescriptions have Facilitated Diversion & Contributed to Overdose Deaths

Oxycodone & Hydrocodone Prescriptions

Rx Opioid Overdose Deaths

Source: CDC Wonder

SDI Health, VONA_02-1-13_Opioids Schedule II & III
Age-Adjusted Rates for Drug-Poisoning Deaths Involving Heroin, By Census Region: US

Deaths per 100,000 population

Northeast: 
- 2000: 5
- 2007: 4
- 2013: 3

Midwest: 
- 2000: 6
- 2007: 5
- 2013: 4

South: 
- 2000: 7
- 2007: 6
- 2013: 5

West: 
- 2000: 8
- 2007: 7
- 2013: 6

Rates for Drug-Poisoning Deaths Involving Heroin, By Selected Age & Race & Ethnicity Groups

Deaths per 100,000 population

18-44
- Non-Hispanic White: 8
- Non-Hispanic Black: 7
- Hispanic: 6

45-64
- Non-Hispanic White: 7
- Non-Hispanic Black: 6
- Hispanic: 5

CDC, NCHS Data Brief, No 190, March 2015.
Abuse of Opioid Medications has led to a Rise in Heroin Abuse and Associated Deaths from Overdoses

Past Month & Past Year Heroin Use
Persons Aged 12 or Older

Heroin Overdose Deaths

Source: CDC Wonder

Which Drug is the First Opioid Used in Addicts?

Shifting Pattern of Heroin vs. Rx Opioid First

Percentage of Heroin-Addicted Treatment Admissions that Used Heroin or Prescription Opioid as First Opioid

- **1960s**: more than 80% started with heroin
- **2000s**: 75% started with prescription opioids
- **2010-2013**: Increasing initiation with heroin

Source: Cicero et al. JAMA Psychiatry. 2014;71(7):821-826
Analgesic Mechanisms of Mu Opiate Drugs (Heroin, Vicodin, Morphine)
How Can Research Help?

- **PAIN**: Develop Less Abusable Analgesics and Alternative Therapeutics
- **OVERDOSES**: User Friendly Naloxone
- **ADDICTION**: New Medications and Immunotherapies
- **IMPLEMENTATION SCIENCE**: Novel approaches to increasing use of effective interventions and policies
Develop Less Abusuable Drugs: Pro-drugs

- **Problem**: changing method of taking opioids – i.e., crushing, injecting – increases euphoria; abuse
- **Challenge**: develop drugs that resist tampering; abuse
- **Research response**: oxycodone pro-drug
  - Inactive compounds metabolized in the body to produce active drug
PAIN: Alternative Therapeutics
Non-Medication Strategies for the Treatment of PAIN and ADDICTION

Transcranial Magnetic Stimulation (TMS)

Deep Brain Stimulation (DBS)
Stereotaxic implantation of electrodes that emit electrical stimulation to a targeted neuronal region

High-Definition transcranial Direct Current Stimulation (HD-tDCS)

Transcranial Direct Current Simulation (tDCS)


Improving OD Treatments: Naloxone for Overdose

• Lay-friendly administration: intranasal naloxone

• AntiOp, developing disposable naloxone nasal spray. Product could be on the market 2015

• Lightlake Therapeutics, conducting clinical trials with intranasal naloxone for binge eating disorder will test this for opioid overdose
Improving Implementation of Medication Assisted Treatments: Addiction

% Treatment Programs Offering FDA-approved SUD medications

- Buprenorphine: 25%
- Methadone: 9%
- Tablet naltrexone: 17%
- Injectable naltrexone: 9%
- Disulfiram: 16%
- Acamprosate: 19%

% OTP patients receiving methadone, buprenorphine, or vivitrol

- Methadone: 26.4%
- Buprenorphine: 3.9%
- Vivitrol: 0.3%
- Not receiving Methadone, Buprenorphine or Vivitrol: 69.4%


2012 N-SSATS Data, SAMHSA
**ADDICTION: New Medications & Immunotherapies**

**Opioid Agonist Treatments Decreased Heroin OD Deaths**
Baltimore, Maryland, 1995-2009

**Challenge: Compliance with daily intake**
**Solution: develop long acting medications**


**RCT Buprenorphine Implants vs Placebo & Sublingual Buprenorphine/Naloxone**

Probuphine is designed to release sustained therapeutic drug levels in patients with opioid addiction for up to six months.

% of Urines Negative (out of 72) for Opioids Across Weeks 1 to 24

Treating Opioid Addiction: Vaccines

Antibodies reduce amount of drug in the brain

 Targets drugs, not receptors
Implementation Science

Strategies that Can Help Address the Dangers of Opioid Overdose and Addiction in the US

• Responsible Prescribing and Management of Chronic Pain, which requires enhanced Education on Pain and its Treatment

• Availability of Naloxone

• Mandatory Addiction Education in Medical, Nursing and Pharmacy Schools
• NIDA CoEs established in 2007 to help fill gaps in medical education curricula related to both illicit drugs and Rx drug abuse

• Medical schools at CoEs have developed a diverse portfolio of innovative curriculum resources about how to identify and treat patients struggling with SUD

www.drugabuse.gov/coe