Problem of Drug Abuse

Drug addiction includes:
- 45 million smokers (20.9%)  
- 7 million hard drug addicts (2%)  
- 12 million alcoholics (4%)  
- 18 million alcohol abusers (6%)  
- 4 million prescription drug abusers (1%)  
- 15 million regular users of marijuana

Addiction is the cause of compulsive smoking and smoking is the number one preventable cause of death in the US.

About 430,000 people die from smoking-related illness in US each year – 1/5 of all deaths! (US Surgeon General/CDC)

Smoking is a behavioral problem

- 1 in 5 Americans smoke  
- 1 out of 4 smokers die from the habit, and live an average of 15.1 years less than their life expectancy  
- 70% of smokers have tried to quit at least once, 46% try each year. Most quitters try 5-7 times before they succeed. (only 2.5% succeed each year)  
- Only 1 in 5 Physicians have received training in smoking cessation  
- Few effective treatments for addiction
Problems associated with hard drug abuse

- Pretty much everything bad:
  - organized crime (esp. cocaine and heroin)
  - political instability
  - violent crime
  - divorce
  - poverty
  - homelessness
  - accidents
  - absenteeism
  - other mental illness (depression, anxiety, schizophrenia)
  - other health problems:
    - dental problems
    - heart disease
    - stroke
    - death

What is Drug Abuse?

The use of any drug, “in a manner that deviates from the approved medical or social patterns in a given culture.” (Jaffe)

- A social problem
- Some drugs may be considered abused in one situation but not others (alcohol)
- Some drugs may be considered abused if used at all (heroin, extasy)
- Some cultures may use drugs and not consider them abuse (peyote, bhang)
- Drug does not have to be addictive (LSD)

What is Drug Abuse?

Medical definition:

Also takes into account the pattern of use e.g., Am. Psychiatric Assoc. (DSM) identifies 3 criteria that must be met to diagnose substance abuse:

(1)”A pattern of pathological use . . .“

(2) Impairment in social or occupational functioning caused by the pattern of pathological use.

(3) Duration of at least one month.”

These types of definitions stress excessive use that results in socially or medically inappropriate behavior
What is Drug Abuse?
Lots of drug use falls outside of medical use:

term "non-medical drug use" – less harsh than drug abuse or addiction, not necessary a problem:

- experimental drug use (one or few times for curiosity, peer pressure, scientific interest);
- recreational (casual) use (moderate use for pleasure);
- circumstantial use (for specific purpose occasionally; e.g., fatigue).

What is Drug Addiction?
Not the same thing as Drug Abuse

Difficult to define, and definition has changed over the years. Modern definition of Addiction (Jaffe):

"a behavioral pattern of drug use, characterized by overwhelming involvement with the use of a drug (compulsive use), the securing of its supply (compulsive drug-seeking), and a high tendency to relapse after withdrawal"

Note that this definition does not necessarily imply that addiction = dependence (many addictive drugs do not produce much dependence).

Names of Drugs
Drugs have many names, most commonly:

- Brand, trade, 'proprietary' name: e.g., Desoxyn®
- different preparations, companies, etc.

- Generic, trivial, 'nonproprietary' name:
  e.g., methamphetamine

- Chemical name: N,alpha-dimethylphenethylamine

- Street name: e.g. ‘ice’ or ‘crank’ - same name may refer to different several different drugs.
  Mostly I will use the generic name.
Several classes of psychoactive drugs

At some point, all were used in medicine, many still are. No good relationship with legality & abuse potential:

**Opiates (narcotics):** morphine, heroin, codeine, hydrocodone (Vicodin), Dilaudid, Demerol

**Depressants:** [Barbiturates: Seconol, Nembutal, Benzodiazepines: diazepam (Valium), Ativan, flunitrazepam (Rohypnol); Methaqualone, GHB]

**Stimulants:** cocaine, amphetamine, methylphenidate (Ritalin), nicotine, caffeine

**Hallucinogens:** LSD, psilocin, psilocibin

**Dissociative Anesthetics:** PCP and Ketamine

**Cannabinoids:** tetra-hydrocannabinol (marijuana)

**Designer Drugs:** MDMA (extasy) many others

History of Drug Abuse

Drug abuse largely man-made, corporate-developed, government-endorsed problem.

- **Highly social and political field, not just scientific.**

Theories of addiction heavily influenced by drugs abused at the time, and by public policy toward those drugs.

Try to keep legal and social status of drug separate from whether or not it is addictive.

*Many illegal drugs do not produce addiction.*

History of Drug Abuse in the US

Aside from alcohol and nicotine use, **Drug addiction** emerged in the US with the use of morphine (from opium) in Civil War soldiers (known as Soldier’s disease)

As the problems associated with morphine became obvious, other drugs replaced it.

Many drugs of abuse originated in plants (e.g., nicotine, cocaine, opium), the rest were made by drug companies.

Until 1906 all drugs were legal -- most remained legal for many years.
History of Drug Abuse in the US

Opium is extracted from the unripe seed capsule of the Poppy plant: Papaver somniferum - mentioned in the Iliad and Odyssey use documented in Egyptian culture. Grown wild in Asia, range from Greece to China - most legal production is in India and Turkey.

Opium contains: morphine, codeine, noscapine (narcotin), papaverine, narceine, thebain, etc.

Widespread use of morphine in US between 1865-1906

This bottle of Stickney and Poor's paregoric was distributed much like the spices for which the company is better known. McCormick also manufactured and sold paregoric, which is a mixture of opium and alcohol. Doses for infants, children, and adults are given on the bottle. At 46% alcohol, this product is 92 proof which is pretty potent in itself.

Widespread use of morphine in US between 1865-1906

Mrs. Winslow's Soothing Syrup was an indispensable aid to mothers and child-care workers. Containing one grain (65 mg) of morphine per fluid ounce, it effectively quieted restless infants and small children. It probably also helped mothers relax after a hard day's work. The company used various media to promote their product, including recipe books, calendars, and trade cards such as the one shown here from 1887 (A calendar is on the reverse side.).
Products containing opium and other narcotics were required to pay a special tax on each bottle of "medicine" and to signify that the tax was paid by sealing the unopened bottle with a tax stamp. Note the irony of portraying a child on the narcotic tax stamp used with Mrs. Winslow's Soothing Syrup (c. 1900). (Domestically sold alcoholic beverages and tobacco products paid the same tax.)

In the following years, Heroin was a drug marketed by Bayer as a cough syrup without the nasty side effects of morphine.

Bayer created aspirin from salicylic acid: he added two acetyl groups and got rid of much of the stomach problems.

Tried the same thing for morphine: diacetylmorphine, called it heroin and claimed it wouldn’t be habit-forming.
Paperweight advertisement for Boehringer & Soehne, "largest makers in the world of quinine and cocaine." This manufacturer was proud of its leading position in the world's cocaine market.

Cocaine toothache drops were popular with children and with their parents. Not only would the medicine numb the pain, but it could also put the user in a "better" mood.

Large # of wines were fortified with cocaine.
Bullard & Shedd's brand of coca wine claimed to be effective in curing sea sickness, headache, neuralgia, gastralgia, etc. It was also promoted to cure the "opium or alcohol habit."

Addictive drugs marketed as panacea

Cocaine was removed from Coke syrup in 1906

Early Coca-Cola syrup label listing ingredients. Even after the cocaine was removed from the coca leaves used to make Coca Cola (c. 1906), the product was still sold for its medicinal effects. Today the company generally refuses to comment on the use of coca leaves in their product (removed due to Temperance movement in GA 1886-1887 -- was making vin Coca).

History of Drug abuse in the US

Pure Food and Drug Act (1906) - regulated drugs, food and drug claims - created FDA.

Harrison Tax Act (1914) - Outlawed opiates and cocaine, mostly due to a trade war with China

• Several laws related to marijuana, cocaine, alcohol (prohibition), heroin, etc.
History of Drug abuse in the US

Boggs Amendment to the Harrison Act (1951) criminalized illicit drug use.

Since then many other drugs came about.

Ephedrine comes from Ma-Huang plant. It is a moderate stimulant used for asthma and now marketed as 'herbal ecstasy.'

Drug company tried to make synthetic ephedrine (later developed pseudo-ephedrine or Sudafed), but made amphetamine, which worked better, instead.
**PPA, ephedrine, Sudafed, epinephrine, & amphetamine: birds of a feather**

**epinephrine (adrenalin)**

**History of Drug abuse in the US**

Amphetamine was widely used over the counter until 1965.

Benzedrine (amphetamine) inhalers were available over-the-counter until the early 1950s. The Smith, Kline, and French (now Glaxo) advertisement proudly proclaims that over 10 million Benzedrine inhalers had been shipped by 1938, only 7 years after the product’s introduction.

**~1950**
History of Drug abuse in the US

Amphetamines became the drug of choice in the 1960s, along with hallucinogens (both became illegal in 1965 -DACA)

Mescaline (Peyote)
Psilocin and Psilocibin ('magic mushrooms')

LSD (acid) - Lysergic acid diethylamide
synthesized by Hoffman in 1938
(now Roche Pharmaceuticals)

LSD, psilocybin, & psilocin do not produce addiction, recreational but considered abused.

History of Drug abuse in the US

PCP (phencyclidine; angel dust) was developed as a elephant tranquilizer by Parke-Davis (Serylan®) along with the animal tranquilizer ketamine. PCP was mildly popular in the '60s and today and ketamine is mildly popular now (special K)

- These drugs are messy in terms of action, and are both addictive and hallucinogenic.

THC (tetrahydrocannabinol) is the active ingredient in marijuana (cannabis sativa), moderate use throughout years. Low addictive potential, strong legalization movement.

History of Drug abuse in the US

Created several classes of drugs
Schedule 1 (Heroin, LSD, Marijuana) - no medical use
Schedule 2-5 - various restrictions on medical use, which also vary by state.

- Various amendments through the years.
- Supposed to be based on ‘abuse potential’ (similar concept to addiction), but strong criticism in scientific community of many of the schedules.
History of Drug Abuse in the US

Several new drugs of abuse, in particular:

- Resurgence of methamphetamine: crank, ice, crystal meth, essentially super version of cocaine.
- Designer drugs recently outlawed - derivatives of amphetamine
  MDMA (3,4-methylenedioxymethamphetamine, ecstasy) - derived from amphetamine by Merck as an appetite suppressant, a mild, addictive hallucinogen, stimulant, and anti-depressant, similar drugs.
  DOB (4-methyl-2,5-dimethoxyamphetamine) super version of MDMA.

ER mentions

Several laws since 1986 to outlaw analogue drugs:
- Fentanyl (china white) - 200+ x potent as heroin - Sublimaze by Ciba.
- Duragesic patch
- Actiq lollipop
- Oxycodeone (Oxycontin) - 2x more potent than morphine widely available and often diverted (same as percodan, percocet)
- "Date rape drugs" - illegal as of 2000 or 2001 (Date Rape Prohibition Act)
- GHB (Georgia home boy; grievous bodily harm) gammahydroxybutyrate - food supplement - form CABA
- Rohypnol (flunitrazepam; Ruffies) - Roche - strong benzodiazepine

Percent of Students Reporting Past Month Use of Any I illicit Drug Has Decreased

19% Decline 2001 to 2005

Source: University of Michigan, 2005 Monitoring the Future Study
Prescription drug abuse is soaring among teens

Percentage of 12th graders who reported using OxyContin in the year prior to being surveyed:

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>4%</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Issues of Concern

Percent of 12th Graders Reporting Nonmedical Use of OxyContin and Vicodin in the Past Year Remained High

<table>
<thead>
<tr>
<th>Drug</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>OxyContin</td>
<td>4.0</td>
<td>4.5</td>
<td>3.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Vicodin</td>
<td>10.5</td>
<td>9.3</td>
<td>9.5</td>
<td>9.5</td>
</tr>
</tbody>
</table>

*Year-to-year differences are statistically significant.*

Source: University of Michigan, 2005 Monitoring the Future Study

Legal "E"

Benzylpiperazine (BZP) and trifluoromethylphenylpiperazine (TFMPP)

Tryptamines

5-MeO-DiPT "Foxy Methoxy"
Sch 1, April 2003

Alpha-methyltryptamine (AMT)
Sch 1, April 2003
### Fortune 500 Drug Companies Profit and Revenue Increases, 2002

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Revenues $ Millions</th>
<th>% Change from</th>
<th>Profits $ Millions</th>
<th>% Change from</th>
<th>Profits as % of Revenues</th>
<th>Stockholders' Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Merck</td>
<td>51,790</td>
<td>9%</td>
<td>7,150</td>
<td>(2%)</td>
<td>14%</td>
<td>15%</td>
</tr>
<tr>
<td>2</td>
<td>Johnson &amp; Johnson</td>
<td>35,096</td>
<td>10%</td>
<td>6,997</td>
<td>16%</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>3</td>
<td>Pfizer</td>
<td>35,501</td>
<td>9%</td>
<td>6,974</td>
<td>17%</td>
<td>19%</td>
<td>20%</td>
</tr>
<tr>
<td>4</td>
<td>Bristol-Meyers Squibb</td>
<td>15,119</td>
<td>11%</td>
<td>1,805</td>
<td>(91%)</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>5</td>
<td>Abbott Laboratories</td>
<td>17,665</td>
<td>8%</td>
<td>2,794</td>
<td>80%</td>
<td>16%</td>
<td>12%</td>
</tr>
<tr>
<td>6</td>
<td>Wyeth*</td>
<td>14,564</td>
<td>3%</td>
<td>4,647</td>
<td>95%</td>
<td>30%</td>
<td>17%</td>
</tr>
<tr>
<td>8</td>
<td>Eli Lilly</td>
<td>11,076</td>
<td>4%</td>
<td>2,708</td>
<td>3%</td>
<td>24%</td>
<td>14%</td>
</tr>
<tr>
<td>9</td>
<td>Schering-Pfizer</td>
<td>10,188</td>
<td>4%</td>
<td>1,974</td>
<td>2%</td>
<td>19%</td>
<td>14%</td>
</tr>
<tr>
<td>10</td>
<td>Amgen</td>
<td>8,503</td>
<td>38%</td>
<td>(1,369)</td>
<td>(22%)</td>
<td>(20%)</td>
<td>(8%)</td>
</tr>
</tbody>
</table>

Total: $217,467 3.7% $35,896 (3.4%)

Median: $17,307 6.9% $2,708 0% 17.0% 14.1% 27.6%


---

### Profitability of Fortune 500 Drug Companies v. Profits for All Fortune 500 Companies, 2002

- **2002 Drug Industry Median**
- **2002 Median of All Fortune 500 Industries**

### Profitability of Fortune 500 Drug Industry and All Fortune 500 Industries, 1970 to 2002

- **Drug Industry Median Profit as % of Revenue**
- **All Industry Median Profit as % of Revenue**
Legal Drug Manufacturing in the World

• Typical profit margin of a Pharmaceutical company is three times that of any other industry represented by Fortune

• For every year since 1982, Pharmaceutical industry has had the highest profit margin of any industry.

• In 2000, US Drug sales were $145 billion, about 40% of world total (US is about 5% of world popln)

• In 1999, NIH spent $17.8 billion for research and pharms spent $22.7 billion

Legal Drug Manufacturing in the World

• There are 24,000 drugs on the market in the US (up 7x since 1990)