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Methamphetamine Use: Lessons Learned

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Executive Summary

This report provides an overview of the methamphetamine problem in the United States. It looks at the history of the problem, trends in use, characteristics of users, adverse effects, trafficking and production and treatment issues. The analysis relies on extensive review of extant literature on the drug, analysis of existing datasets relevant to methamphetamine use, and conversations with law enforcement treatment, and government personnel dealing with the problem.

History of Methamphetamine Use

Amphetamines, including methamphetamine, were first synthesized in the early part of the 20th century, although they were not identified for medical use until the 1930s. First manufactured as a bronchial dilator, they were quickly prescribed for a variety of other conditions—narcolepsy, attention deficit disorder, obesity, and fatigue. With an increasing problem of abuse of these drugs due to legal availability and easy access in the 1950s and 1960s, amphetamines/methamphetamine were made Schedule II substances in 1970. Through the next decade, further restrictions on prescriptions and on the precursor chemicals needed for manufacture resulted in reductions in use nationwide. Methamphetamine had faded from a previous national popularity rivaled only by marijuana until reappearing in Hawaii and the West in the 1980s.

Trends

Throughout the 1990s, methamphetamine use grew steadily in the West and Northwest. By the turn of the millennium, it had reappeared in many areas of the Midwest and South and surfaced to a lesser degree in the Northeast and Mid Atlantic. In the general population, as reflected in the National Survey on Drug Use and Health (NSDUH), methamphetamine use rose from just under 2% of the adult population in 1994 to approximately 5% in 2004. Reporting on youth, Monitoring the Future (MTF) reports that amphetamine/methamphetamine use has remained stable over the last decade for both 8th graders and 12th graders, dropping slightly in 2003. Data from the Youth Behavioral Risk Surveillance System (YBRSS) shows similarly stable, if not slightly declining, numbers of users among youth nationwide.

National treatment data from the Treatment Episode Data Set (TEDS) on admissions to treatment indicate a steady rise in the number of persons nationwide who enter treatment for methamphetamine abuse. From 1992 to 2002 the rate of treatment admissions for methamphetamine abuse in the U.S. increased fivefold, from less than 1% in 1992 to over 6% in 2003. The Drug Abuse Warning Network emergency room reports show a similar trend nationally: a slight rise from just under 16,000 mentions in 1995 to 17,696 in 2002.

But National trends are seriously misleading. While national data such as these show some increases, albeit at low levels, regional data on methamphetamine use provide a far more serious picture of the problem. TEDS data show that in 1992 only two states (Hawaii and California) reported more than 5% of total treatment admissions were for methamphetamine. In 2003, 26 states reported over 5%, 8 states reported over 20%, and 2 states (Hawaii and Idaho) reported over 40% methamphetamine admissions. The highest rates were reported in Hawaii and the West, where states like Idaho reported 42%, Nevada reported 28%, and California reported 31%. Midwestern states like Iowa (20%), and Southern states like Arkansas (22%) also report rates far higher than the national average. While the highest rates of use remain in the West and Midwest, there are increases in other new areas. In North Dakota, for example, in 1992 no admissions were for methamphetamine; in 2003, 12% of North Dakota admissions were for meth abuse.

Regional differences in DAWN emergency room mentions are similarly dramatic. While some cities with high numbers of ER mentions for meth have remained unchanged or even declined somewhat (Los Angeles, San Francisco, San Diego, Dallas, Denver), other areas have experienced enormous upswings in ER mentions since 1995: Seattle (109% increase), Minneapolis (243% increase), New Orleans (194% increase), St. Louis (97% increase). These regional trends are mirrored in the Arrestee Drug Abuse Monitoring (ADAM) data. In 11 ADAM sites in 2003, 25% of arrestees tested positive for methamphetamine in their systems; only one site had a proportion that high in 1996.

Characteristics of Users and Adverse Effects

Unlike many other illegal drugs, methamphetamine is a drug that appeals equally to men and women. All of the national data sets show an almost equal gender split for self reported meth use. Users also tend to be White and in their 20s and 30s. Though both cocaine and methamphetamine are stimulants, a comparison of characteristics of methamphetamine users and cocaine or crack users indicates that the two drugs do not, for the most part, share a common user group; that is, the drugs do not seem to substitute for each other or appeal to the same users.

Methamphetamine is a drug that has both acute toxic effects and can produce long term physiological problems. It is a powerful central nervous system stimulant that promotes the release of neurotransmitters like dopamine, norepinephrine and serotonin, each of which controls the brain's messaging systems for reward and pleasure, sleep, appetite and mood. However, when ingested (injected, snorted, eaten), meth produces prolonged euphoric or energized states. The adverse effects are both short-term (cardiac problems, hyperthermia, depression, confusion) and chronic. When used chronically, methamphetamine causes long-term neural changes that result in impaired memory, mood alterations, impaired motor coordination, and psychiatric problems long after termination of use.

Trafficking, Production, Regulation

Methamphetamine is synthesized from precursor chemicals. Methods of production are commonly available on the Internet or in underground publications and can be executed by almost anyone with high school chemistry experience. Many of the chemicals used are household products that are not feasible to regulate. However, others (ephedrine and pseudoephedrine products, anhydrous ammonia) have come under serious scrutiny and legislation on both the state and Federal level has developed to monitor their sale and limit their availability for illegal uses.

Methamphetamine found in the U.S. is most often produced domestically or in Mexico. It is produced either in small "Mom and Pop" labs making only a few pounds at a time or in superlabs which produce 10 pounds or more in a production cycle. Historically, needed precursor chemicals for large-scale production were smuggled to labs primarily in the Southwest and California, but current distribution is more geographically dispersed. The total number of meth clandestine lab incidents/seizures has risen steadily from just over 9,000 (44 states reporting) in 2000 to approximately 16,000 (46 states reporting) in 2002, to just over 17,000 (47 states reporting) in 2003. Some Western states (California, New Mexico, Idaho, Nevada, Colorado) have experienced significant declines in lab incidents/seizures, while states like Louisiana, Missouri, Arkansas, Mississippi, Tennessee, and Georgia have seen the numbers of seizures/incidents, as much as tripled or quadrupled since 2000.

While the number of "Mom and Pop" labs, often called Small Toxic Labs or STLs, is far greater than the number of superlabs, DEA estimates that the bulk of meth on the market comes from superlabs. The damage done to farmland, water supply, and vegetation from labs of any size, however, is a major problem in all areas where meth is manufactured. Environmental cleanup is costly and may require specialized equipment and training not available to local law enforcement.

Control and regulation of the chemicals used in meth production began in the 1980s and continues. In the 1990s, a series of laws targeted ephedrine and other precursor chemicals and increased the penalties for methamphetamine trafficking and manufacture. In 2000, Congress passed the Methamphetamine Anti-Proliferation Act to address diversion of products containing pseudoephedrine, and introduced thresholds for these and other over the counter medications containing possible precursor substances. Successful law enforcement operations such as DEA'S Operation Mountain Express and Operation Northern Star targeted importation of ephedrine/pseudoephedrine through domestic organizations operating superlabs in Phoenix, Las Vegas, Riverside and San Diego. The Combat Methamphetamine Epidemic Act of 2005, having passed the House of Representatives in December 2005, and currently under consideration in the Senate, would restrict the circumstances and amounts of sale of ephedrine/pseudo-ephedrine products, set impact quotas on these substances, and increase penalties for production and distribution.

On the retail level, methamphetamine is a new market in some areas and established market in others. In those areas where it is relatively new, it is generally produced by local "cooks" and distributed in a "hand to hand", relational network of people. In areas where the market is well established and the demand is high, more organized networks of producers and distributiors appear to operate.

Treatment

Methamphetamine users are seen as some of the most difficult drug treatment patients, due to protracted physiological and psychological problems caused by the drug's impact on neural pathways. Earliest treatment approaches were based on experience with treating cocaine users. Current psychosocial approaches include case management, community reinforcement and the Matrix Model, a manualized protocol of relapse prevention, cognitive approaches, family therapy and incentives.

Pharmacotherapies are still under development for stimulant users. Several medications and supportive protocols have been studied in a series of NIDA-supported clinical trials, though no standard pharmacotherapy for meth treatment has yet been finalized.

Introduction

Methamphetamine may be the most poorly understood major drug of abuse in the United States, perhaps due in part to its wholly synthetic nature. Many Americans can easily connect marijuana, cocaine and heroin to the plants they are derived from, but most would find it difficult to link methamphetamine back to its most basic precursor, the Chinese herb Ma Huang, or identify it with its many other precursor forms—ephedra, ephedrine, pseuodephedrine. While Americans might recognize the names "methamphetamine," "amphetamine" or "speed" as dangerous substances, few link these drugs to the dietary supplements, energy enhancers or appetite suppressants that share the same origins.

In addition, methamphetamine does not have the national profile of marijuana, opiates, or cocaine. Compared to these substances, methamphetamine is a relatively new drug. It does not appear in historical accounts in the United States before the 20th century, and there is no cultural tie to its use comparable to marijuana's link to the '60s and jazz musicians, heroin's association with William S. Burroughs and beat poetry, or cocaine's history with legal "tonics" and Sherlock Holmes. In contrast, methamphetamine has been primarily known to some as the favorite drug of motorcycle gangs, a less than rich cultural heritage.

Amphetamines/methamphetamine[1] abuse is not new, however. Widely available throughout the 1940s and '50s through prescription, by 1970 amphetamines alone or in a variety of compounds became the most widely abused drugs in the U.S. after marijuana (Grinspoon and Hedbloom, 1975). In 1970, legal production of amphetamines reached over 10 billion tablets, many times the amount needed for legitimate medical use. A survey of use among a national sample of over 7,000 college students conducted that year found that 11% reported amphetamine/methamphetamine use (Grinspoon and Hedbloom, 1975). Changing laws and changing drug trends over the next two decades appeared to effect the virtual disappearance of these drugs. However, starting in the 1980s, methamphetamine use resurfaced, steadily gathering a following once again. Beginning in Hawaii and the West, methamphetamine became increasingly popular, spiking treatment admissions from 2% of all treatment admissions in 1993 to 7% in 2003 (U.S. DHHS, OAS, 2005).

But these figures are deceptive. Methamphetamine use has been at epidemic stages in some areas of the country for over a decade, while in others its popularity is confined to smaller subgroups. In California, the proportion of all the treatment admissions for methamphetamine has gone from 8% to 31% from 1992 to 2003; in Arkansas, it skyrocketed from 2% to 22%; and in Iowa the rate went from 2% to 22% (U.S. DHHS, OAS, TEDS, 2005) over the same time period.

[1] Amphetamines are a category of drugs that include dextroamphetamine (Dexadrine), methamphetamine (Methedrine, Desoxyn) and amphetamine itself (Benzadrine). All are central nervous system stimulants. Many data sources do not distinguish between the general category of amphetamine and methamphetamine, and simply combine them into a general category of amphetamine-like substances.

Law enforcement is also concerned. Data from the National Drug Threat Assessment Survey (NDIC, February 2005) of state and local law enforcement agencies show that 40% of agencies report methamphetamine as their primary drug threat, surpassing cocaine (36%), or heroin (9%). The National Association of Counties in 2005 found that 58% of county law enforcement agencies surveyed listed methamphetamine as the number on drug problem in their areas (NACO, 2005).

Cheap, easy to manufacture and long acting, methamphetamine has become a major player in the drug culture. While the largest number of seizures are still found in the West, Midwest, and the South, other areas show marked increases. The number of clandestine labs seized in the Northwest increased from 94 in 2002 to 143 in 2003 (USDOJ, NDIC, 2005). Amphetamine/methamphetamine use in the Northeast, Mid-Atlantic, and some parts of the South is less common, but is appearing in subpopulations of users with increasing frequency. The percentage of admissions to treatment for abuse of amphetamines/methamphetamine in Connecticut, Delaware, Washington, D.C., Maine, Maryland, New Hampshire, New Jersey, Rhode Island, Vermont, Ohio, Pennsylvania, Michigan, Virginia, Massachusetts, and New York is under 1% of all admissions (U.S. DHHS, OAS, 2005), and emergency room mentions attributable to the drug in cities in many of those same areas number less than 10 cases annually (U.S. DHHS, OAS, DAWN, 2004).

Powerful stimulant effects and the high potential for profit by distributors are just two of the reasons methamphetamine is as popular or more popular than cocaine in some U.S. cities. Difficulty treating meth addicts and difficulty regulating the precursor chemicals used to manufacture it challenge law enforcement, treatment professionals, and already strained rural and urban resources.

This monograph summarizes current information about methamphetamine: characteristics of users, treatment approaches, production and trafficking, and the impact on law enforcement. We draw on a variety of sources: scientific and professional literature, published materials from Federal and state reporting systems, analysis of several Federal datasets, and discussions with law enforcement and public health providers at all levels of government. In addition, we have reviewed Internet chat rooms, visited blog sites, and explored the many Internet sites distributing information that offer supplies, detail manufacture, and discuss use.

We first trace the development of methamphetamine, describe trends in use, and examine characteristics of users. In Chapter 2, we discuss trafficking, production, and law enforcement efforts, and in Chapter 4, look at the effects of the drug on behavior and health and describe approaches to treatment. Chapter 4 summarizes our findings and discusses their implications for research and policy and presents the case of the impact of methamphetamine use on two rural counties.

Chapter 1: Methamphetamine Use in the United States

1.1 History of Methamphetamine

Amphetamine and methamphetamine were drugs originally developed as synthetics to be used as substitutes for ephedrine, a far older, natural substance derived from the herb Ma Haung, or Ephedra, a plant used for centuries for treatment of respiratory problems. The active ingredient in Ephedra, ephedrine, was isolated in the 1880s by German chemists, but not marketed until the 1920s, when it was formulated for use in bronchial inhalers. Japanese scientists synthesized methamphetamine in 1919. In 1932, Smith, Kline, and French introduced these drugs in over-the-counter inhalers for asthma and congestion (Brecher, 1972).

In the 1930s, the American Medical Association approved the use of amphetamines under names like Benzedrine for treatment of a range of disorders—narcolepsy, depression, Parkinsons, attention deficit disorder, and alcoholism. Other uses soon followed. By 1943, half of manufacturers' Benzedrine prescription sales were for weight control, depression, or simply to stay awake, and new variations on the popular, legal compounds of amphetamine and methamphetamine flourished under over 100 names (Grinspoon and Hedblom, 1975).

Its effects on sleep and fatigue were recognized early on. Soldiers and pilots in World War II were given amphetamine and methamphetamine to combat fatigue. In 1940, the Burroughs Wellcome company introduced methamphetamine tablets to commercial markets under the name Methedrine, and amphetamine and methamphetamine were both widely available in the early 1940s. In Japan, use of the injectable form of methamphetamine grew dramatically after WWII supplies used by the armed forces were released to the market at the end of the war, leading to serious problems with addiction. The first Japanese methamphetamine epidemic peaked in 1954, with up to 2 million people (over 2% of the total population) using meth intravenously. Meth use continues in Japan today: in 1998, 90% of all drug arrests in Japan were methamphetamine-related (UN General Assembly, 1998).

Throughout the 1940s and 1950s, amphetamines remained readily available in the U.S. The U. S. armed services continued to use amphetamines for combat fatigue in the Korean War, and U.S. soldiers and pilots in Vietnam used amphetamine and methamphetamine to fight combat fatigue. Today the U.S. Army and Air Force allows the use of stimulants, including amphetamine and methamphetamine, to aviators to combat the effects of fatigue (NAVMED P-6410, Naval Strike and Air Warfare Center, 2000). A survey of pilots in Desert Storm also indicated substantial (57%) use of stimulants to remain awake in combat (Emonson and Vanderbeek, 1995).

Civilian use of amphetamine and methamphetamine began to escalate in the late 1950s and early 1960s with its appearance in other forms (Dexedrine, Dexamyl, Desoxyn, Biphetamine), available by prescription and leaked to the illegal market. In addition, users began injecting the contents of benzedrine inhalers and liquid methamphetamine in ampoules. The 1960s rise in use has often been linked to new distribution networks operated by motorcycle gangs in the U.S. However, until the mid-to-late 1960s methamphetamine and amphetamine were widely used by a broad segment of society for a variety of reasons, and available by prescription. Low cost, lengthy duration of effect and easy access via prescription all contributed to use by women for weight loss, truck drivers and college students to stay awake, and by many users in combination with other drugs like barbiturates and heroin to get high (Miller, 2004).

By the 1960s, the amphetamines, under many brand names and in many compounds, were part of the growing drug culture. "Speed freaks" became a term used to described high dose, compulsive users who ingested methamphetamine or amphetamine in large doses, often as much as a half gram in one IV injection or two to four 10 milligram capsules at once orally,[2] and "Speed Kills" entered the lexicon as a familiar prevention slogan (Goode, 1999; Brecher, 1972).

As methamphetamine use rose in the 1960s, the process of drug schedulization and increased regulation of all drugs was underway. In 1963 the State Attorney General of California and the U.S. Department of Justice requested that injectable ampoules of amphetamine products be removed from the market, leaving intravenous users with a supply vacuum, and ushering in illicit manufacture. The Comprehensive Drug Abuse Prevention and Control Act of 1970 classified amphetamine/methamphetamine as a Schedule II drug.[3] The Act also made methamphetamine illegal to possess without a prescription. Non-injectable forms of most amphetamine products were reclassified as Schedule II the following year. The 1970s and 80s saw a rapid decline in the use of amphetamines in medicine and hence less was diverted to the street. By the mid-1980s the number of prescriptions written for amphetamines had dropped 90% from its pre-legislation level; by 1990, the number had dropped again by a third (Goode, 1999).

The relative ease of methamphetamine manufacture and the absence of commercially produced methamphetamine led to the clandestine production of methamphetamine, and ultimately to its link with outlaw biker gangs in California and the Pacific Northwest. Biker

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[2] For comparison, the therapeutic dose for these drugs in tablet form is typically 5–10 milligrams.

[3] Drugs and drug products that come under the jurisdiction of the Controlled Substance Act are categorized into five schedules. Schedule I drugs are those deemed as having no accepted medical use and high abuse potential (i.e., heroin, marijuana, LSD). Schedule II drugs are those with high abuse potential, but some medical utility, and require medical use justification and a prescription (i.e., methadone, Ritalin). There are generally no refills and no telephone prescriptions for Schedule II drugs. All amphetamines are Schedule II drugs. Their current medical use is restricted to the treatment of narcolepsy and minimal brain disorder (MBD) in children in the form of dextro-amphetamine (Merck, 2004).

gangs found that speed worked well with their lifestyle, and substantial profits for production and distribution encouraged them to corner the market. The methamphetamine disbursed via biker distribution networks was predominantly injectable or in crushable tablet form (Goode, 1999; Miller, 2004).

The early manufacturers of meth in the U.S. used what is called the P2P method, named after the precursor substance employed, phenyl-2-propanone. This method yields relatively small amounts—less than 10 pounds—of the lower quality dl-methamphetamine and, until regulation of this precursor, was the most common illegal production technique. This was the method associated with motorcycle gang production. Regulation of the precursors used in this method produced a change to the use of other substances, like ephedrine and pseudoephedrine, which result in production of the higher quality d-methamphetamine. In the early 1980s, methamphetamine became more easily synthesized with the circulation of new "recipes" or methods that were easy to execute. San Diego soon became the new methamphetamine hub, and meth use in Southern California exploded (Miller, 2004). Purer smokable methamphetamine, or "ice," also gained notoriety in the late 1980s as "the new crack cocaine."

Many of the primary ingredients required to manufacture methamphetamine have remained legal since illicit labs began operation. The Chemical Diversion and Trafficking Act of 1988 allowed for Federal regulation of some precursors, and the Methamphetamine Control Act of 1996 strengthened penalties for possession, distribution, and manufacturing, as well as tightened controls on precursors. In 2003, ephedrine, the key ingredient in many contemporary meth recipes, was banned in its pure form in the U.S under the Ephedra Prohibition Act. Pseudoephedrine, a common ingredient in cold medicines, has also become more tightly controlled. In April 2004, Oklahoma passed the earliest comprehensive legislation restricting ephedrine/pseudoephedrine products, limiting sales to pharmacies, requiring that products be placed behind pharmacy counters, and forcing buyers to register the sale with identification. Many other states have followed suit.

In 2004, the Illinois began regulating the amount of pseudoephedrine sold in cold tablets and the number of cold medication packets that can be sold in a single transaction; it also requires that all cold tablets be sold in sealed blister packs (Illinois Senate Bill 2244, August 24, 2004). Beginning in November, 2004, Oregon shoppers were required to show identification when purchasing over-the-counter cold medications that contain pseudoephedrine. Indiana has started a retailer education program to help workers identify customers who might be purchasing multiple packages of over-the-counter medications for illicit purposes. North Dakota, a state with a largely rural population and a growing meth problem, considers possession of over 24 grams of a precursor substance a felony.

In December 2005, the House of Representatives passed the Combat Methamphetamine Epidemic Act of 2005, the first step in enacting a nationwide measure to require drugs containing ephedrine, pseudoepedrine, and phenylpropanolamine to be kept behind pharmacy counters and purchased only after identification and sign in of buyer, as well as limit

purchases to no more than 9 grams per 30-day period. The legislation also adds further restrictions on the impact on meth precursor chemicals through increased accountability to Federal regulators at all points of distribution, and enhances penalties for persons manufacturing meth in areas where children reside.

1.2 Trends in Methamphetamine Use

1.2.1 Methamphetamine Use, 1989-2004

In 1962, the FDA launched a campaign addressing the growing problem of amphetamine/methamphetamine abuse. By the late 1960s, "speed kills" became part of the national lexicon, and Federal and state law changed to limit access to manufacturing and distribution of these drugs. The drugs once as popular as marijuana and the hallucinogens of the 1960s, receded in popularity as a major part of the national drug scene.

Beginning in the 1980s, the country saw a reappearance of the drug beginning in Hawaii and the West. This spread of methamphetamine use from the West Coast of the United States eastward into the Midwest characterized the next two decades. Its movement, however, was slower than early predictions, gradually rising in the Western states in the 1980s, appearing in Midwestern states in the 1990s, and making an appearance in the Northeast and Mid Atlantic only over the past few years.

There are difficulties looking at methamphetamine trends using many of the most reliable national data sources. Since prevalence of use has been low nationally for years, many national surveys folded reporting of amphetamine/methamphetamine into a general category labeled "stimulants (non-cocaine)," making it hard to detect changes in use of individual drugs. Many surveys also combine amphetamines and methamphetamines in the same category, and consequently may include illicit use of legal substances like Ritalin, Adderall, or "diet" drugs containing phenylpropanolamine. In addition, because nationally the incidence of methamphetamine is far lower than for drugs such as marijuana or cocaine, the National Survey on Drug Use and Health (NSDUH), that has in recent years developed state level estimates for many drugs, does not support strong state level methamphetamine/amphetamine estimates. Other sources of national estimates include two surveys of youth, Monitoring the Future (MTF) and the Youth Behavioral Risk Surveillance System (YRBSS), treatment admissions data found in the Treatment Episode Data Set (TEDS), emergency room mentions in the Drug Abuse Warning Network (DAWN) and urinalysis and interview results in the Arrestee Drug Abuse Monitoring (ADAM) system.

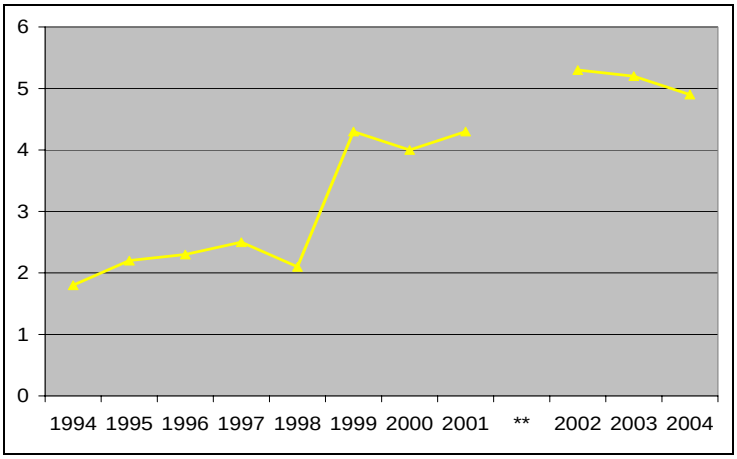
1.2.2 Self-Reported Methamphetamine Use

National Survey on Drug Use and Health (NSDUH)

Self-reported lifetime methamphetamine use for people age 12 and older has been on the rise in the NSDUH (formerly the National Household Survey on Drug Abuse) since 1994 (Figure 1.1), though is still far lower than reported use of marijuana or cocaine.

Figure 1.1

Percentage of Total Population Age 12 and Older Reporting Lifetime Methamphetamine Use: National Survey of Drug Use and Health (formerly NHSDA) 1994 through 2004



** Data collection procedure changes implemented in 2002; data prior to 2002 should not be used for comparison with post-2002 data

Sources: U.S. Department of Health and Human Services, Office of Applied Studies, SAMHSA, NSDUH, 2004

As this indicates, the proportion of individuals in the nation who report lifetime use of methamphetamine is relatively small compared to other drugs (about 5% of the entire U.S. population aged 12 years and older), though still representative of millions of Americans. It is also a number that has been growing steadily since the late 1990s (from less than 2% in 1994 to over 4% in 2001. Postsampling changes in 2002 show a drop from over 5% to just under. We look at regional changes in sections that follow.

Monitoring The Future (MTF)

Data on the use of methamphetamine is not available in MTF before 1999. Prior to that time (1991–1999) questions were asked only regarding amphetamine as a general category and about "ice," methamphetamine in smokable form. From 1999 to 2003, methamphetamine and amphetamine are combined and answers reflect the mention of the term "methamphetamine".

Table 1.1

Monitoring the Future Lifetime Use

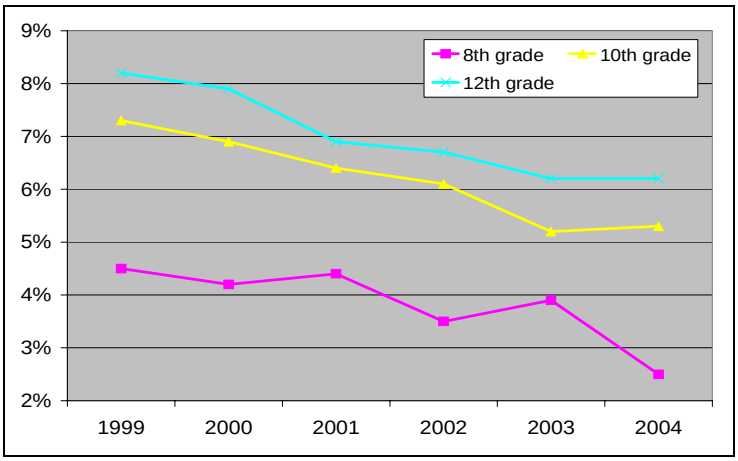
12th Graders	Ice	Amphetamine	Methamphetamine
1991	3.3	15.4	--
1992	2.9	13.9	--
1993	3.1	15.1	--
1994	3.4	15.7	--
1995	3.9	15.3	--
1996	4.4	15.3	--
1997	4.4	`16.5	--
1998	5.3	16.4	--
1999	4.8	16.3	8.2
2000	4.0	15.6	7.9
2001	4.1	16.2	6.9
2002	4.7	16.8	6.7
2003	3.9	14.4	6.2
2004	4.0	13.1	6.2
2005	4.0	15.0	4.5

Source: Johnston, O'Malley, Bachman, and Schulenberg, 2005

Tracking amphetamine use among 12th graders, MTF shows slight increases during the last decade and a significant one-year (2005) decrease. Similarly, data tracking methamphetamine use since 2000 indicates a somewhat downward trend in reported use. This pattern is reflected in reported use among both 8th and 10th graders (Figure 1.2).

Figure 1.2

Monitoring the Future Percent Reporting Any Lifetime Methamphetamine Use 1999 through 2004



Sources: Johnston, O'Malley, and Murphy, 2005

MTF also produces estimates on prevalence of drugs by geographic regions. Data on methamphetamine from 1999–2004 for 12th graders shows the highest prevalence of meth use in the West (4.9%) and North Central (3.3%) regions, more than twice the percentage reporting in the Northeast (1.3%), and South (4.0%). Only the figures for 12th graders in the South and West showed statistically significant increases.

Youth Risk Behavioral Surveillance System (YRBSS)

The Youth Risk Behavioral Surveillance System (YRBSS) is a source of both national and smaller area estimates of self-reported drug use of youth. In addition to national estimates, YRBSS has provided information for 34 cities/state areas on methamphetamine since 1999. As Table 1.2 indicates, between 1999 and 2003, few significant trends of meth use can be detected, though use in some areas has changed significantly. Vermont, Montana, and Philadelphia, for example, appear to have significantly declining use, while levels in most other states/cities are relatively stable. These data are interesting in comparison with that reported for adults in other surveys like NSDUH. While most sources show adult use highly concentrated in Western states, adolescent youth reflected in YRBSS indicates some use among youth in areas like Vermont, Delaware, or Maine comparable to Los Angeles or San Diego. Combining all areas in the YRBSS, national estimates appear to be declining for all grade levels from 1999 highs (Table 1.3).

Table 1.2

Youth Risk Behavior Surveillance System

Methamphetamine Trend Data	1999	2001	2003
Alabama	10.8	7.4**	8.6
Arkansas	13.9	11.8	--
Boston	3.1	3.5	3.6
Chicago	4.2	2.8	3.7
Dallas	5.4	5.4	5.2
Delaware	7	6.8	6.2
Florida	--	7.6	6.4
Ft. Lauderdale	5.9	5.6	4.5
Houston	4.1	6	--
Idaho	--	7.2	5.6
Los Angeles	--	7.6	8
Maine	--	8.4	8.3
Massachusetts	8.3	7	6.1
Miami	5.6	4.8	3.8
Michigan	9	8.2	7.8
Mississippi	6.3	5.5	6.9
Missouri	8.2	10.4	6.2
Montana	13.5	12.6	9.3**
Nevada	16.2	15.6	12.5
New York City	2.9	2.8	2.4
North Carolina	--	7.8	6.6
North Dakota	10.5	9.7	8.5
Orange County	--	7.3	5
Palm Beach	10.3	8	7.1
Philadelphia	5.1	4.6	2**
Rhode Island	--	8.6	6.9
San Bernardino	--	8.6	8.5
San Diego	9.2	8.4	7.6
South Dakota	10.4	8.3	7.4
Utah	7.3	5.3	6
Vermont	10.3	7.8**	7.2
Wisconsin	9.5	7.9	--
Wyoming	12.6	10.7	11.6

* significant at .05
** significant at .01

Source: Center for Disease Control and Prevention, 2003, Youth Risk Behavioral Surveillance System (YRBSS).

Table 1.3 United States					
Percentage of students who used methamphetamine one or more times during their life					
Year	**Total All Grades**	**9th Grade**	**10th Grade**	**11th Grade**	**12th Grade**
2003	7.6	6.7	7.5	8	8
2001	9.8	8.1	9.7	9.2	12.8
1999	9.1	6.3	9.3	10.1	11.5

Source: CDC, 2003, Youth Risk Behavioral Surveillance System (YRBSS)

1.2.3 Administrative Datasets

There are several administrative data sets that also provide information on trends in methamphetamine use. The Treatment Episode Data Set (TEDS) represents information gathered from clients at admission to each episode of treatment in programs across the country. At intake, programs record basic client characteristics as well as information about their drug use. TEDS is not a sample, but rather an attempt to get a census of all persons in all publicly funded programs, as well as those in treatment with private providers participating in TEDS.

DAWN is a system of data abstraction from the records of a nationally representative set of hospitals emergency departments. DAWN provides area level and national estimates of the number of emergency department episodes that involve various drugs and the reason for the visit (poisoning, dependence, etc.).

Treatment Episode Dataset (TEDS)

Reports of treatment admissions for primary meth amphetamine/amphetamine[4] use in the nation accounted for 1% of treatment admissions in 1992 and just over 7.4%, or 135,737 people in 2002 (Figure 1.3). These numbers again mask the strong regional nature of methamphetamine use. Twenty-one states had levels of use over the national average and 12 states had rates more than twice that, or 15% or more of all admissions (Figure 1.4). For example, Oregon reported that almost one-third of all admissions in that state in 2003 were for methamphetamine/amphetamine use, a rate that represents a more than four-fold increase over the 1992 rate. States with a large rural population also figure prominently in the areas with a high percentage of admissions for meth abuse. Heavily rural, Arkansas, Oklahoma,

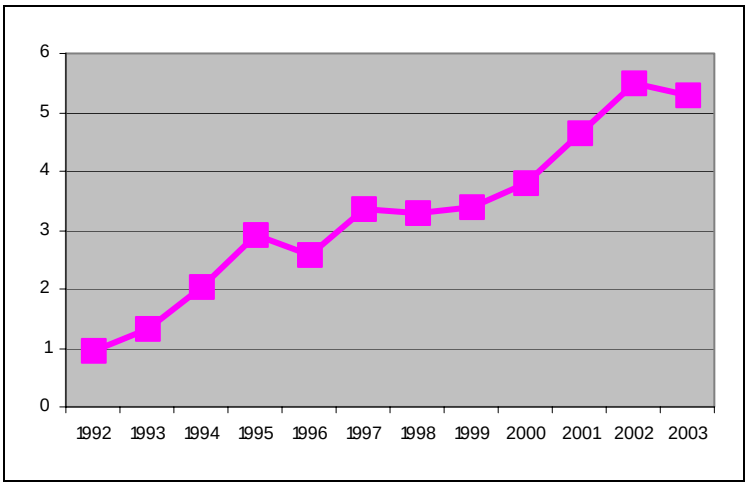
[4] Unfortunately, some states do not report methamphetamine distinct from amphetamine, so it is impossible to determine the proportion of methamphetamine treatment admissions as a percentage of overall primary treatment admissions. However, based on a special study of amphetamine treatment episodes, SAMHSA estimates that methamphetamine accounts for 80% of all primary amphetamine treatment admissions (DASIS Report, 2001).

Idaho, Utah, Iowa, and Nebraska all report 20 percent or more of their admissions in 2003 cite methamphetamine as the primary drug of abuse. This is in stark contrast to the small methamphetamine numbers for these states (3% or less) in 1992.

The method of ingestion of methampethamine has changed with the increase in use over the last decade. In the early 1990s the most common methods of ingestion were inhalation/snorting (39%) and injection (32%), and only 12% of methamphetamine admissions reported smoking the drug. By 2003, over half of the admissions listed smoking as the route of admission and about 20% of users were injecting.

Figure 1.3

Percent of Treatment Admissions Reported as Primary Methamphetamine Use (Treatment Episode Data Set 1992–2003)



Source: U.S. Department of Health and Human Services, SAMHSA, OAS, Treatment Episode Data Set, 2005.

Table 1.4

Primary Methamphetamine/amphetamine Admissions Aged 12 and Over by State or Jurisdiction: TEDS 1992–2003; as Percentage of Total Reported Treatment Admissions

State or Jurisdiction	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Hawaii	9%	13%	17%	21%	18%	23%	22%	24%	27%	32%	35%	45%
Idaho	3	4	11	17	13	18	19	22	21	21	26	42
California	8	10	13	15	13	18	18	17	18	22	28	31
Nevada	5	11	18	21	17	22	22	21	22	24	27	28
Utah	1	2	5	10	9	13	19	15	17	19	19	25
Arkansas	2	4	7	10	8	11	13	16	18	18	20	22
Oklahoma	2	3	7	11	8	13	13	15	19	19	20	21
Iowa	2	2	6	13	9	15	12	11	13	15	18	20
Oregon	4	6	12	18	13	15	15	14	14	16	17	17
Washington	1	2	4	8	6	8	10	10	12	14	14	15
Wyoming	1	2	4	--	--	11	13	10	10	10	13	15
Nebraska	0	1	1	3	3	5	8	7	10	14	16	14
Montana	3	3	6	9	9	12	13	10	11	13	13	14
North Dakota	0	1	1	2	2	4	3	3	5	7	12	12
Missouri	1	1	2	4	4	8	8	8	8	9	10	11
Kansas	1	1	2	4	4	7	7	6	7	8	10	10
Minnesota	1	1	1	3	2	4	4	3	4	6	8	10
Arizona	--	--	--	--	--	--	6	4	5	9	7	10
Texas	2	2	2	3	3	4	4	3	5	6	7	8
Georgia	0	1	1	2	1	3	2	1	2	3	5	8
Alaska	0	0	0	1	0	1	1	1	1	1	2	8
Alabama	0	0	0	1	1	1	1	2	3	5	7	7.4
Mississippi	--	--	--	1	1	1	2	2	3	5	5	6
South Dakota	0	0	1	2	2	3	3	2	2	3	5	6
Indiana	0	1	1	1	1	--	1	2	2	3	4	5
Colorado	1	1	2	3	2	3	3	3	3	4	4	5
Tennessee	0	0	0	0	0	1	1	1	2	2	3	4
New Mexico	1	1	2	3	2	3	2	1	1	2	2	4
Louisiana	1	1	1	1	1	0	1	1	1	1	2	3
Illinois	0	0	0	1	0	1	0	1	1	1	2	3
Kentucky	--	--	--	--	--	1	1	1	1	2	2	2
Florida	0	0	0	0	0	1	1	1	1	1	1	1
Wisconsin	0	0	0	0	0	0	0	0	0	1	1	1
South Carolina	0	0	0	0	0	0	0	0	0	1	1	1
North Carolina	0	0	0	0	0	0	0	0	0	1	1	1
Michigan	0	0	0	0	0	0	0	0	0	0	1	1
Virginia	0	0	0	0	0	1	1	0	0	0	1	1
Rhode Island	0	0	0	0	0	0	0	0	0	0	0	0.9
Ohio	1	0	0	0	0	0	0	0	0	0	0	0.5
Pennsylvania	1	1	0	0	0	0	0	0	0	0	0	0.4
Maine	0	0	0	0	0	0	0	0	0	0	0	0.4
New Hampshire	0	0	0	0	0	0	0	0	0	0	2	0.3
Vermont	0	0	0	0	0	0	0	0	0	0	0	0.3
District of Columbia	--	--	--	--	--	0	--	0	0	1	0	0.2
New Jersey	0	0	0	0	0	0	0	0	0	0	0	0.2
Connecticut	0	0	0	0	0	0	0	0	0	0	0	0.2
New York	0	0	0	0	0	0	0	0	0	0	0	0.2
Delaware	0	0	0	0	0	0	0	0	0	0	0	0.2
Maryland	0	0	0	0	0	0	0	0	0	0	0	0.2
West Virginia	0	0	--	1	0	--	--	1	0	1	0	0.1
Massachusetts	0	0	0	0	0	0	0	0	0	0	0	0.02

Source: U.S. Department of Health and Human Services, SAMHSA, OAS, TEDS (2004)

Drug Abuse Warning Network (DAWN)

Emergency room visits for methamphetamine-related problems increased in 2002, part of a gradual rise nationwide. As Table 1.5 shows, the changes regionally have been dramatic. Some places—like Denver, Dallas, and San Francisco—have seen significantly fewer emergency department (ED) mentions since the mid-1990s. For the most part, these are areas where meth use has been rising since the late 1980s and early 1990s. In other areas, like Minneapolis, where the problem is more recent, the increases are startling.

Table 1.5

Methamphetamine: ED mentions, Estimates by Metropolitan Area by Year[2]

Metropolitan area	Total 1995	Total 1996	Total 1997	Total 1998	Total 1999	Total 2000	Total 2001	Total 2002	% Change[2] 1995, 2002
TOTAL COTERMINOUS U.S	15,933	11,002	17,154	11,486	10,447	13,505	14,923	17,696	
Atlanta	147	135	214	162	83	109	172	246	67.3
Baltimore	4	6	7	6	10	6	6	8	100.0
Boston.	7			6	12	14	14	13	
Buffalo	6	9	8	9	7	5	4	2	-66.7
Chicago	34	28	29	31	22		45	42	
Dallas	203	115	159	186	100	135	111	98	-51.7
Denver	175	105	292	120	101	110	98	99	-43.4
Los Angeles	1,276	1,268	1,229	786	910	1,375	1,517	1,713	
Miami	5	9	10	16	9	15	27	15	200.0
Minneapolis	93	108	217	109	112	153	321	319	243.0
New Orleans	18	22	26	25	23	27	NA	53	194.4
New York	23	21		36	17	31	NA	63	173.9
Newark					3	6	0	1	
Philadelphia	91	66	101	48	47	67	60	50	-45.1
Phoenix	777	725	800	446	341	600	604	501	
St. Louis	76	39	67	66	104	162	115	150	97.4
San Diego	686	666	976	721	584	747	673	598	
San Francisco	1,106	934	1,012	616	554	591	611	727	-34.3
Seattle	258	195	479	266	353	540	395	541	109.7
Washington, DC	24	11		16	33	62	24	31	

[1] Numbers in 1,000s

[2] This column displays only those statistically significant ($p < 0.05$) increases and decreases between estimates for the periods noted.

ED = emergency department.

NA = Not available

Source: U.S. Department of Health and Human Services, SAMHSA, Office of Applied Studies, Drug Abuse Warning Network (2002)

Although the number of ED visits in non-Western DAWN sites are still relatively small when compared to those in San Francisco, San Diego, Phoenix, Seattle, and Los Angeles, the statistically significant increases displayed in Table 1.5 are indicators of a steady eastern spread of methamphetamine use. Cities like Miami, Minneapolis, New Orleans, and Atlanta are examples of this phenomenon.

1.2.4 Interview and Bioassay Drug Use Indicators

Drug Use Forecasting/Arrestee Drug Abuse Monitoring Data

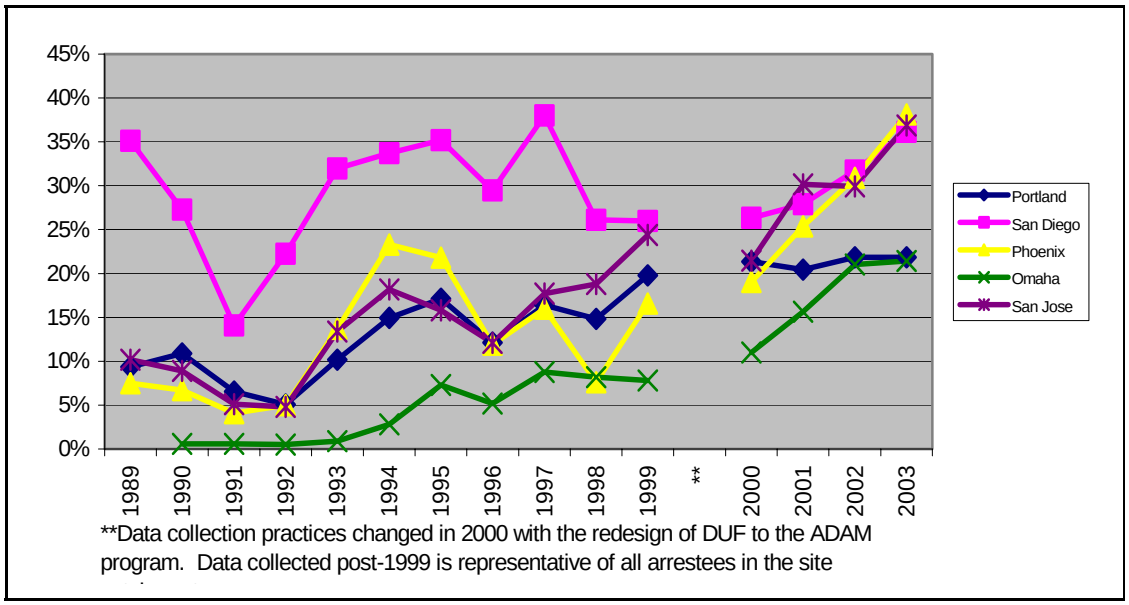
The Drug Use Forecasting (DUF) Program began collecting illicit substance use information from recent arrestees in 1987. By 1989, the program was collecting data in over 20 sites throughout the United States, expanding to 35 sites in 1999. Although the DUF sample was one of convenience, the data can at least give a rough idea of prevalence rates of methamphetamine use among the arrestee population before 2000. In the year 2000, the DUF program was revamped to include a rigorous sampling strategy that supported prevalence estimates at the county level and was renamed the Arrestee Drug Abuse Monitoring (ADAM) program. Data from 2000 forward give accurate estimates of the prevalence of methamphetamine use in the arrestee population in each county.

While the data collected prior to 2000 cannot be used to examine trends, the rise in the *presence* of methamphetamine among arrestees in these years is worth noting. For example, Omaha, Nebraska urine screens of arrestees were virtually free of methamphetamine until the mid-1990s (Figure1.4), when meth-positive UAs began to increase, rising to over 20% of all tests in 2003. Similarly, San Jose arrestees tested positive at rates under 20% throughout the 1990s; from 2000–2003 the percent positive rose from just over 20% to over 35%. The past 2000 trend in all but Portland continued to move upward. San Diego, the site with the highest proportion of meth positives among arrestees throughout the 1990s, is now joined by many other sites. By 2003, eleven sites reported that 25% or more arrestees tested positive for methamphetamine use at the time of arrest; for five sites (San Diego, Phoenix, San Jose, Sacramento, and Honolulu), more than 35% of arrestees tested positive for methamphetamine.

Arrestees are a unique bellweather of drug use trends. They tend to be the first and the heaviest consumers of illegal drugs, as ADAM/DUF data show. The late 1980s and early 1990s DUF data indicated serious problems with meth use in western sites. The problem surfaced in the late 1990s DUF and early 2000 ADAM data in the Southwest and Mid-West sites, notably more rural areas like Omaha and Des Moines.

Figure 1.4

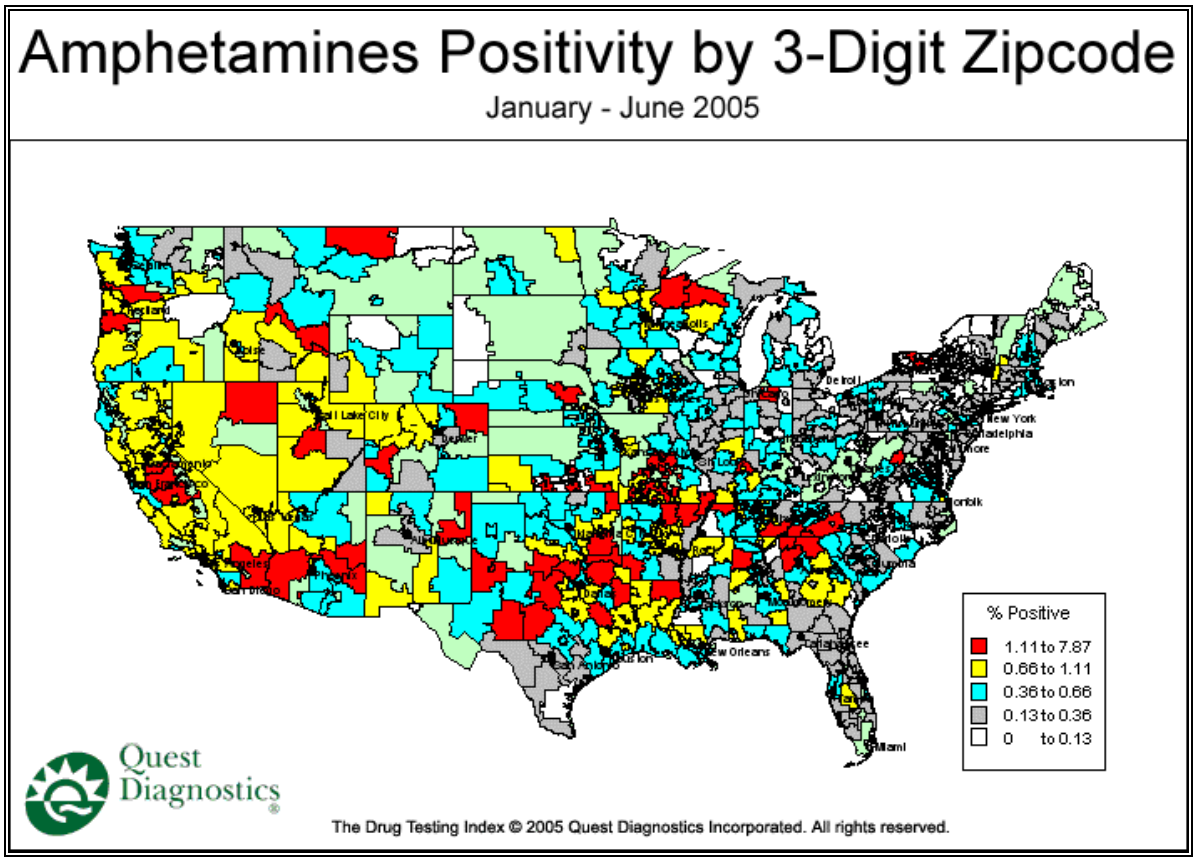
Arrestees Testing Positive for Methamphetamine in Selected DUF/ADAM Sites 1989-2003



Source: U.S. Department of Justice, National Institute of Justice, Arrestee Drug Abuse Monitoring Program, 2003

1.2.5 Private Sector Information

One of the most interesting and striking indicators of rising methamphetamine use can be found in Quest Diagnostics' 2003 Drug Testing Index. Quest data represent information gathered from tests of workforce employees. Quest Diagnostics reports that its Index is derived from over 7.1 million urine screens in 2004 alone. Quest analysts believe amphetamine/methamphetamine to be responsible for the rise in overall workforce positivity (from 2002 to 2005) (Quest Diagnostics, 2004).



Not surprisingly, the greatest concentrations of workforce amphetamine use are on the West Coast and in the Southwest. But rural areas in the South and Midwest also have pockets of higher amphetamine positives, as well as small areas in the Northeast. This is particularly interesting, as many other drug use indicators have detected little or no methamphetamine use in the Northeast or Mid-Atlantic states. There are two possible explanations for this: either the positive test results for these areas are legal usage of amphetamines such as Ritalin or Aderall, not primarily meth, or this population is not being adequately captured in other surveys. Quest data may reflect use in the subpopulations, but not be methamphetamine users willing to report in NSDUH, seeking treatment (TEDS), or being arrested (ADAM).

Positivity Rates by Drug Category
(For General U.S. Workforce, as a percentage of all such tests)

Drug	1997	1998	1999	2000	2001	2002	2003	2004	2005
Amphetamines	0.26%	0.20%	0.22%	0.25%	0.29%	0.34%	0.49%	0.31%	0.35%

Source: Quest Diagnostics, 2005.

According to Quest Diagnostics,

> Among general U.S. workforce employees, the incidence of positive drug tests attributed to amphetamines rose by more than 44% in 2003 from 2002, reaching 0.49% of all drug tests that look for amphetamines among this group of workers. During 2002 amphetamines positivity was 0.34%. Growth in amphetamines use during this period represents the largest single-year surge in amphetamines use documented by the Drug Testing Index during the past five years. Prior year-over-year increases have been significantly smaller between 14% and 17%. Drug test data suggest that greater use of methamphetamine among a large group of general U.S. workforce employees during 2003 may have caused the increase in amphetamines use overall. For this group of workers, the incidence of positive drug tests attributed to methamphetamine increased by more than 68% in 2003 from 2002, reaching 0.32% of all drug tests. During 2002 methamphetamine positivity was 0.19% (*Quest Diagnostics, 2004).*

1.3 Who Uses Methamphetamine?

Data sources provide overlapping pictures of methamphetamine use. The National Survey on Drug Use and Health (NSDUH) and Monitoring the Future, general population surveys of adolescents and adults, includes both low level users whose use has not reached a stage that put them in contact with institutions like treatment or corrections, as well as some problematic users who are not in treatment, incarcerated or living in a transient situation. The Treatment Episode Data Set (TEDS) provides data on persons at a point in their drug use that has prompted treatment seeking; this is usually when problematic use has been established and the user is either forced or is ready to seek treatment. ADAM provides data on what are likely the heaviest users and those who have run into trouble with the law. These sources together can provide a picture of who uses methamphetamine.

From its earliest reputation as a "biker drug" in the 1960s and 70s, methamphetamine has been associated with White, male, blue-collar workers. In fact, in its earlier incarnations, amphetamine compounds were popular with a range of users—college students, professionals, travelers, dieting suburbanites, as well as the perhaps more visible biker crowd (Grinspoon and Hedblom, 1975). Who uses methamphetamine today?

Table 1.6 shows the characteristics of treatment admissions in TEDS for amphetamine/ methamphetamine, crack cocaine and cocaine. We include information on crack and cocaine users for comparison. Like methamphetamine, cocaine and crack are powerful stimulants, widely available in certain areas of the country. Early in the methamphetamine epidemic in the West, treatment providers and researchers speculated that substitution might occur among crack or cocaine users with methamphetamine or vice versa, as the euphoria generated from cocaine or crack use is similar in nature (albeit shorter) to that found with methamphetamine. Given this speculation, we look at cocaine and/or crack user characteristics for indication of crossover or substitution among current users of these drugs.

1.3.1 Gender

With the exception of data from the NSDUH, most sources indicate that methamphetamine appeals fairly equally to both men and women. Among 12th graders reporting in Monitoring the Future (Johnston et al., 2005), the gender split among methamphetamine users is fairly even: 6.6% of males and 5.7% of females report ever using the drug. Data from TEDS also substantiate the almost equal split in terms of gender in 2003: 55% of methamphetamine admissions were men, and 45% were women. This differs from the gender split among users of other drugs. For example, among treatment admissions for crack use in 2003, males (59%) were somewhat more frequent admissions than females (41%); for cocaine powder and for heroin users, the split is even more dramatic.

Table 1.6

Treatment Episode Data Set (TEDS) 2003: Admission for Amphetamine/Methamphetamine or Crack Cocaine Use

	All Admissions	Amphetamine/ Methamphetamine	Crack Cocaine (Smoked)	Cocaine (Other Route)	Heroin
% of all admissions	**100%**	**7%**	10%	**4%**	**15%**
Sex					
Male	69%	55%	59%	66%	68%
Female		45	41	34	32
Age at Admission					
Under 19	13	10	2	7	3
20-24	13	20	6	13	13
25-34	25	36	27	31	28
35-50	25	31	59	44	46
Over 50	9	2	6	5	10
Race					
White	59	73	35	49	48
Black, African American	24	3	55	31	25
Hispanic American	13	16	7	16	24
American Indian/ Alaskan Native	2	2	1		1
Asian/Pacific Islander/Other	3	7	2	2	3

Sources: U.S. Department of Health and Human Services, SAMHSA, OAS, TEDS (2005)

1.3.2 Age

Methamphetamine treatment admissions (Table 1.6) are concentrated in the under 34 age group, and there are considerably more methamphetamine/amphetamine admissions for persons under 25 (30%) than for crack (8%) or cocaine (20%), or heroin (16%).

Table 1.7 indicates the percentage of persons in the general population in age categories who reported to NSDUH that they had used methamphetamine in their lifetime and/or in the past year for 2002 and 2003. As this shows, both past year and lifetime use is indistinguishable across years. Lifetime use differences are also difficult to interpret as they represent increased time or cumulative opportunity to have used as the respondent ages. Incidence of recent use appears to be similar among adults in this dataset.

Table 1.7

Age of Methamphetamine Users Reporting Lifetime, Past Year Percentage Use in NSDUH, 2003 and 2004

	2003		2004	
Age	**Lifetime**	**Past Year**	**Lifetime**	**Past Year**
12–17	1.2%	.6%	1.3%	.7%
18–25	5.2%	1.6%	5.2%	1.6%
26+	5.3%	.4%	5.7%	.4%
Total[a]	11,726	1,440	12,303	1,315

[a] Number in thousands

Source: U.S. Department of Health and Human Services, SAMHSA, OAS, NSDUH (2004)

1.3.3 Ethnicity

TEDS data indicate that amphetamine/methamphetamine users entering treatment are more likely to be White (73%) than members of other ethnic groups (Table 1.6), and more likely to be White than users of crack (35%), cocaine powder (49%), or heroin (48%) as compared to all treatment admissions (59%). It is a drug that does not appear to attract African American users, and has a substantially higher proportion associated with Asian/Pacific Islanders users than either the norm for all admissions or the proportion associated with cocaine, crack, or heroin. Methamphetamine is also a growing problem among American Indians. Indian Health Services data indicate that the number of persons treated for amphetamine/methamphetamine use at IHS reached 4,000 by September 2004, double the number treated in 2000 (Murr, 2004).

Only a few other drugs show a similar pattern. Among the over 12,000 sedative or tranquilizer admissions in TEDS, over 80% of users are White; the same is true for the over 50,000 admissions for non-heroin opiates (Demerol, Oxycontin, Percodan, etc.) (U.S. HHS, TEDS, 2005), where 89% of treatment admissions are White.

1.3.4 Methamphetamine Use Among Arrestees

Table 1.8 indicates the characteristics of arrestees reporting methamphetamine use in the prior 12 months. We have selected sites that have had high levels of methamphetamine use (over 30%) for more than two years (San Diego, Phoenix) and sites with lower and more recent methamphetamine use (Omaha, Oklahoma City). As this indicates, in both types of sites, the profile of users looks similar to that reported in TEDS: users are predominantly White (over 50% in all but one) and in their 20s and 30s (over 60% in these sites). The racial distribution in San Diego, however, is more evenly split between White and Blacks.

Table 1.8

Characteristics of Arrestees Reporting Methamphetamine Use in Prior 12 Months, 2003

	Omaha	San Diego	Phoenix	Oklahoma City
Race				
White	60%	39%	57%	90%
Hispanic	35	21	13	8
Black, African American	3	36	25	1
American Indian	2	4	5	1
Asian/Pacific Islander	---	---	---	---
Age				
Under 20	12	8	10	12
21-30	42	40	33	36
31-40	24	27	32	30
41-50	20	19	16	12
50+	4	6	3	1
In Treatment in Past Year				
Yes	66	56	68	30
Employment				
Unemployed	35	35	34	36
Education				
No High School	25	29	29	29
High School	49	42	40	32
Trade School	3	5	6	13
College or Beyond	23	23	25	26

Source: U.S. DOJ, National Institute of Justice, Drug Abuse Monitoring Program (ADAM), 2003

ADAM data also provide information on employment and education of methamphetamine users. The majority of methamphetamine users in all of the selected ADAM sites work full or part time and have a high school or better education.

In addition, ADAM and TEDS data provide information on whether amphetamine/ methamphetamine users have sought treatment in the past year and/or in their lifetime.

Reports from TEDS in 2003 indicate that 50% of the amphetamine/methamphetamine users report no treatment prior to the current one, and only 4% had 5 or more lifetime admissions. This differs somewhat from treatment experiences of cocaine users: one-third of crack users had no prior admission, but 13% of crack users had 5 or more admissions (USDHHS, OAS, 2005). As Table 2.3 shows, a large number of meth users in ADAM have past year treatment experience.

1.3.5 Use in Subpopulations

Research on the drug use of subpopulations indicates that some hard to reach or hidden populations are involved in methamphetamine use and may not appear in traditional surveys. Studies of the gay and bisexual communities in two Western cities (Semple, Patterson and Grant, 2002) found that methamphetamine is widely used in these communities and often linked to both unsafe sex and injection practices (Copeland and Sorenson, 2001; Urbina and Jones, 2004; Frosch, et al., 1996; Woody et al., 1999), non–compliance with medication for HIV (Reback, Larkins and Shoptaw, 2003) and to the spread of HIV within the male gay community (Reback and Ditman, 1997). This is particularly problematic given data showing rising seroconversion rates in young gay and bisexual males in the 1990s (Shoptaw, Reback and Freese, 2002; Moliter et al., 1998). Methamphetamine may be part of this picture. Studies find that methamphetamine is increasingly used by gay men to enhance sexual activity and is often found in places like sex clubs and "circuit parties" where the potential for multiple partners is high (Halkitis, Parsons and Stirratt, 2004). Qualitative studies report high rates of meth use associated with unprotected sex, high risk sexual activities with many partners whose serostatus is unknown to the participant (Semple, Patterson and Grant, 2002). Several studies of convenience samples of gay men report over 50% stating that they used methamphetamine as part of party activity which was expected to include sexual activity (Halkitis et al., 2003; Lee et al., 2003).

These findings are particularly alarming given evidence that methamphetamine use is associated with poor overall health status (Greenwell and Brecht, 2003), greater prevalence of HIV encephalitis among users (Bell et al., 1998) and interference with antiretroviral medications, compliance, and efficacy (Ellis et al., 2003).

Chapter 2: Production and Trafficking

2.1. Methods of Methamphetamine Manufacture

2.1.1 Sources of Methamphetamine and Precursors

In contrast to essential chemicals used in refining coca leaf into cocaine or opium into heroin, precursor chemicals are used in the manufacture of synthetic drugs and are part of the final product (U.S. Department of State, 2004). The two precursor substances currently most often used to manufacture methamphetamine are pseudoephedrine and ephedrine. Ephedrine is a chemical derivative of the ephedra plant that grows in China, India, Mongolia, and Pakistan (U.S. DEA 2004a); pseudoephedrine is a chemical derivative of ephedrine.[5] China, India, Germany, and the Czech Republic are the primary producers of pseudoephedrine; in 2003, 50% of the pseudoephedrine imported into the U.S. was from Germany, and 71% of the ephedrine was from the Czech Republic (U.S. Census Bureau, 2004).

The majority of methamphetamine distributed across the U.S. is made in super-labs capable of producing 10 pounds or more in a 24-hour period. This requires large-scale diversion of ephedrine/pseudoephedrine from legitimate industry by criminal organizations (U.S. DEA, 2002a). Extraction from over-the-counter medications, like bronchiodilators, nasal decongestants or energy supplements, is thought to be confined to small toxic lab (STL) production by independent operators, the "Mom and Pop" labs, and a quick trip to the Internet is all that is necessary to find the hundreds of sites offering mail order purchases of bulk ephedrine or pseudoephedrine tablets. "Although the sheer number of STLs found throughout the United States is greater than the number of super-labs, the latter are actually responsible for the greater share of methamphetamine being used and distributed throughout our nation" (U.S. ONDCP, 2004). Finally, producers may develop nonsynthetic pseudoephedrine from ephedra plants or extracts sold as stimulants or in weight loss products. Since the U.S. Food and Drug Administration issued a consumer alert advising consumers to stop buying and using ephedra products in 2003 and banned the sale of dietary supplements containing ephedrine alkaloids in 2004 (U.S. FDA, 2004), this method is less likely than others.

2.1.2 Methamphetamine "Recipes"

Learning to make methamphetamine is not difficult. There are hundreds of recipes on the Internet for manufacture, as well as guidebooks to help the beginner. Such guidebooks, like *Secrets of Methamphetamine Manufacture* (Uncle Fester, 2002)–legally published and distributed through routine ordering channels, and in its sixth edition–provide recipes, pros and cons of certain methods, list equipment needs, and troubleshoot potential problems.

[5] While these chemicals are not the same, they have a common molecular structure that makes them both the bases for making amphetamine and methamphetamine.

Even frequently asked questions and advice on converting operations into larger-scale production centers are included.

There are two general approaches to production: 1) extraction or hydrogenation of amphetamine or methamphetamine from ephedrine or pseudoephedrine, and 2) synthesis of the drugs from other precursor chemicals. The method used by early illicit producers in the 1960s and 1970s involved synthesis of the drug from precursor chemicals. This method typically produced 5–10 pounds of methamphetamine at a time. With restrictions placed on these chemicals, new methods involving ephedrine and pseudoephedrine emerged. These methods involve either extraction or hydrogenation processes. Today, most illicit labs employ this approach, beginning with ephedrine or pseudoephedrine extracted from pharmaceutical grade products and synthesizing the final product (methamphetamine) in a series of mixtures and filtering protocols (Ferguson, 1997). Unlike earlier methods of production, today's extraction and synthesis involves everyday chemicals found in many household products or, as in the case of anhydrous ammonia, in farm products, and use precursors found in over the counter pharmaceuticals.

The chemicals needed for production of meth using the ephedrine/pseudoephedrine reduction method are ephedrine/pseudoephedrine, hydriodic acid and red phosphorus. Other chemical substitutes for hydriodic acid include iodine/hypophosphorus acid or anhydrous ammonia and sodium, though the former substitution can produce particularly volatile gases and has a higher potential for fires or explosions. The older P2P method of production does not use ephedrine/pseudoephedrine but a number of other precursor chemicals (phenyl-2-propanone, aluminum, methylamine and mercuric chloride) and produces dl-methamphetamine.

Using one of the processes described above, one of two types of methamphetamine is produced: dextro-levo-methamphetamine or dl-methamphetamine and dextro-methamphetamine or d-methamphetamine. Dl-methamphetamine is the result of production using the older P2P method and is not as potent as d-methamphetamine which is the result of using the ephedrine/pseudoephedrine reduction method. It is d-methamphetamine that is the most commonly found form in current circulation. "Ice" is a form of methamphetamine found primarily in Hawaii that results from crystallizing powder methamphetamine in a solution like methanol or acetone; it is of higher purity than either of the other two forms and is generally smoked.

2.1.3 Small Toxic Laboratories

"Mom and Pop" labs or small operations can produce methamphetamine easily and relatively cheaply. DEA estimates that with about $100 of materials, a "cook" or meth manufacturer using the chemicals described above can produce about $1,000 worth of the product in a matter of hours (DEA, Congress, 2003). Larger operations (superlabs) rely on diversion of larger quantities of pharmaceutical grade ephedrine to avoid the need to remove impurities (coloring, additives) or in other agents found in some pseudoephedrine tablets or other over the counter medications.

"Mom and Pop" labs are referred to as small toxic labs, or STLs, and are more prolific in the U.S. than larger superlabs, but are not thought to produce the bulk of retail methamphetamine. Small labs by definition are those producing less than 10 pounds of meth in a production cycle. However, as the name implies, STLs are dangerous to the lab operator, neighbors, and law enforcement. These labs are temporary, mobile, and difficult to detect, as chemicals used in production are easy to obtain, and the profit margin makes the risks acceptable to meth "cooks."

According to the DEA,

> "The growing use of the Internet, which provides access to methamphetamine "recipes," coupled with increasing demand for high-purity product, has resulted in a dramatic increase in the number of mom and pop laboratories in the United States. In 2001, the number of labs with capacities under ten pounds totaled over 7,700." (U.S DEA, 2003).

There are literally thousands of these small operations. Meth lab seizures have been reported in the 46 states, from around 6,700 in 1999 to over 10,000 in 2003. In recent years, seizures have declined somewhat in the West and Northwest, and increased substantially in Southwest and Midwest. Even in the Northeast, seizures increased from 94 to 143 from 2002 to 2003. Mom and Pop labs represent the largest proportion of labs seized—92% of the over 10,000 seizures in 2003 (USDOJ, NDTA, 2005). This is particularly the case in the new expansion areas of the South, Midwest, and Northeast. Most operating labs are small producers, with low production capacity using local supplies. These operators use extraction methods that can be mastered by an individual with little background in chemistry. Equipment employed in STL production is generally found among routine household supplies:

Equipment Used in Methamphetamine Production

Aluminum foil	Pails and buckets
Blenders	Paper towels
Cheesecloth	Plastic storage containers
Clamps	Propane cylinders
Coffee filters	Rubber gloves
Funnels	Rubber tubing
Gas cans	Strainers
Ice chests	Tape
Jugs and bottles	Tempered glassware
Laboratory beakers and glassware	Thermometer
Measuring cups	Towels and bed sheets

Source: National Drug Intelligence Center, Methamphetamine Laboratory Identification and Hazards Fast Facts, December, 2003.

Methamphetamine itself is the final and least hazardous substance involved in STLs. By-products of the production process are often extremely toxic and affect all who come in contact with them, not only the manufacturer. It is estimated that one pound of methamphetamine produced in a clandestine lab results in the production of 5–6 pounds of hazardous waste (Scott, 2002). These waste product chemicals can render the farmland, forests (in one case even a national forest campground) useless until hazmat (hazardous materials) teams can clean the area (USDA, 2002; Snell, 2002; Scott, 2002). In many states, the property owner, even if not involved in the illegal activity, can be held financially responsible for the cleanup, which can cost $5–$10,000 per site. In Oregon, prospective buyers and tenants must be informed about residences which formerly housed a meth lab, and the possible hazards listed on the property title (Peck, 2004).

Environmental effects are not limited to the immediate area of the lab. Areas where meth labs are often found in agricultural regions, forests, and ranchland locations that are particularly vulnerable to toxic waste runoff. U.S. Forest Service officers have encountered tree "kills" in areas surrounding STLs, and ranchers in Arizona have reported suspicious cattle deaths in areas downstream from labs (Snell, 2002). California's Central Valley, home to both superlabs and STLs, is also one of the world's most productive agricultural regions. These hazards are also reflected in injuries to responding law enforcement officers, reports of which almost doubled from 2002 to 2003 (USDOJ, NDTA, 2005).

The seizure of small toxic laboratories is a significant resource drain for all public safety agencies involved. Whether the lab is suspected and raided by investigators or encountered by accident in the course of an operation, first responders and police agencies require equipment and training (Scott, 2002). Hermetically sealed hazmat suits, licensed contractors, and enough training to safely process a meth lab are expensive and resources are often limited in local law enforcement agencies. Annual costs for lab cleanups by DEA for predominantly meth operations increased from $2 million ten years ago to over $16 million in 2003 (NDTA, 2005).

2.2 U.S. and Global Markets for Methamphetamine and Precursor Chemicals

2.2.1 Sources of Methamphetamine and Precursors

Methamphetamine found in the U.S. is typically produced domestically or in Mexico. Until recently, Canada was a primary source of diverted pseudoephedrine and ephedrine. Mexican drug trafficking organizations produce methamphetamine using large-scale labs based in Mexico and the U.S. Southwest, dominating since 1994 the older U.S. methamphetamine distribution that had been carved out by regional outlaw motorcycle gangs and other small-scale producers (U.S. DEA 2003a). Heavy Mexican participation is evident in those areas of the highest and most long-standing use and thought to be linked to Mexico's greater availability of bulk quantities of ephedrine/pseudoephedrine from China. Some of the labs were found over the last few years in investigations into Mexican production are ones able to

produce many hundreds of pounds of Meth in a single production cycle (USDOJ, NDTA, 2005). The U.S. Sentencing Commission found that twice as many Federal methamphetamine cases between FY1992 and FY1998 involved Hispanic noncitizens than Hispanic citizens, and Mexican nationals accounted for 93% of noncitizen methamphetamine traffickers. The number of states convicting Mexican nationals grew from three states in FY1992 to 30 states in FY1998 (U.S. Sentencing Commission 1999).

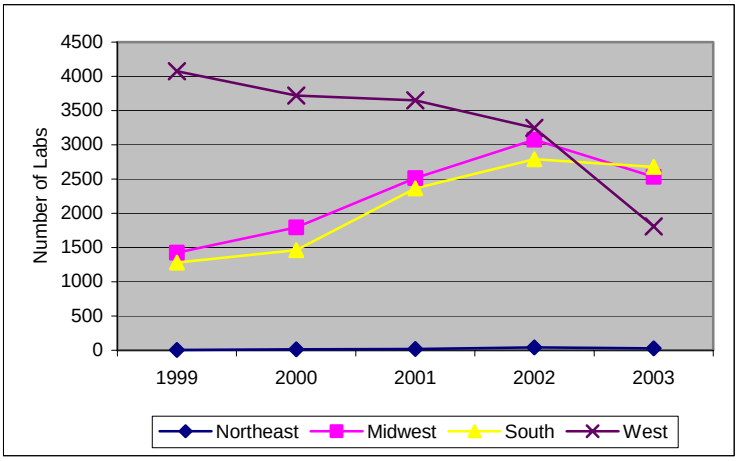
Limitations in the availability of precursor chemicals have produced innovations to the meth market. Methylsulfonylmethane (MSM), a dietary supplement for both humans and horses, is sometimes found in methamphetamine produced by Mexican criminal organizations. MSM is added during the production process, reducing the purity of the final product and increasing profitability. Unlike some of the other chemicals used in production, MSM is readily available and unregulated. In part due to this product, larger manufacturers have significantly reduced purity since the mid-1990's, with levels falling to just over 40% in 2001, down from nearly 72% in 1994 (ONDCP, 2003).

Law enforcement sources also report that small numbers of independent meth producers have begun producing anhydrous ammonia themselves, rather than relying on stolen or illicit supplies. This chemical is the precursor most frequently interdicted by law enforcement (U.S. DOJ, NDIC, 2004), and law enforcement efforts have made it harder to find or steal from local farm operations.

Historically, precursors were smuggled to clandestine labs primarily located in the Southwest, but current distribution is more geographically dispersed. According to DEA's National Clandestine Laboratory Seizure System, which maintains data on U.S. lab seizures by local, state, and Federal law enforcement, Western lab seizures have actually declined (U.S. DEA, undated). As shown in Figure 2.1, lab seizures in the West dropped from 4,073 to more than half as many (1,810) between 1999 and 2003. In contrast, lab seizures in the South doubled (1,280 to 2,676), and lab seizures in the Midwest nearly doubled (1,424 to 2,534). While there are very few lab seizures in the Northeast, they have increased from 4 in 1999, to 30 in 2003, indicating aspects of a problem rolling East.

Figure 2.1

Methamphetamine Lab Seizures by U.S. Region and Year, 1999–2003

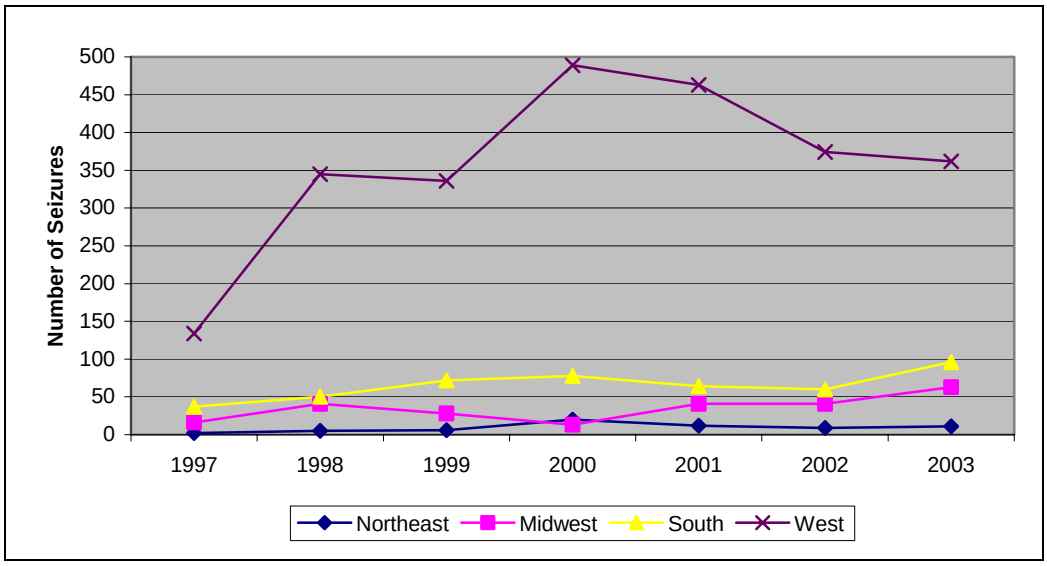


Source: National Clandestine Laboratory Database (U.S. DEA undated)

As shown in U.S. Customs Service (see Figure 2.2) data on drug seizures at U.S. airports, seaports and land border ports-of-entry, methamphetamine seizures are still substantially higher in the West than in other regions. However, seizures peaked in the West during 2000, and have since decreased by 26% (from 489 in 2000, to 362 in 2003). Seizures in the Northeast are too small to demonstrate any trends, but seizures have increased in the Midwest and South, quadrupling from 13 in 2000 to 63 in 2003 in the Midwest. Although the West still holds a large margin, this suggests some shift in methamphetamine trafficking from some Western ports of entry to other regions of the U.S.

Figure 2.2

U.S. Customs Methamphetamine Seizures by U.S. Region and Year, CY1997–CY2003

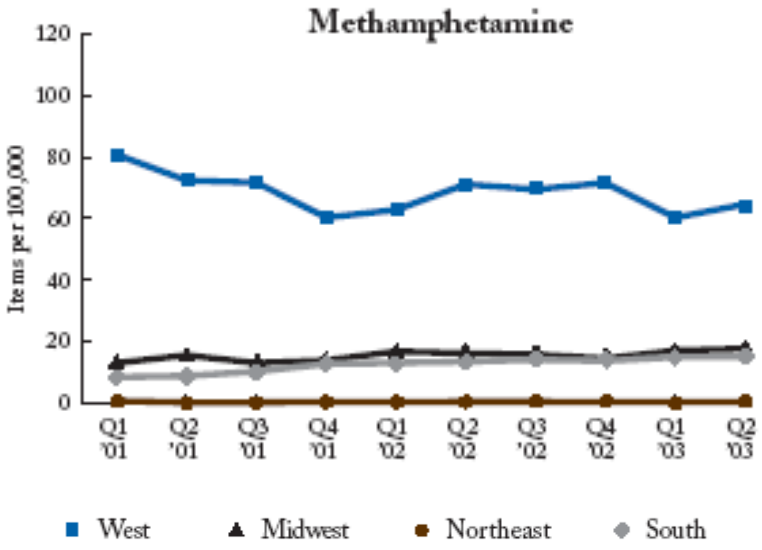


Source: U.S. Treasury/U.S. Customs Service courtesy of ONDCP

Similar regional trends are reported by DEA's National Forensic Laboratory Information System, which collects drug analysis data from state and local labs (RTI International, 2003). Nationally, methamphetamine is the third most frequently identified drug (after marijuana and cocaine), seized in 12.5% of all drug cases examined during the first half of 2003, a figure that has remained constant since 2001. However, methamphetamine seizures in the West have declined from about 80 to 60 per 100,000 adult population (see Figure 2.3). Seizures in the Midwest and South remain below 20 items per 100,000, but have generally increased. As documented by lab and drug seizures, methamphetamine has not impacted the Northeast as it has other U.S. regions. However, law enforcement intelligence has led to special investigations (i.e., Operation Chelsea Connection), targeting crystal methamphetamine distribution in New York City, in particular at gay nightclubs (U.S. DEA 2004b).

Figure 2.3

Methamphetamine Exhibits Analyzed per 100,000 Population by U.S. Region, January 2001–June 2003

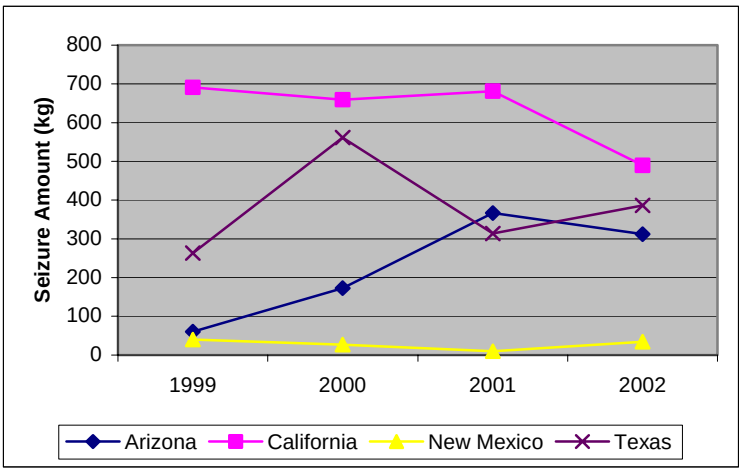


Source: RTI International, National Forensic Laboratory Information System, 2003.

Methamphetamine trafficking trends also vary within region—over time and between states. DEA's El Paso Intelligence Center (EPIC) data show Southwest border methamphetamine seizures have increased from 807 kg in FY1998 to 1,223 kg in FY2002 (U.S. DEA 2003b). As expected, California had the highest number of seizures at nearly 700 kg annually until a decrease to 490 kg in FY2002 (see Figure 2.4). Texas seizures fluctuated between 263 kg and 561 kg; Arizona seizures increased from 60 kg to over 300 kg; and New Mexico seizures remained low, fluctuating between 10 kg and 40 kg. FY2003 figures indicate 40% of all seizures were made in Arizona, an area which historically has been less active than other border states like California or Texas (U.S. DEA 2003b).

Figure 2.4

Southwest Border Methamphetamine Seizures by State, FY1999–FY2002 (in kg)



Source: U.S. Department of Justice, National Drug Intelligence Center, EPIC Federal-Wide Drug Seizure System, 2003.

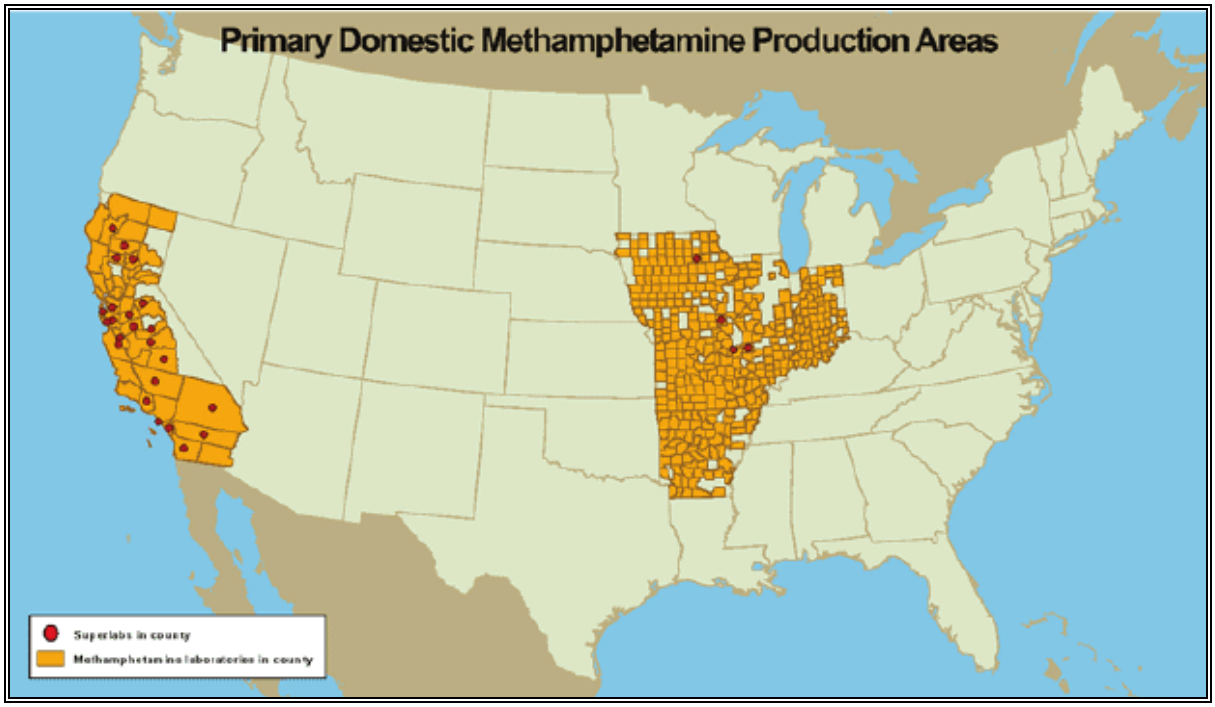
Each of these data sources points to the gradual movement of production (and presumably use) eastward, though the epicenter remains stable, but firmly fixed, in the West.

Drug purity also varies regionally, suggesting different production and trafficking organizations and/or methods. According to preliminary 2003 data from DEA's Special Testing and Research Lab, methamphetamine seizures are 48% pure on average nationally, but 83% pure among Southwest border seizures and 56% pure in the Northeast (U.S. DEA 2003a). Mexico-produced methamphetamine, which most likely comprises Southwest border seizures, has the highest purity; purity may decrease as it is "cut" and moves further from the border.

2.2.2 Production in Superlabs

Although methamphetamine is produced throughout the United States, California is the only state where production reaches "superlab" distinction, with some exceptions in the central U.S. (Figure 2.5). Superlabs, or labs capable of producing ten pounds or more of methamphetamine, are believed to be the source of most of the meth produced in the United States (NDIC, 2005). Most superlabs are controlled by Californian or Mexican criminal groups located in California. Four Southern California counties accounted for over 40% of the superlabs seized in 2003 (USDOJ, NDTA, 2005).

Figure 2.5



Source: U.S. Department of Justice, Drug Enforcement Administration, El Paso Intelligence Center, National Clandestine Laboratory Seizure System as of March 9, 2004.

The Inland Narcotics Clearinghouse (INCH), located at the Riverside County Sheriff's Department Special Investigations Bureau and a component of the Los Angeles High Intensity Drug Trafficking Area (HIDTA)**,** estimates that in 2000 in Riverside and San Bernadino Counties alone methamphetamine laboratories had a production capability of 44.6 metric tons. This exceeds the 3.87 metric tons reported seized to the Federal Drug Seizure System by all Federal agencies in 2000 by 172% (NDIC, 2002).

2.2.3 Methamphetamine and International Trafficking

Methamphetamine presents a diverse and global problem, and U.S. markets are inextricably linked to international drug organizations. Regardless of whether the final methamphetamine product is made domestically, many precursor chemicals are not produced in North America, and must be obtained from foreign sources. It is a highly mobile and profitable market, and frequently used by non-U.S. crime organizations with money laundering capabilities.

"Trafficking organizations find synthetic drug production (especially methamphetamine) attractive for several reasons: there is no dependence on growing seasons; no large workforce is required; necessary chemicals are easily obtained; it is easy to locate laboratories near consumer markets; and there is a high profit return on their investment"

(U.S. DEA, 2003b: 2). Unlike marijuana, cocaine and heroin, methamphetamine production cannot be countered with crop eradication or source identification made by tracing signature elements back to geographic origin. The necessary meth precursors do not deteriorate with time, and can be rerouted to mobile labs upon detection of trafficking routes.

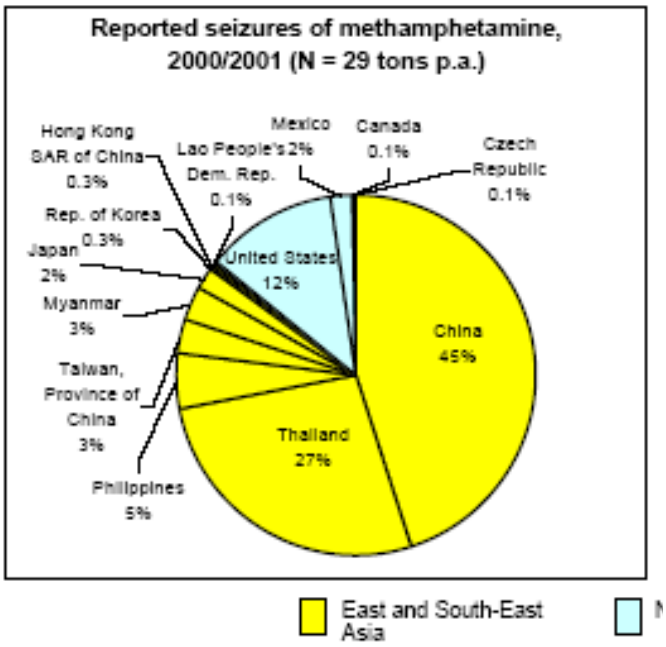
The supplies of precursors, notably ephedrine and pseudoephedrine tablets used by the many small Mom and Pop labs, traditionally come from gathering small supplies of blister pack cold medications in multiple pharmacy buys or ordering ephedrine tablets over the Internet. Large domestic producers have used bulk supplies of tablets obtained from Canadian, Middle Eastern, Mexican or Far Eastern courses. Recent efforts at the Canadian border and stronger enforcement of regulations on Canadian production have helped to limit diverted tablets from that source. As a result law enforcement sources report increased seizures of Asian pseudoephedrine tablets in California destined for super labs in that region.

The highest number of ephedrine seizures in 2000/2001 was reported by China (10,150 in 2000), followed by Burma (3,922) and India (930). As shown in Figure 2.6, China (45%) had the highest number of methamphetamine seizures of those surveyed by the UNODC in 2001, followed by Thailand (27%) and the U.S. (12%).

The U.S is only one of several world markets for methamphetamine. It is used in Europe, East and Southeast Asia, and more recently Australia. The highest methamphetamine abuse level reported worldwide is in Thailand, where it is used by 5.6% of the population aged 15 to 64 (UN Office on Drugs and Crime, 2003).

Figure 2.6

Report Seizures of Methamphetamine by Country, 2000/2001



Source: UNODC Annual Reports Questionnaire Data (UNODC 2003).

The main source of amphetamine type stimulants is Burma (Myanmar), which has no chemical industry, but obtains precursors produced in India, China, and Thailand (U.S. DEA 2003b). Burma produces in excess of 800 million methamphetamine tablets (Ya-Ba) annually. The insurgent group, United Way State Army, is the primary producer. Cambodia, Laos, and Thailand produce lower volumes. An estimated 80% of these are consumed in Thailand, sometimes shipped through Laos; the remainder end up in Australia, Brunei, Hong Kong, Indonesia, Malaysia, Singapore, Taiwan, and Vietnam. "There is no reliable seizure data on Burma-produced tablets entering the United States" (U.S. DEA, 2003b: 3), only when methamphetamine shipments to California are detected. The Ministry of Health of Burma has issued a notification that prohibits the import, sale or use of precursors, and has agreed on cross-border cooperation among Mekong river subregion countries, but the country has no laws or regulations concerning chemical control.

Along with India, China is a major producer of ephedra and a leading exporter of bulk ephedra (U.S. DEA, 2004c). These precursors are used in the manufacture of crystal methamphetamine, which is trafficked by organized crime groups based in Hong Kong, Taiwan, and Japan. China is the primary producer and consumer of crystal methamphetamine; smaller quantities are produced in Philippines, Taiwan, and South Korea. Most of the crystal methamphetamine produced is consumed locally, and these countries consider crystal methamphetamine abuse a major drug problem, second to heroin/opium. However, cargo bound for international markets have been seized in southern China ports,

indicating some exports. Other consumer markets include: Australia, Brunei, Hong Kong, Indonesia, Japan, Malaysia, Singapore, South Korea, Taiwan, the Marianas Islands, and the U.S. (especially Guam and Hawaii). Reports on crystal methamphetamine seizures have fluctuated from 1.3 metric tons in 1995 to 20.9 metric tons in 2000; seizures reported between 2001 and 2003 are below 5 metric tons (U.S. DEA, 2004c).

While outlaw motorcycle gangs still dominate domestic methamphetamine production in Australia, ethnic organized crime groups in that country do trade methamphetamine among themselves (U.S. DEA, 2004d). In 2003 Customs seized pseudoephedrine shipments from Cambodia and crystal methamphetamine shipments involving ethnic Chinese organized crime groups. DEA Canberra reports methamphetamine seizures have risen from 8.81 kg in FY2000 to 244 kg in FY2003. Australia is not a major drug or source country, but it does represent a transit point along maritime and aviation routes between Southeast Asia and the Americas, as well as a market. Australian drugs of choice are marijuana, Ecstasy and methamphetamine, in that order (U.S. DEA, 2004d). New Zealand also reported many seizures of pseudoephedrine and methamphetamine in 2003 (United Nations Office on Drugs and Crime, 2004).

2.2.4 Chemical Diversion and Control

A need for comprehensive chemical controls—not only drug laws—was first recognized during a series of international conferences held in the 1980s, and culminated in Article 12 of the 1988 United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances (Vienna Convention; RCMP and U.S. DEA, 2001). Effective with the Vienna Convention, parties accept the obligation to enact laws and regulations to control chemical commerce and prevent diversion to illicit drug manufacture. The UN Commission on Narcotic Drugs meets annually to review goals and update the surveillance list of chemicals and source countries. For example, the members mandated a Chemical Action Task Force at the 1990 Economic Summit, and recommended additional chemicals to the original Vienna Convention list (RCMP and DEA, 2001).

As stated previously, while many U.S. traffickers extract pseudoephedrine from nonprescription over the counter medications for methamphetamine production, the more common methods involve diversion in bulk from legitimate chemical production or commerce to illicit drug manufacture. While other countries have worked with the U.S. in targeting precursor and methamphetamine trafficking through the UN and other joint efforts, they often lack the necessary chemical control regulations and enforcement resources. The most susceptible countries are themselves, or proximate to, drug producing countries, have weak import/export and border controls, and do not verify end-use or respond to pre-export notifications (U.S. Department of State, 2004). Where regulated, exporting countries require a permit from the importing country to verify a chemical product transaction is legitimate. Some use the Letter of No Objection method, by which exporting countries require a letter stating there is no objection from the importing country before allowing above-threshold

transactions to proceed (RCMP and U.S. DEA, 2001). Still, the challenge is to implement chemical controls and monitoring systems without jeopardizing legitimate commerce.

In the U.S., pseudoephedrine and other precursors used to manufacture methamphetamine are List I chemicals under Federal law. Manufacture, importation, and exportation are regulated by DEA, which engages in the Letter of No Objection Program. In 1988, the Chemical Diversion and Trafficking Act instituted a regulatory and enforcement framework for precursor control that allows DEA to determine legitimate chemical use of import/export declarations in the U.S. DEA and chemical diversion investigators assist INTERPOL and other countries in determining legitimate end-use, with enforcement assistance from the U.S. Customs and Border Protection. Precursor control was further enhanced by the Crime Control Act of 1990, which added precursor chemicals to the Controlled Substances Import and Export Act. The Domestic Chemical Diversion Control Act of 1993 targeted methamphetamine specifically by placing over the counter ephedrine and other products under DEA regulatory control, and requiring registration of List I chemical handlers.

In 1996, Congress passed the Comprehensive Methamphetamine Control Act, which broadened all controls of chemicals used in controlled substances production and increased penalties for methamphetamine manufacture and trafficking of both listed chemicals and methamphetamine itself. Congress passed the Methamphetamine Anti-Proliferation Act of 2000 to address the diversion of drug products containing pseudoephedrine and phenylpropanolamine from retail and mail order sources by reducing the thresholds for regulated transactions of over the counter (U.S. DEA, undated c).

2.2.5 Regulating Chemicals in Other Countries

In 1995, the Royal Canadian Mounted Police established the National Chemical Precursor Diversion Program to encourage voluntary reporting and cooperation by the chemical industry (RCMP and U.S. DEA, 2001). Canada passed their own Controlled Drugs and Substances Act of 1997, which identified nine precursor chemicals. Various governmental organizations, including Health Canada and the Customs and Revenue Agency, worked to place precursors on the Export Control List in 1992; this required permits for export of above-threshold quantities of pseudoephedrine/E. Canada also issued Letters of No Objection, but these were issued to the industry importer, who submitted the letter with their purchase order to the foreign supplier. The letter method had no legal basis, but was offered as a courtesy to the industry and to encourage tracking. All of these measures failed to affect precursor diversion because they lacked regulatory or administrative controls and thus chemical trade was weakly monitored (RCMP and U.S. DEA, 2001). After several years' development, the Controlled Drug and Substances Act of 2003 established regulated chemical control by Health Canada and enforcement by RCMP. It prohibits the import, export, and possession for export of precursors sold in quantities above threshold except by licensed dealers; Class A precursors and their thresholds include acetic anhydride (1000 kg), ephedra (20 gm per package), ephedrine (400 mg per package), and pseudoephedrine (3 gm

per package)—all essential components of methamphetamine (National Association of Pharmacy Regulatory Authorities, 2003).

Other source and drug producing countries have had more difficulty regulating and enforcing chemical control and impacting methamphetamine production and distribution. As summarized in the latest International Narcotics Control Strategy Report (U.S. Department of State, 2004):

- Mexico has established a Chemical Sensitive Investigative Unit that monitors chemical and pharmaceutical diversion, including illegal shipments of nonprescription pharmaceuticals containing pseudoephedrine from Hong Kong and other Far East countries.

- India has chemical control laws that include pseudoephedrine, respond to requests for approval and end-use verification (especially regarding pseudoephedrine), and cooperate with the DEA diversion investigator in New Delhi.

- China will not allow pseudoephedrine export without affirmation by the importing country's authorities—either by permit or Letter of No Objection. However, significant amounts of pseudoephedrine are exported to Mexico, and recent pseudoephedrine seizures in the U.S. and Panama destined for Mexico were traced to legitimate Hong Kong pharmaceutical companies. The Chinese Public Security Bureau's chemical control unit verifies chemical handlers and transactions, with assistance from DEA in Beijing and Hong Kong, but the country lacks infrastructure to adequately monitor the voluminous chemical production and international trade. Penalties for drug trafficking are severe; sentences for the seizure of 50 grams of crystal methamphetamine may include the death penalty.

- European Union chemical diversion control regulations bind all member states, but these are individually implemented and enforced. Regulations have transaction record, import/export permits and declaration, and shipment suspension provisions. Germany and the Netherlands are major source countries of diverted chemicals (the Dutch trade is in MDMA). Germany's Precursor Control Act of 1994 criminalized chemical diversion, and the Federal Police and German Customs form the Joint Precursor Chemical Unit that is devoted to investigations and cooperates with DEA's Frankfurt office.

2.2.6 U.S. Federal Law Enforcement and Prosecution

In addition to its own offices (EPIC, Special Testing and Research Laboratory, and Field Divisions), DEA leads several ongoing collaborative efforts toward precursor and methamphetamine control:

- Since 1990, High Intensity Drug Trafficking Areas (HIDTAs) have institutionalized teamwork between local, state and Federal efforts to reduce drug trafficking in over 30 U.S. regions.

- Operation Pipeline is a Nationwide highway interdiction program created in 1984 to train, aid communications, and provide analytic support to state and local law enforcement in detection of drug trafficking using private motor vehicles. Operation Convoy was created in 1990 to target drug trafficking in commercial vehicles, using surveillance undercover and other law enforcement activities at truck stops, transshipment areas, and motels (U.S. DEA, undated b).

- Operation Topaz, started in 2001 coordinates international strategy targeting anhydrous ammonia. Operation Prism is a voluntary and multilateral initiative started in 2003 to track and prevent the diversion and trafficking of chemicals and equipment used in ATS manufacture in major source countries. Both involve the UN International Narcotics Control Board (U.S. ONDCP, 2002).

- The Organized Crime Drug Enforcement Task Force (OCDETF) led by DEA's Special Operations Division, comprises: agents and analysts from DEA, Federal Bureau of Investigation, Internal Revenue Service, Bureau of Immigration and Customs Enforcement, and Bureau of Alcohol, Tobacco, Firearms and Explosives; and attorneys from the Justice Department's Criminal Division and various U.S. Attorney's offices. OCDETF has been responsible for Operation META (started in 1997, resulting in 121 arrests of the Amezcua-Contrera group in Mexico), Operation Mountain Express (see below), and other investigations involving money laundering, weapons, and smuggling.

- The Combat Methamphetemine Epidemic Act of 2005, having passed the House of Representatives, is under consideration in the Senate at this writing. This act would reclassify pseudoephedrine, ephedrine and PPA to Schedule Listed Chemicals and reduces the transaction limit from 9 grams to 3.6 grams per purchase. It also requires behind the pharmacy counter storage and written verification of purchase. Internet sellers of the products would be covered under the same restrictions. The law also sets production quotas for the three target substances, though there is little domestic production of these products. The law, however, would also set import quotas on these substances. Finally, the legislation enhances criminal penalties for production and distribution, including penalties for child endangerment.

These efforts have had substantial impacts on trafficking and production practices. Unfortunately, criminal organizations are able to circumvent regulations and enforcement by shifting resources and networks. When DEA's Operation Mountain Express (Phases I and II) succeeded in curtailing diversion of pseudoephedrine from domestic industry, traffickers focused on Canadian sources (U.S. DEA, 2003c). DEA then engaged the Royal Canadian Mounted Police for Operation Mountain Express Phase III to target importation of

pseudoephedrine from Canada for illegal manufacture of methamphetamine in the U.S. Middle Eastern drug organizations used brokers in Detroit, Chicago, Cincinnati, and LA to smuggle pseudoephedrine from Canada through Detroit for distribution to Mexican drug organizations operating superlabs in Phoenix, Las Vegas, LA, Riverside, and San Diego. Collectively, Operation Mountain Express Phases I-III resulted in over 300 arrests, and seizure of 9 clandestine labs, over 30 tons of pseudoephedrine, 181 lbs of methamphetamine, and over $16 million USD (U.S. DEA, 2002b). DEA's Operation Northern Star (considered Phase IV) targeted continued illegal importation of pseudoephedrine from Canada to the US, ranging from precursor suppliers, chemical brokers, transporters, manufacturers, distributors, and money launderers (U.S. DEA, 2003c). Finally, Canada passed the Drug and Substances Act of 2003 and decreased diversion of pseudoephedrine to the U.S. The U.S. no longer considers Canada a major source of pseudoephedrine used in domestic illicit manufacture of methamphetamine (RCMP, 2004). Now Mexico and other drug producing countries are diverting pseudoephedrine from alternative sources. As noted, recent pseudoephedrine seizures destined for Mexico were traced to legitimate Hong Kong pharmaceutical companies (U.S. DEA, 2004c).

Pseudoephedrine and other precursors used to manufacture methamphetamine are List I chemicals, and unlawful distributing, importing, exporting, or possessing a listed chemical is a Federal crime (U.S.C. §2D1.11). Methamphetamine is regulated by DEA as a Schedule II narcotic, and unlawful manufacturing, importing, exporting, or trafficking is a Federal crime (U.S.C. §2D1.1). The U.S. Sentencing Commission (1999) found that Federal cases involving methamphetamine had tripled from 630 in FY1992 to 2,234 in FY1998. Just over 20% of all methamphetamine cases involved a weapon. In FY2002, 2,171 Federal cases related to methamphetamine were filed against 4,208 defendants, in addition to approximately 100 major methamphetamine lab cases (ONDCP, 2004). Penalties and quantity triggers have changed over time:

- Following the Anti-Drug Abuse Act of 1986, the initial Federal Sentencing Guidelines (effective 1987) assigned to methamphetamine an equivalent of twice that of cocaine.

- Congress established mandatory minimums for methamphetamine in the Anti-Drug Abuse Act of 1988 as 10 pure grams triggering 5 years minimum prison, and 100 pure grams triggering 10 years minimum prison.

- In the Crime Control Act of 1990, Congress focused on crystal methamphetamine, which was typically over 80% pure and raised addiction concerns. The 1991 Federal Sentencing Guidelines treated "ice" as 100% pure methamphetamine.

- In response to the Comprehensive Methamphetamine Control Act of 1996, the 1997 Federal Sentencing Guidelines were amended to add enhancements for illegal methamphetamine or chemical importation and for related environmental offenses.

- The Methamphetamine Trafficking Enhancement Act of 1998 increased mandatory minimum penalties by halving the associated minimum quantity of pure methamphetamine—5 grams for 5 years prison, and 50 grams for 10 years prison, making the quantity triggers consistent with those for crack cocaine.

- The Methamphetamine Anti-Proliferation Act of 2000 raised the sentencing guideline level for methamphetamine manufacturing offenses that risk harm to others.

Currently, Federal methamphetamine trafficking carries minimum penalties of five years prison, and fines of $2 million for individuals (or $4 million, if not an individual), for first offenses involving under 50 pure grams. These are doubled for second offenses or offenses involving larger amounts. The maximum penalty is life imprisonment for two or more prior offenses. Penalties may change with the legislation currently under review in Congress.

2.3 Methamphetamine Retail Markets

There are a number of factors that affect a retail drug market: whether it is produced domestically, its maturity, and law enforcement policy. Drugs that are imported by definition have a "deeper" or more tiered distribution system. Heroin and cocaine, for example, are agricultural products, grown abroad, that need to be harvested, processed at several junctures, shipped, and eventually packaged for different levels of distribution (wholesale to the street). These many steps involve many people at different levels of the chain: growers, extractors or producers, transporters or smugglers and distributors and the myriad number of middlemen or assistants needed to move product across borders before it gets to the customer.

Methamphetamine also differs from other drugs of abuse in fundamental ways that affect the retail market. The geographic distribution of meth markets is one of their most distinguishing features. Many urban markets like Philadelphia, New York, Chicago, Miami, awash in illegal drugs like cocaine, heroin or marijuana, have little methamphetamine. Even in areas that do have high levels of methamphetamine use, the meth markets and laboratories are often found in outlying vicinities rather than in the more populous urban centers.

Many studies of trafficking in cocaine and heroin have shown that it is generally only at the tail end of the distribution chain of these drugs that you find a user or consumer. Methamphetamine, by contrast, is a drug synthesized from several possible precursor chemicals, most domestically available. Using widely accessible recipes, cooks produce methamphetamine in small lots (Mom and Pop labs) for personal use or distribution, or in larger lots (in superlabs) for wider sales. The need for depth or specialization in the organization is less acute with methamphetamine than for other drugs. Also, unlike other distribution organizations, the meth producer (particularly in smaller operations) is quite often a consumer.

The maturity of a market also effects its form: how long has the drug been around; how many people know how to produce and sell it; how big is the demand? If use can be seen as

an indication of the history or maturity of a market, there are retail methamphetamine markets at varying degrees of maturity across the country, with the most established located in the West and the newest in the Midwest and some areas of the South.

Law enforcement policy also affects market activity through local disruption and/or heightened scrutiny. Urban areas often have special task forces assigned to combat or disrupt particular markets. Rural areas often with only a handful of officers have far fewer resources to deal with drug use or sales. In these less well-staffed areas, markets may also have more privacy or room to develop.

Data from the 35 ADAM sites help characterize local methamphetamine sales at the retail level. These data indicate that the methamphetamine retail market (as described by arrestee users) is different than the retail market for other drugs like crack or heroin. Heroin, for example is a "cash" market in those areas where it is available. In Chicago and New York, over 60% of transactions for heroin are made in cash only, rather than bartered, given away, or exchanged for services. The same is true to a lesser extent for crack cocaine. In contrast, ADAM data indicate that methamphetamine transactions in all but a handful of sites are less likely than crack transactions to be "cash only." In sites as different geographically as San Diego, Salt Lake City and Minneapolis, crack transactions are twice as like as meth transaction to be cash only. Meth sales are also more likely to be made indoors. By contrast, crack in most ADAM sites has a substantial outdoor sales market: over 60% of crack purchases in San Jose and over 50% in Seattle, Portland, Minneapolis and New York are outdoor purchases. Only one site (Portland) reports higher than 30% outdoor meth purchases. Omaha is an interesting example of this phenomenon. Both crack and meth are actively transacted in Omaha. Omaha's crack sales reported by arrestees occur outside over 30% of the time, compared to their meth sales that occur outside less than 10% of the time. Though similar drugs, crack and meth are likely bought and used by different populations of users.

We can also look at how active the market is in terms of how many dealers are available for sales. ADAM sites with both meth and crack sales show that crack users are involved with more *different* dealers than meth users. In Sacramento, arrestees report that on average they obtained meth from just over two dealers in the last 30 days; crack users report they obtained from, on average, over four dealers in the last 30 days (Hunt and Kuck, 2004). Many other sites with established meth use (San Diego, Phoenix, Portland) have similar data. The dominance of indoor or non-public transactions, involving fewer dealers suggests that, rather than an organized cash driven business, it is one in which users and even producers are selling to friends and acquaintances rather than to strangers. A study done in the early 1990s in San Diego (Eck, 1998) reported the same results. Crack and cocaine were more likely to be open market transactions and methamphetamine markets were more likely to be enclosed or indoor, private transactions.

In a study of methamphetamine in both urban and rural counties of Nebraska, Herz (2000) found that use was more common in rural areas of the county than in urban Omaha, but that

the drug was widely available in both areas and obtained through friends, family members or acquaintances. There were also significant differences between urban and rural areas as to percentage of arrestees reporting that they ever sold methamphetamine. There were almost twice as many sellers in some rural counties. There were, however, no significant differences in the number of persons who reported *producing* methamphetamine in urban or rural counties (from 9% to 12% of arrestees).

Ethnographic data on methamphetamine supports the picture of the meth market as more relational, as non-cash and relying more on associations rather than having a basis in organized street sales, as is often found with crack or heroin. Data from ethnographic sources in a special report on drug markets (ONDCP, 2002) indicate that independent or smaller sellers sell locally produced meth in residential locations or hotels, while more organized sellers handle Mexican or out of area produced meth and operate in more open or public selling areas. Law enforcement sources cited in this report also note that disrupting the meth market is difficult, because it is a relational "hand to hand"(ONDCP, 2002:60) market accessed through personal introduction or through beepers and cell phones among acquaintances.

While some large cities report concentrated selling locations, most areas describe multiple selling locales in urban, suburban and rural areas. In a study of six cities' methamphetamine problems and initiatives, The Office of Community Oriented Policing Services found that labs seized by police were found with similar frequency in vehicles, residences, storage lockers and hotels/motels. Many of the labs seized were what they termed "boxed labs," or highly mobile sets of chemicals and equipment producing relatively small amounts for local distribution (COPS, 2003).

These reports indicate that the methamphetamine retail market is different from other drug markets in many areas and reflects in large part what has been termed a "cottage industry" model of drug distribution (Eck and Gersh, 2000). In contrast to larger or more organized networks, cottage industry drug distribution is characterized by a large number of small groups, weak or little organizational structure and fluid group membership. In contrast to a more organized market, the cottage industry drug market does not use sophisticated technology or transportation routes, and handles relatively small amount of the drug at a time. This appears to be the methamphetamine model in rural areas and in areas where it is in its early stages of development.

However, areas where methamphetamine has gained and maintained a large consumer audience do, in fact, show signs of more organized group involvement. Mexican drug trafficking organizations have made significant inroads into manufacture and distribution, particularly in Western and Midwestern cities where previously small laboratory operators dominated production (ONDCP, 2003). San Diego, Phoenix and Salt Lake City have reported increases in out of area methamphetamine product on the market for the last few years. Salt Lake City narcotics officers estimated in 2003 that half of the supply was produced by local groups and about 40% by illegal aliens. Law enforcement sources in

several sites with established meth markets report the same shift from a local dominance of the market to gradual inroads of distributors and manufacturers from outside of the area (COPS, 2003).

Chapter 3: Treatment for Methamphetamine Abuse

Although amphetamines and methamphetamine abuse has been present in the culture in some form for over 60 years, concern for how to treat abusers has remained a consistent issue for treatment providers. Data from TEDS on admissions to treatment in the U.S. have shown a gradual increase in the proportion of admissions for methamphetamine abuse from one percent in 1992 to over 7 percent a decade later, over 125,000 admissions. Data from the 2004 NSDUH indicate that the percentage of over 600,000 meth users who have used the drug in the last month, the proportion that meet the criteria for clinical dependence more than doubled from 2002 (28%) to 2004 (59%) (SAMHSA, OAS, 9/16/05).

Prior to the rise of cocaine use in the 1970s and 80s, the majority of treatment approaches focused on problems associated with alcohol, opiates and sedative abuse. The epidemic of first cocaine powder and then crack focused wider attention on a different population of patients, stimulant abusers. Methamphetamine abuse in the 1990s brought new challenges to treatment service delivery, now dealing with a longer acting stimulant that produced even more protracted physiological and psychological problems. In addition, methamphetamine use became tremendously popular in rural areas, where treatment programs were not traditionally located.

3.1 What Are the Effects of Methamphetamine?

Methamphetamine and amphetamine are powerful central nervous system stimulants that can be consumed through a variety of routes, each with a different lag time to effect dependent on different rates of absorption. The slowest rate of absorption is when the drug is taken orally (in pill form or as tea), producing effects (more muted than with more direct ingestion methods) within 20–30 minutes; it can also be ingested intranasally (snorted), where it is absorbed by mucosa, taking effect in 3–5 minutes. The two most rapid absorption routes are injection or inhalation (smoking), where effects are felt within 7–15 seconds. Users who inhale methamphetamine as smoke or vapors experience a euphoric rush, much like that found in crack smoking, though with meth the high is sustained much longer (NIDA, 2002; Goode, 1999; Brecher, 1972).

The immediate methamphetamine rush is followed by an extended high that can last 4 to 24 hours. During this period the user is overly stimulated, shows rapid flights of ideas and speech, is highly assertive or confident, but may also display suspicious or paranoid behaviors. The “high” declines as time progresses and is followed by “crashing,” a period marked by fatigue, hunger, thirst, cravings and some mental confusion. Without taking another dose, the user may show continued lack of energy, anhedonia (inability to experience pleasure), depression, anxiety, and insomnia (Avis, 1990; U.S. HHS; CSAT, 1999; NIDA, 2002). These unpleasant feelings encourage taking repeated doses over extended periods of time.

Novice users could ingest an 1/8 gram of methamphetamine to produce the effects described above. A regular user would ingest more methamphetamine (¼ gram units) to gain the effect and, on a "run" or in a binge of use covering days, take multiple grams. The duration of its effect is due to its long half-life. It takes 12 hours for half of ingested methamphetamine to be cleared or metabolized in the system (NIDA, 2002) compared to the half life of ingested cocaine which is approximately one hour.

3.1.1 What is the effect of methamphetamine on the brain?

Methamphetamine is a stimulant that rapidly crosses the blood brain barrier, carried into nerve terminals by transporter molecules. Once in the nerve terminals, methamphetamine promotes the release of neurotransmitters like dopamine, norepinephrine and serotonin. Dopamine controls the rewards and pleasure system; epinephrine controls things such as appetite, mood and fight/flight responses; and serotonin controls sleep and appetite. Normally these substances are recycled or reabsorbed (reuptake) into the nerve terminal to be used again when stimulated. Reuptake occurs when transporters move "used" or released dopamine, for example, back into the nerve cell that produces it, ending the pleasure signal. However, normal reuptake is inhibited by methamphetamine, and a neurotransmitter like dopamine stays in the synapse longer, failing to shut off the euphoric effect (Avis, 1990; Volkow, 2001). Similarly, methamphetamine increases the release of norepinephrine and inhibits its reuptake, causing extended anxiety, sleeplessness and paranoia. The process is repeated with serotonin, which is thought to contribute to methamphetamine user aggressiveness, mood changes and sometimes psychotic symptoms (NIDA, 2002; Cohen et al., 2003).

Each of these effects is exaggerated both with higher doses and from extended use of methamphetamine. In some cases, the effect is what the user is seeking (exhilaration, energy), while in others it is an undesirable by-product of the drug (paranoia, confusion). It is the action of the drug on these critical neural pathways that is the basis for many of the serious adverse effects associated with its use.

Immediate Adverse Effects

Like many other stimulants, methamphetamine effects multiple systems of the body. The body responds to methamphetamine as if it were preparing itself in a "fight or flight" emergency situation. Heart rate elevates, metabolism increases, blood vessels constrict, pupils dilate, and body temperature rises. In a normal response to emergencies, these effects are short lived, and the body returns to normal when the crisis passes. With methamphetamine use, the effect is sustained for hours, placing an extended burden on the nervous, circulatory, renal, and respiratory systems. Acute physical problems that come from this long period of being "hyper alert" include hyperthermia, palpitations, chills, hyper motor activity, kidney failure, mental confusion, tremors, and dizziness (U.S. HHS; CSAT, 1999; Brown, Wise and Kiyatkin, 2003; NIDA, 2002).

The toxic effects of even single methamphetamine administration primarily affect the central nervous system and the cardiovascular system. For example, emergency rooms report cases of chest pain, tachycardia, arrhythmia, arterial aneurysm, and hypertension from the increased, sustained stimulation of that system from even a single administration. Overdose or extreme intoxication has also been associated with multiple organ failure, heart attack, stroke and clinical signs of heatstroke (Lan et al., 1998).

DAWN reported almost 39,000 drug abuse related emergency room visits in 2002 (USDHHS, SAMHSA, DAWN, 2004) involving amphetamine or methamphetamine—a 54% increase over levels reported in the mid-1990s. While methamphetamine ranks fourth overall in rates of ER visits in the population (7/100,000 population) behind cocaine, marijuana and heroin, it is a category of drugs that is concentrated in some areas and expanding into others. Areas like San Diego and Seattle have experienced over 70% increases in the rates of meth ED mentions in the population since 1995. Other areas like Phoenix or San Francisco have remained consistently high since 1995, reporting rates as high as 80–90 /100,000 populations (U.S. DHHS, DAWN, 2004).

Long-term Effects

Methamphetamine, particularly when used chronically, causes long-term changes in the brain that produce damaged memory, mood changes and impaired motor coordination, even months after the user has stopped (Volkow et al., 2001). Data from both human and animal studies show that long-term use produces significantly reduced density of critical dopamine transporter molecules. The longer and more severe the use, the greater the loss of dopamine transporter density and the more severe the resulting psychiatric symptoms (Sekine et al., 2001). A study of over 1,000 methamphetamine users in treatment found high levels of psychiatric problems, such as depression, anxiety, suicide, and violent or assaultive behaviors. Residual psychiatric symptoms include prolonged inability to experience pleasure, anxiety and psychotic episodes (Zweben et al., 2004; Cohen et al., 2003). Residual symptoms are also found to be easily triggered or made worse by new use or even by external psychological stressors (Angrist 1994; Rawson, 2004). In a study using PET scans with meth users and controls, investigators found three major areas of brain function differences among methamphetamine users compared to non-users—loss of dopamine transporters, whole brain inflammation, and loss of motor and cognitive ability (Volkow et al., 2001; Nordahl, Salo, and Leaman, 2003).

Effects to the cardiac system of users are also reported in the literature (Wijetunga, Seto, Lindsay and Schatz, 2003). In a case control study of users, 64% of meth users showed normal heart function compared to 88% of age-matched controls. In addition, 28% of meth users showed severe cardiac dysfunction compared to 7% of age matched controls. Pre-natal methamphetamine has also been associated with low gestational weight in humans and changes in gene expression and neural development in mice (Smith et al., 2003).

While use itself produces medical and psychiatric problems, methamphetamine production can have adverse physical effects on those involved. Manufacture of methamphetamine involves a number of toxic chemicals which, when inhaled, produce serious injury to lung tissue. Manufacture often uses anhydrous ammonia, a key ingredient in soil fertilizer that can be explosive under some circumstances. Caustics used in production also include acids and alkali, which cause chemical burns when in contact with skin and pulmonary burns when inhaled. Basic chemicals found in meth labs include solvents (acetone, freon, methanol, toluene), caustics (anhydrous ammonia, hydrochloric acid, sulfuric acid) and metals and salts (iodine, red phosphorus). The solvent toluene, for example, can cause ventricular arrhythmia, and its aspiration can produce renal toxicity. In addition, explosions or fires involving many of the chemicals used lead to burning of skin, eyes and nasal passages (Dhaliwal and Sood, 2003).

3.1.2 Child Endangerment

Child endangerment is a critical issue in dealing with methamphetamine use and production. Accidental poisoning of children exposed to methamphetamine production has been reported in numerous areas (Kolecki, 1998) and is of increasing concern to local public safety responders in rural areas where staff training may be limited (Weisheit, 2004).
Data from the Office of National Drug Control Policy report that children are present at over 10% of all methamphetamine related incidents (lab seizures, accidents) in the United States. Of the over 14,000 incidents in 2003, almost 1,300 involved children being exposed to toxic chemicals and over 700 resulted in the removal of the child to protective custody (http:/www.whitehousedrugpolicy.gov). Raiding a meth lab involves a number of law enforcement and other public safety officials (fire services, HAZMAT teams). Too often, however, the responding team finds it is in need of child welfare specialists, social services and trained medical staff to test children on the site for exposure. In 2003, ONDCP and the Department of Justice's Office of Community Oriented Policing Services began developing Drug Endangered Children initiatives to assist states with the coordination of their efforts on behalf of children. As a consequence, a number of states have introduced guidelines for addressing the presence of children as well as created additional penalties for child endangerment for the manufacturer who exposes children to the drug or its precursors

3.2 Treating Methamphetamine Abuse

Many treatment specialists have pointed to the unique challenges associated with treating methamphetamine users (Rawson, Anglin and Ling, 2002, CSAT, 1999). Stimulant users in general and methamphetamine users in particular have unusually high rates of relapse, experience extended periods of depression and may experience continued episodes of confusion and paranoia, even after a long period of abstinence. The protracted craving, mental confusion, depression and even psychotic episodes make the methamphetamine patient more difficult than many other drug treatment patients, and one whom providers are in the early stages of learning to manage effectively. As CSAT's Treatment Improvement Protocol for Stimulant Users states,

> "Some of the most frightening research findings about MA (methamphetamine) suggest that its prolonged use not only modifies behaviors, but literally changes the brain in fundamental and long-lasting ways. Animal studies have shown that chronic use of MA can significantly reduce brain dopamine levels for up to 6 months after last use, with less significant reductions persisting up to 4 years…. The adverse effects produced by MA are often long lasting, and there is some speculation that some types of damage may be permanent. Finally, these impairments in brain functioning may underlie the cognitive and emotional deficits seen in many MA users. Understanding the chronic effects of MA use is essential for treatment providers who serve this population." (CSAT, 1999: 21)

Initial approaches for stimulant abuse were developed in response to the rise of cocaine in the 1980s. The earliest stimulant treatment model was the 28-day inpatient Minnesota model, a long-standing approach based on alcohol abuse treatment. A number of programs using this approach sprang up and, by the late 1980s, this model was the most commonly used treatment for stimulant abuse (CSAT, 1999).

Many of the studies of effectiveness of various approaches with stimulant abuse come from this early work with cocaine treatment. Interventions that were shown effective in cocaine outcome studies share some common features: individualized assessment and treatment planning; use of learning or cognitive-based approaches; engagement of patient social networks in the process; and skills training and incentives or vouchers for compliance (CSAT, 1999). Standard approaches like relapse prevention (Marlatt and Gorden, 1985) also showed efficacy with stimulant abuse patients, particularly in increasing treatment retention (Carroll et al., 1994). Voucher programs (programs in which the patient earns vouchers that can be exchanged for money or items contingent on participation and/or compliance) have also shown promise with stimulant abusers. In three randomized clinical trials in the 1990s with cocaine users, researchers found that community reinforcement combined with vouchers or incentives models retained clients longer in treatment and produced longer periods of abstinence than standard counseling care. The gains were also sustained longer (6, 9 and 12 months after treatment entry) than found with standard counseling (Higgins et al., 1995; 1997).

Case management approaches have also been applied to stimulant abuse treatment. Hall and colleagues (2002) evaluated the Iowa Case Management Project, a program designed to add case management services to interventions provided by a standard treatment program. Results of a controlled evaluation of the technique with methamphetamine users indicate improvement in two areas: employment and in depressive symptoms.

The Matrix Model is an approach developed specifically for stimulant users. Developed in the mid to late 1980s, the model combines many of the traditional treatment elements from the past in an outpatient regimen: relapse prevention, family therapy, 12-step programming, contingency contracting and incentives. The original model involved a 24-week intensive

treatment period, but more recent adaptations are of shorter duration (Rawson et al., 1996). Data from the Methamphetamine Treatment Project, a CSAT funded multi-site outpatient treatment study of the Matrix model, offers additional support. The objectives of a series of studies in the MTP were to compare the Matrix Model with treatment as usual (standard care) in a large randomized trial in eight sites. Findings indicate that meth users who were assigned to the Matrix Model programming participated in treatment more actively, stayed longer and remained more consistently drug free while in treatment. However, comparisons at six months post treatment found that all study participants improved with no significantly significant increase attributable to the Matrix Model programming post release (Rawson et al., 2004).

3.3 Pharmacotherapies

Methamphetamine abuse provides one of the clearest models for viewing addiction as a brain disease. Damage inflicted on neural systems of meth abusers appears more extensive, longer lasting and more difficult to reverse than for other drugs of abuse with effects of memory impairment, mood disorder and motor skills deficits lasting as long as 5–10 months after gaining abstinence (Volkow et al., 2001). Research findings point to changes in blood flow in the brains of users that may indicate cell damage beyond repair (Swan, 2003). These and other findings into the action and resultant damage to the brain caused by stimulants, particularly methamphetamine, prompted a search for pharmacological interventions not only to help meth users to stop using, but also to reverse damage caused by chronic use (Ernst et al., 2000).

Developing pharmacotherapies for the treatment of stimulant abuse face many of the same challenges faced in developing medications for the treatment of cocaine; many candidate medications have been investigated. Because stimulants effect multiple neurotransmitter systems, any medication developed either to block the effects of the meth or cocaine (antagonists or vaccines) or to replace the effects of the drugs (agonists) must interfere with the action of a number of systems (Grabowski et al., 2004). In the late 1990s NIDA established the Methamphetamine Clinical Trial operation to test a number of medications and protocol in multiple sites for their potential in treatment methamphetamine abuse. These trials often couple medications with standardized cognitive behavioral therapy in double blind placebo designs. Some of the approaches that have been tried include the use of antidepressants including desipramine (Lima et al., 2002), bupropion, and imipramine (Galloway and Newman, 1996), though there has been little evidence of their effectiveness with either cocaine or amphetamines. Galloway and colleagues (1994), however, found in a random assignment study of imipramine support for methamphetamine users that patients on higher doses of the medication did stay in treatment longer than those on lower doses. Fluoxetine and amlodipine have also been tested in randomized control trials but with disappointing results (Grabowski et al., 2004). Vigabatrin was also recently tried in a non-random, nine-week study with stimulant users and showed initial promise in reducing use (Barclay, 2004).

Poor results with these drugs has encouraged a further look at the use of replacement or agonist therapies in the treatment of amphetamine/methamphetamine abuse, much like the approach used with methadone in the treatment of opioid abuse. As with methadone, the approach relies in part on a harm reduction model, in that it replaces the illicit drug, methamphetamine, with a legal, controlled dose of a similar or replacement drug, provided, however, in a therapeutic setting where supportive services can be supplied. The replacement of, for example, dextroamphetamine for methamphetamine would ideally reduce problems related to crime, injection practices family and economic issues nd health problems related to escalating illegal use. Grabowski and colleagues (2003) have reviewed the available and somewhat limited research on using replacement (agonist) therapies in the treatment of methamphetamine or amphetamine abuse. These studies are often small and involve self selected samples and self report of behavior change. However, many indicate that using oral dextroamphetamine to stabilize illicit amphetamine users' dependency can provide some reduction in the use of other drugs, injection behavior and criminal activity.

Chapter 4: Summary and Lessons Learned

Synthesized at the turn of the last century and widely used legally until as recently as 30 years ago, amphetamine/methamphetamines have an interesting history. First heralded as wonder drugs for increasing energy and alertness, the drugs were touted as a powerful therapeutic tool in combating a variety of medical conditions. In the 1950s, the drugs were vigorously marketed for a range of ailments like narcolepsy, weight control, depression, hyperactivity (Ellinwood, 1974), and pharmaceutical production of tablets went from 3.5 billion in the late 1950s to 10 billion by 1970 (Grinspoon and Hedblom, 1975). Methamphetamine was also available in injectable form; in 1962, over 500,000 ampoules of methamphetamine were prescribed, contributing to a growing problem of intravenous abuse (Brecher, 1972).

Restrictions on the chemicals used to produce amphetamine/methamphetamine and elimination of the ready prescription supply in the 1970s coincided with the ultimate decline in use of these drugs, a decline that continued throughout that decade and (in most areas of the country) into the next. While illicit manufacture developed in response to restrictions, the availability of high purity methamphetamine declined dramatically, as pharmaceutical supplies of precursor substances fell drastically. Locations that had been focal points for its use saw it virtually disappear. For example, Philadelphia, a hotbed of methamphetamine use in the late 1960s and early 1970s (Jenkins, 1992), saw methamphetamine use plummet. By 2003, less than 1% of arrestees in the ADAM Philadelphia site tested positive for meth. While low levels of use remained in pockets of the country (Wiedrich, 1987), the problem took on a distinctly regional nature.

Starting in Hawaii and areas of Southern California in the 1980s, methamphetamine reappeared. With production techniques and methods of use imported from the Pacific Rim (Jenkins, 2004),methamphetamine in smokable form (Ice) became popular in Hawaii. By 1987 and 1988, law enforcement seized hundreds of methamphetamine labs in San Diego, and by 1990 use had appeared in Phoenix, Denver and Portland (Miller, 2004). By the mid 1990s, it was well entrenched in many areas of the West and had moved into the Southwest, Texas and some states west of the Mississippi, often originating in rural areas.[6] Admissions to treatment for meth abuse in Iowa grew from 1% in 1992 to 12% by the end of the decade. The "tweaker" of the 1990s had replaced the "speed freak" of the 1960s. At the millennium, meth use had moved slowly but steadily into areas of the Mid-Atlantic and Northeast, often confined in its early stages to small subpopulations of users, such as the gay community or club goers (Paul, Stall, and Davies, 1993) or in the club drug scene (Maxwell, 2004).

Methamphetamine is a uniquely domestic drug, derived from chemical precursors rather than from plant or agricultural products. It is easily made and often consumed by the "cook" or amateur chemist who makes it. Recipes for its manufacture abound on the Internet and in

[6] See "The Case of a Rural Town" in this report, page 49.

published material, making it an accessible product for relatively unskilled chemists willing to assemble the equipment and chemicals required. Consequently, it is a different distribution network than found with other drugs like heroin and cocaine that require growers, transporters, producers, as well as distributors, to get the product to the end user. For meth, most production steps reside in the "cook." As many small labs produce less than five pounds of product per production cycle, distribution is likely to be relatively local to the cook. Many law enforcement sources interviewed for this report stated that the meth produced locally was consumed there as well. The distribution market does not always remain small and local, however. Higher-volume distribution and a more complex distribution systems are found in areas where the drug has been established for several years and there is a larger demand. In those areas, law enforcement reports increasing market share captured by larger local manufacturers and organized drug trafficking groups.

Today, methamphetamine is second only to alcohol and marijuana as the drug used most frequently in many Western and Midwestern states. Seizures of dangerous laboratory materials have increased dramatically—in some states, fivefold. In response, many special task forces and local and Federal initiatives have been developed to target methamphetamine production and use. Legislation and negotiation with earlier source areas for precursor substances have also reduced the availability of the raw materials needed to make the drug.

There are some indications of methamphetamine use stabilizing in areas where it skyrocketed over a decade ago. Forty percent of San Diego arrestees tested positive for meth in 1996, thirty-three percent in 1998, and thirty-six percent in 2003. The same appears true in other West Coast ADAM sites. While this is promising, the movement of methamphetamine into the South and the Nation's middle states continues. The "Case of a Rural Town" exhibit chronicles the appearance and expansion of methamphetamine use and production in two rural counties in Illinois. While areas differ in how patterns of use appear, this scenario is reminiscent of accounts of methamphetamine's earlier appearances in other areas (Herz, 2000; Pennell et al., 1999).

The Case of a Rural Town[7]

The effect methamphetamine use has on the many areas of society it touches is highlighted in a recent ethnographic study of the movement of methamphetamine into the drug culture of a small Midwestern community, which looked at the impact of methamphetamine use and manufacture in two adjacent rural Illinois counties. The amount of methamphetamine seized in Illinois rose from 3,433 grams in 1994 to almost 20,000 grams in 2001; 57% of the 2001 seizures came from rural counties.

The first appearance of methamphetamine came in 1998 in the form of a small lab seizure in a town of around 25 people. While the "cook" in that case was arrested and incarcerated, law enforcement stated that he reported that he had taught "6 or 7" other people how to make methamphetamine. The next year the town seized 7 or 8 new labs. Over the next few years, the number of arrests for methamphetamine began to increase until they have reached about 40% of the county's 366 annual felony arrests.[8]

Most of the methamphetamine produced in the labs in these two counties is consumed in the counties. The "business" of meth production is not well organized and relies on bartering or pooling resources among users working with a cook. In some cases, the cook agrees to teach others how to make the drug in exchange for a supply of precursors. Local law enforcement sources note that typically very few assets are found worth seizing or attaching in these local labs as there is little cash exchanged in the distribution process; the drug is traded or bartered away.

Treatment for the increasing number of meth users has strained the social service system in these counties. The Human Resource Center of the counties is the agency responsible for drug treatment services, and now provides outpatient care and operates a special intensive format for methamphetamine users. In addition to drug treatment needs, these clients (either entering treatment or sitting in correctional facilities) often present with enormous health care needs related to methamphetamine abuse—decaying teeth, high blood pressure, hepatitis, infections. One sheriff noted, "We are mandated to take care of their medical problems if they don't have resources to do it. So that means that 90% of the time we have to pay for their medical … they (their teeth) are so abscessed that we have to do two weeks worth of high-dollar antibiotics to get the poison out of their system before they can extract the tooth …. Last year, year '03 for me, I had $30,000 in my inmate medical budget. I spent over $60,000" (Weisheit, 2004:12).

The effect on the counties has been devastating. Like many rural areas, there is only one professional fire department in the two county area. This department coordinates volunteers to take care of county needs, and the hazards from lab fires, explosions or toxic materials spillage and dumping present challenges to both safety and budget. EMT volunteers are faced with calls from users or their families where the patient may be experiencing cardiac difficulties, inhalation of toxic chemicals or be in the midst of a psychotic episode and dangerous to others.

Even the local workforce is affected by the invasion of methamphetamine. Plant managers interviewed reported that it takes numerous tries before filling positions because potential employees fail the drug test. He estimated that even with the shortage of labor in the area, companies that drug test applicants screen out the 25–30% of otherwise acceptable candidates due to methamphetamine use.

The problems related to methamphetamine use and production in these two counties has been repeated in many areas across the country. Places where the market has been established for many years have developed specialized task forces and resources to deal directly with their growing problem. Places where the problem is newer and resources may be more limited, like these two counties, are in the initial stages of coping.

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[7] The description of methamphetamines' effect on these two counties is taken with permission from Dr. Weisheit's detailed paper describing his work (Weisheit, 2004).

[8] The amount of methamphetamine seized in Illinois rose from 3,433 grams in 1994 to almost 20,000 grams in 2001; 57% of the 2001 seizures came from rural counties.

Some Lessons Learned

In 2004 about 12 million Americans reported ever having used methamphetamine, and 1.4 million report they used it in the past month, a far lower number than those who use marijuana, cocaine or even some illicit prescription medications. Why, then, are there increasingly alarming reports about meth use in new places as well as from areas that continue to be inundated with problems related to its use? Methamphetamine is a drug somewhat different from others in the drug culture. It has a large domestic production component; its abuse is particularly resistant to treatment interventions because of the protracted impact it has on the user's brain, even after abstinence is achieved; it has a rural following of users, areas where treatment and law enforcement resources are spread far thinner than in major urban areas; and its manufacture and distribution network looks quite different in its early stages of infiltration into an area than in its established phase. All of these elements have challenged law enforcement interventions and treatment approaches in their efforts to stop or contain its spread. The lessons learned for law enforcement and treatment from examining almost twenty years of a gradual but steady move of the drug from the Western states to other areas of the country are useful.

First, all data point to a critical need to view at drug problems as local problems first. Methamphetamine use has been rampant in the West and Northwest since the late 1980s and currently represents the major drug problem in those locales. This serious concentration of a problem is masked by data developed to derive national estimates. While national estimates are critical to understanding the Nation's problems as a whole, they mask emerging regional problems that may become national ones. Attention to systems and methods of data collection that can provide local estimates are invaluable in this regard.

Second, methamphetamine production, established in the major cities of the West, has moved steadily into the rural areas of the Midwest and South, where production can be hidden in more remote areas and a market of chemical supplies is available. Rural towns in states like Iowa, Arkansas, Tennessee, Kentucky now face serious threats from methamphetamine production and use. While only one methamphetamine lab was seized in Virginia four years ago, 61 were seized in 2004; in West Virginia, that number went from 3 to 84 over the same four years (CESAR Briefing, March 2005). The burden to law enforcement in the many small towns police and/or large county sheriff's departments is enormous; the costs of clean up, enforcement , maintenance of users in county jails—and can overwhelm limited resources. But the face of methamphetamine production and distribution is not simply a rural one. In those areas where the drug is established and there is a large demand, major, often foreign manufacturers enter the market, providing far larger quantities and more efficient networks for distribution.

Thus, legal efforts at restricting the importation of precursor chemicals and regulating the availability of prescription stimulants can make a difference in the nature of the production and use of methamphetamine. Scheduling of amphetamines and methamphetamine in 1970 to restrict their availability from an almost open market in the 1950s and 60s coincided with a

dramatic reduction in the manufacture of the drugs and their use in the popular culture for over a decade. Restrictions on the import of other precursors produced an adaptation in the most popular method of manufacture. The introduction of substances or additives to precursors to make local manufacture more difficult are promising.

Fourth, the treatment of methamphetamine abuse has moved forward with researchers developing promising cognitive behavioral models, potential pharmacotherapies and other interventions to deal with the devastating effects of the drug on its chronic users, but has to continue as a high priority. As UCLA drug researcher Anglin notes, "This (methamphetamine) takes us beyond the model of drug treatment to one of brain damage" (in Sommerfeld, 2001), emphasizing the critical need for the development of immediate, effective methods of treatment.

In summary, inexpensive, easily made and in demand, methamphetamine is used by housewives, students, club-goers, truckers and a growing number of others. It is a drug with wide appeal. Some users are interested in its ability to make them more alert; others with its appetite suppressant effects; others with its ability to lift depression and/or make them more confident and energized for extended periods of time. This is not, however, a benign substance. Methamphetamine produces serious health risks to users, including cardiac and respiratory problems and extended or even perhaps permanent changes to the brain. It is also a drug whose production creates severe biohazards to the areas in which production occurs, as toxic materials are dumped, creating years of contaminated land and water supply. It is also a drug that appears to move easily into new areas not typically associated with drug trafficking, and takes hold as producers share with other users, and users in turn become producers and distributors. With the potential of easy production and substantial profits in heavy use markets, methamphetamine is also a drug that has come to appeal to larger, more coordinated distributors, who have appeared in established markets in the West and Southwest. All of these factors make methamphetamine a major challenge for public health and law enforcement for the future. In 1999, Pennell and colleagues (Pennell et al., 1999) highlighted the crisis of methamphetamine use in five western cities, warning that "meth matters." The problem described in those areas remains, has moved East and, as the report warned almost ten years ago, is no longer a regional one.

Bibliography

Angrist, B. (1994) "Amphetamine psychosis: Clinical variations of the syndrome." In A. Cho, and D. Segal, Eds. *Amphetamine and Its Analogs.* San Diego: Academic Press: 387–414.

Avis, H. (1990) *Drugs and Life.* Dubuque, IA: William Brown Publishing.

Barclay, L. (2004) "Vigabatrin appears safe, effective in methamphetamine, cocaine addiction," *Medscape Medical News*, http://www.medscape.com/.

Bell, J.E., Brettle, R.P., Chiswick, A., and Simmonds, P. (1998) HIV encephalitis, proviral load and dementia in drug users and homosexuals with AIDS. Effect of neocortical involvement. *Brain 121*: 2043–52.

Brecher, E. (1972) *Licit and Illicit Drugs.* Boston: Little Brown.

Brown, P., Wise, R. and Kiyatkin, E. (2003) "Brain hyperthermia is induced by methamphetamine and exacerbated by social interaction." *The Journal of Neuroscience* 23(9): 3924–3929.

Carroll, K.M., Rounsaville, B.J., Nich, C., Gordon, L.T., Wirtz, P.W., and Gawin, F. (1994) "One year followup of psychotherapy and pharmacotherapy for cocaine dependence." *Archives of General Psychiatry* 51: 989–997.

Centers for Disease Control and Prevention, Department of Health and Human Services (2003). Youth Risk Behaviors Surveillance System (YBRSS). Available at www.cdc.gov/HealthyYouth/YRBS

Center for Substance Abuse Treatment (CSAT). (1999) *Treatment for Stimulant Use Disorder, TIP* 33. U.S. Department of Health and Human Services. Substance Abuse and Mental Health Services Administration (SAMHSA).

Chang, L., et al. (2002) Perfusion MRI and computerized test abnormalities in abstinent methamphetamine users. *Psychiatry Research Neuroimaging* 114(2):65-79.

Cohen J., Dickow, A., Horner, K., et al. (2003) "Abuse and violence history of men and women in treatment for methamphetamine dependence." *American Journal on Addictions* 12(5): 377–385.

Community Oriented Policing Services, Office of. (2003) *An Evaluation of the COPS Office Methamphetamine Initiative.* Washington, DC: U.S. Department of Justice.

Cretzmeyer, M., Sarrazin, M., Huber, D., Block, R. and Hall, J. (2003) "Treatment of methamphetamine abuse: Research findings and clinical directions." *Journal of Substance Abuse Treatment* 24(3): 267–277.

Degenhardt, L. and Topp, L. (2003) " 'Crystal meth' use among polydrug users in Sydney's dance party subculture: characteristics, use patterns and associated harms." *International Journal of Drug Policy* 14(1): 17–24.

Dhaliwal, K. and Sood, A. (2003) "Ammonia inhalational lung injury during illicit methamphetamine production." *Journal of Burns and Surgical Wound Care* Vol. 2.

Eck, J. and Gersh, J. (2000) "Drug trafficking as a cottage industry." *Crime and Prevention Studies*, Vol. 11: 241–271.

Ellinwood, E. (1974) "Epidemiology of stimulant abuse." In E. Josephson and E. Carroll, Eds. *Drug Use*. Washington, DC: Hemisphere Publishing Corporation.

Ellis, R., Childers, M., Cherner, M., Lazzaretto, D., Letendre, S., and Grant, I. (2003) "Increased Human Immunodeficiency Virus Loads in Active Methamphetamine Users Are Explained by Reduced Effectiveness of Antiretroviral Therapy." *The Journal of Infectious Diseases* 188:1820–6.

Emonson, D. and Vanderbeek, R. (1995) "The use of amphetamines in U.S. Air Force tactical operations during Desert Shield and Storm." *Aviation Space Environmental Medicine*, March 66(3): 260–3.

Ernst, T., Change, L., Leionido-Yee, M., Speck, O. (2000) "Evidence for long-term neurotoxicity associated with methamphetamine abuse: AH MRS study." *Neurology* 54(6): 1344–9.

Ferguson, Jeffrey. (1997) "Investigation and Prosecution of Methamphetamine Manufacture." Presented at the 38th Annual International Drug Conference, Orlando, FL. August 20, 1997.

Frosh, D., Shoptaw, S., Huber, A., Rawson, R.A., and Ling, W. (1996) Sexual HIV risk among gay and bisexual male methamphetamine abusers. *Journal of Substance Abuse Treatment*, 3, 483–486.

Galloway, G., Newmeyer, J., Knapp, T., Stalcup, S., and Smith, D. (1994) "Imipramine for the treatment of cocaine and methamphetamine dependence." *Journal of Addictive Diseases*, 13 (4), 201–216.

Gawin, F. H. and Kleber, H. D. (1984) "Cocaine abuse treatment. Open pilot trial with despiramine and lithium carbonate." *Archives of General Psychiatry* 41: 903–909.

Goode, E. (1999) *Drugs in American Society.* 5th Edition. New York: McGraw-Hill College.

Gorman, E. M., Morgan, P., and Lambert, E. (1995) "Qualitative Research Considerations and Other Issues in the Study of Methamphetamine Use Among Men Who Have Sex With Men." *NIDA Research Monograph* 157: 156–181.

Grabowski, J., Shearer, J., Merrill, J., and Negus, S.S. (2004) "Agonist-like, replacement pharmacotherapy for stimulant abuse and dependence." *Addictive Behaviors 29*(7): 1439–1464.

Greenwell, L. and Brecht, M.L. (2003) Self-reported health status among treated methamphetamine users. *American Journal of Drug and Alcohol Abuse 29*(1): 75–104.

Grinspoon, L. and Hedblom, P. (1975) *The Speed Culture*. Cambridge, MA: Harvard University Press.

Halkitis, P.N., Parsons, J.T., and Stirratt, M.J. (2001) A double epidemic: Crystal methamphetamine drug use in relation to HIV transmission among gay men. *Journal of Homosexuality 41*(2): 17–35.

Halkitis, P.N., Perry, N., Parsons, J.T., and Wilton, L. (2003) An exploratory study of contextual and situational factors related to methamphetamine use among gay and bisexual men in New York City. *Journal of Drug Issues 33*(2): 413–432.

Hall, S., Carswell, C., Walsh, E., Huber, D. and Jampoler, J. (2002) "Iowa case management: Innovative social casework." *Social Work* 24: 132–141.

Herz, D. (2000) "Drugs in the heartland: Methamphetamine use in rural Nebraska." *Research In Brief.* National Institute of Justice, April.

Higgins, S.T. and Budney, A.J. (1997) "From the initial clinic contact to aftercare: A brief review of effectiveness strategies for retaining cocaine abusers in treatment." In L.S. Onken, J.D. Blaine, and J.J. Boren, Eds. *Beyond the Therapeutic Alliance: Keeping the Drug-Dependent Individual in Treatment.* NIDA Research Monograph Series, Number 165. DHHS Pub. No. (ADM) 97–4142. Rockville, MD: National Institute on Drug Abuse, 22–43.

Hunt, D. and Kuck, S. (2004) "Methamphetamine Consumption: Implications for Local and National Policy." Paper presented at American Society of Criminology, Nashville, TN, November 18.

Jenkins P. (1992) "The speed capital of the world: Organizing the methamphetamine industry in Philadelphia 1970–1990." *Criminal Justice Policy Review* 6(1): 17–39.

Johnston, L.D., Bachman, J.G., O'Malley, P.M. and Schulenberg, J.E. (2004) *Monitoring the Future: A Continuing Study of American Youth (12th-Grade Survey), 2003*. Conducted by University of Michigan, Institute for Social Research, Survey Research Center. ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Johnston, L.D., Bachman, J.G., O'Malley, P.M. and Schulenberg, J.E. (2004) *Monitoring the Future: A Continuing Study of American Youth (12th-Grade Survey), 2003*. Conducted by University of Michigan, Institute for Social Research, Survey Research Center. ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research, 2004.

Johnston, L.D., O'Malley, P.M., Bachman, J.G., and Schulenberg, J.E. (2005) *Monitoring the Future National Survey Results on Drug Use, 1975–2004. Volume I: Secondary School Students* (NIH Publication No. 05-5727). Bethesda, MD: National Institute on Drug Abuse.

Kolecki, P. (1998) "Inadvertent methamphetamine poisoning in pediatric patients." *Pediatric Emergency Care*, 14: 385–387.

Lan, K., Lin, Y., Yu, F., Lin, C. and Chu, P. (1998) "Clinical manifestation and prognostic features of acute methamphetamine intoxication." *Journal of Formosa Medical Association* 97: 528–533, August.

Lima, A.R., Lima, M.S., Soares, B.G.O., and Farrell, M. (2005) Carbamazepine for cocaine dependence. (Cochrane Review). In: the Cochrane Library, Issue 1, 2005. Chichester, UK: John Wiley and Sons Ltd.

London, E., Simon, S., Berman, S., et al. (2004) "Mood disturbances and regional cerebral metabolic abnormalities in recently abstinent methamphetamine abusers." *Archives of General Psychiatry* 61(1): 73–84.

Marlatt, G. and Gordon, J. (1985) *Relapse and Prevention.* New York: Guilford Press.

Maxwell, J. (2004) *Patterns of Club Drug Use in the United States, 2004*. University of Texas, Austin, The Addiction Technology Transfer Center.

Merck (2004), *The Merck Manual of Diagnosis and Therapy, 17th Edition, Internet Edition* M. Beers and R. Berkow (Eds.), Section 15, Chapter 195, "Amphetamine Dependency," Medical Services USMEDSA, USHH.

Miller, M. (2004) "History and epidemiology of amphetamine abuse in the United States." In J. Inciardi and K. McElrath, Eds. *The American Drug Scene* (4th edition). Los Angeles, CA: Roxbury Publishing.

Molitor, F., Truax, S.R., Ruiz, J.D., and Sun, R.K. (1998) Association of methamphetamine use during sex with risky sexual behaviors and HIV infection among non-injection drug users. *Journal of Western Medicine 168*(2): 93–7.

Murr, A. (2004) "A new menace on the Rez." *Newsweek*, September 27: 3.

National Association of Pharmacy Regulatory Authorities (2003). *The New Precursor Regulations*. Ottawa, Canada (www.napra.ca).

National Association of Counties (2005) *The Meth Epidemic in America: Two Surveys of U.S. Counties* (July 5).

Naval Strike and Air Warfare Center. "Performance Maintenance During Continuous Flight Operations: A Guide For Flight Surgeons," (Jan. 1, 2000) NAVMED P-6410, p. 8, available online through the Virtual Naval Hospital of the University of Iowa, at http://www.vnh.org/PerformMaint/, last accessed Jan., 2004.

Nordahl, T., Salo, R. and Leamon, M. (2003). "Neuropsychological effects of chronic methamphetamine use on neurotransmitters and cognition: A review." *Journal of Neuropsychiatry and Clinical Neurosciences* 15(3): 317–325 (August 1).

Paul, J., Stall, R., and Davis, F. (1993) "Sexual risk for HIV transmission among gay bisexual men in substance abuse treatment." *AIDS Education and Prevention* 5: 11-4.

Peck, Clint. (August, 2004) "Got Meth?" Beef: *KeepMedia.com*. Available online at http://www.keepmedia.com/pubs/BEEF/2004/8/01/519600. Last Accessed 12/15/04.

Pennell, S., Ellett, J., Rienick, C., and Grimes, J. (1999) *Meth Matters: Report on Methamphetamine Users in Five Western Cities.* National Institute of Justice, Research Report, April, NCJ176331.

Quest Diagnostics. (2004) *The Drug Testing Index*. Teterboro, NJ. Available online at: http://www.questdiagnostics.com/employersolutions/DTI_07_2004/dti_index.html

Rawson, R., Anglin, M., and Ling, W. (2002) "Will the methamphetamine problem go away?" *Journal of Addictive Disease* 21(1): 21–33;

Rawson, R., Marinelli-Casey, P., Anglin, M.D., Dickow, A., Frazier, Y., Gallagher, C., Galloway, G.P., Herrell, J., Huber. A., McCann, M.J., Obert, J., Pennell, S., Reiber, C., Vandersloot, D., Zweben, J. (June 2004) "A multi-site comparison of psychosocial approaches for the treatment of methamphetamine dependence." *Addiction* 99(6): 708-717(10).

Rawson, R.A., Obert, J.L., and McCann, M.J. (1995) *The Matrix Intensive Outpatient Program Therapist Manual.* Los Angeles, CA: The Matrix Center, Inc.

Rawson, Richard. Personal Communication. July 16th, 2004.

Reback, C. (1997) *The Social Construction of a Gay Drug: Methamphetamine Use among Gay and Bisexual Males in Los Angeles.* Report for the City of Los Angeles, AIDS Coordinator.

Reback, C.J. and Ditman, D. (1997) The social construction of a gay drug: Methamphetamine use among gay and bisexual males in Los Angeles. Executive Summary. City of Los Angeles, AIDS Coordinator.

Reback, C., Larkins, S., and Shoptaw, S. (2004) "Changes in the Meaning of Sexual Risk Behaviors Among Gay and Bisexual Male Methamphetamine Abusers Before and After Drug Treatment." *AIDS and Behavior*. 8:1: 87–98.

Royal Canadian Mounted Police and U.S. Drug Enforcement Administration (2001). *Chemical Diversion and Synthetic Drug Manufacture*. Ottawa, Canada: RCMP and Washington, DC: DEA (http://www.usdoj.gov/dea/pubs/intel/intel010621p.html).

Royal Canadian Mounted Police (2004) *Drug Situation in Canada—2003*. Ottawa, Canada: RCMP Criminal Intelligence Directorate.

RTI International (2003) National Forensic Laboratory Information System, Midyear Report 2003. Research Triangle Park, NC: RTI.

Ruzzamenti, William. Personal Communication, August 26, 2004.

Sanchez, D. and Harrison, B. (2004) "The Methamphetamine Menace." *Legisbrief*. National Conference of State Legislatures. 12:1:January.

Scott, M. (2002) "Clandestine Drug Labs." *Problem Oriented Guides for Police* 16. Washington, DC: U.S. Department of Justice, Office of Community Oriented Policing Services.

Semple, S.J., Patterson, T.L., Grant, I. (2002) Motivations associated with methamphetamine use among HIV positive men who have sex with men. *Journal of Substance Abuse Treatment, 22*(3): 149–156.

Sekine, Y., Iyo, M., Ouchi, Y. et al. (2001) "Methamphetamine-related psychiatric symptoms and reduced brain dopamine transporters studied with PET." *American Journal of Psychiatry* 158: 1206–1214, August.

Shoptaw, S., Rawson, R., McCann, M., and Obert, J. (1994) "The matrix model of outpatient stimulant abuse treatment: Evidence of efficacy." In S. Magura and S. Rosenblum, Eds., *Experimental Therapeutics in Addiction Medicine*. Binghamton, NY: The Haworth Press, 129–141.

Shoptaw, S., Reback, C.J., Freese, T.E. (2002) Patient characteristics, HIV serostatus, and risk behaviors among gay and bisexual males seeking treatment for methamphetamine abuse and dependence in Los Angeles. *Journal of Addictive Diseases 21*(1): 91–105.

Smith, L., Wallace, M., Berman, T. et al. (2003) "Effects of prenatal methamphetamine exposure on fetal growth and drug withdrawal symptoms in infants born at term." *Journal of Developmental and Behavioral Pediatrics* 24(1): 17–23.

Snell, Marilyn Berlin. (2001) "Welcome to Meth Country." Sierra Magazine. Sierra Club. Available online at: http://www.sierraclub.org/sierra/200101/meth.asp. Last accessed 12/15/04.

Sommerfeld, J. (2001) Beating an addiction to meth: Researchers zero in on brain effects, treatment approaches," MSNBC, www.msnbc.com/news, January 22, 2001.

Thompson, P., Hayashi, K., Simon, S., Geaga, J., et al. (2004) "Structural abnormalities in the brains of human subjects who use methamphetamine." *Journal of Neuroscience*, 24(26): 6028–6036 (June 30).

Uncle Fester. (2002) *Secrets of Methamphetamine Manufacture.*

United Nations Office on Drugs and Crime (2003) *Ecstasy and Amphetamines: Global Survey, 2003*. New York, NY: UN (ISBN 1-148164-3).

United Nations General Assembly Special Session on the World Drug Problem; June 1998. Available at http://www.un.org/ga/20special/featur/amphet.htm, last accessed 8/16/2004.

United Nations Office on Drugs and Crime (2004) *Bi-Annual Seizure Report 2003/2.* Vienna, Austria: UN Anti-Organized Crime and Law Enforcement Unit.

Urbina, A. and Jones, K. (2004) Crystal methamphetamine, its analogues, and HIV infection: Medical and psychiatric aspects of a new epidemic. *Clinical and Infectious Disease 38*(6): 890–94.

U.S. Census Bureau (2004) *U.S. Trade Quick-Reference Tables: December 2003 Imports.* Presented by Office of Trade and Economic Analysis, International Trade Administration, U.S. Department of Commerce (http://www.ita.doc.gov/td/industry/otea/Trade-Detail/Latest-December/Imports/29/293942.html)

U.S. Department of Health and Human Services, National Institute on Drug Abuse. (2002) *Methamphetamine Abuse and Addiction*, Research Report Series, Pub No. 02–4210, January.

U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2004) Drug Abuse Warning Network (DAWN). Rockville, MD. Available online at dawninfo.samhsa.gov.

U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA), Office of Applied Studies. (2005). Treatment Episode Data Set (TEDS). Rockville, MD.

U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. (2005). *The NSDUH Report: Methamphetamine Use, Abuse and Dependence: 2002, 2003 and 2004*. Rockville, MD, September 16.

U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2004). National Survey on Drug Use and Health (NSDUH). Rockville, MD.

U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (September, 2004) "The DASIS Report: Primary Methamphetamine/Amphetamine Treatment Admissions, 1992–2002." Rockville, MD.

U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (April, 2004) "The DASIS Report: Characteristics of Primary Amphetamine Treatment Admissions: 2001" Rockville, MD.

U.S. Department of Justice, National Drug Intelligence Center (2005) "National Threat Assessment 2005, www.usdoj.gov/ndic/pubs11/12620/meth, February.

U. S. Department of Justice, National Drug Intelligence Center. (2004, April) "National Drug Threat Assessment 2004: Threat Matrix." Johnstown, PA. No. 2004-Q0317-004.

U.S. Department of Justice, National Drug Intelligence Center (2003b, December) "Methamphetamine Laboratory Identification and Hazards Fast Facts." Johnstown, PA. No. 2004-L0559-001.

U.S. Department of Justice, National Drug Intelligence Center. (2004, April) "National Drug Threat Survey 2003 Report." Johnstown, PA. No. 2001-Q0317-005.

U. S. Department of Justice, National Drug Intelligence Center. (2003, January) "National Drug Threat Assessment 2003." Johnstown, PA. No. 2003-Q0317-001.

U. S. Department of Justice, National Drug Intelligence Center. (2001, December) "National Drug Threat Assessment 2002." Johnstown, PA. No. 2002-Q0317-001.

U. S. Department of Justice, National Drug Intelligence Center (2003a, December) *Arizona Drug Threat Assessment: Methamphetamine*. Washington, DC: DEA. (http://www.usdoj.gov/ndic/pubs6/6384/meth.htm).

U.S. Department of Justice, National Institute of Justice. Arrestee Drug Abuse Monitoring Program. (2003) Washington, DC: U.S. Department of Justice, National Institute of Justice.

U.S. Department of State (2004, Mar*) International Narcotics Control Strategy Report—2003.* Washington, DC: Bureau for International Narcotics and Law Enforcement Affairs.

U.S. Drug Enforcement Administration, El Paso Intelligence Center, National Clandestine Laboratory Seizure System as of March 9, 2004.

U.S. Drug Enforcement Administration (undated a) *Maps of Methamphetamine Lab Seizures*. (http://www.usdoj.gov/dea/concern/map_lab_seizures.html)

U.S. Drug Enforcement Administration (undated b) *Operations Pipeline and Convoy*. (www.usdoj.gov/dea/programs/pipecon.htm).

U.S. Drug Enforcement Administration (undated c) *Methamphetamine Anti-Proliferation Act of 2000: Frequently Asked Questions*. Washington, DC: DEA Diversion Control Program.

U.S. Drug Enforcement Administration (2002a, Apr) *The Forms of Methamphetamine*. Washington, DC: DEA, Drug Intelligence Brief.

U.S. Drug Enforcement Administration (2002b, Jan 10) *More than 100 Arrested in Nationwide Methamphetamine Investigation*. Washington, DC: DEA News Release (www.usdoj.gov/dea/pubs/presrel/pr011002.html).

U.S. Drug Enforcement Administration. (2003) "Drug Trafficking in the United States." Washington, DC: U.S. Department of Justice.

U.S. Drug Enforcement Administration (2003a, Nov) *Country Profile for 2003: Mexico*. Washington, DC: DEA, DEA Drug Intelligence Report (DEA-03047).

U.S. Drug Enforcement Administration (2003b, Sep) *Methamphetamine: The Current Threat in East Asia and the Pacific Rim*. Washington, DC: U.S. DEA, DEA Drug Intelligence Brief (DEA-03052).

U.S. Drug Enforcement Administration (2003c, Apr 15) *Over 65 Arrested in International Methamphetamine Investigation.* Washington, DC: DEA News Release (www.usdoj.gov/dea/pubs/pressrel/pr041503p.html)

U.S. Drug Enforcement Administration (2003d) "Facing the Methamphetamine Problem in the United States." Statement of Rogelio E. Guevara, Chief of Operations, Drug Enforcement Administration, Before the House Committee on Government Reform Subcommittee on Criminal Justice, Drug Policy and Human Resources.

U.S. Drug Enforcement Administration (2004a, Jan) *India: Country Brief.* Washington, DC: DEA Drug Intelligence Brief.

U.S. Drug Enforcement Administration (2004b, Mar) *U.S. Charges New York Crystal Meth Dealer Ring.* Washington, DC: DEA, Press release (http://www.usdoj.gov/dea/pubs/states/newsrel/ nyc030204p.html)

U.S. Drug Enforcement Administration (2004c, Feb) *China: Country Brief*. Washington, DC: DEA Drug Intelligence Brief (DEA-03081).

U.S. Drug Enforcement Administration (2004d, Apr) *Australia: Country Brief 2003*. Washington, DC: DEA Drug Intelligence Brief (DEA-04009).

U.S. Food and Drug Administration (2004, Feb 6) *FDA Issues Regulation Prohibiting Sale of Dietary Supplements Containing Ephedrine Alkaloids and Reiterates Its Advice That Consumers Stop Using These Products*. Washington, DC: FDA, FDA News.

U.S. Office of National Drug Control Policy (2002, Sep) *Efforts to Control Precursor Chemicals.* Washington, DC: ONDCP Fact Sheet.

U.S. Office of National Drug Control Policy. (2002) *Pulse Check.* Executive Office of the President, January–June 2002.

U.S. Office of National Drug Control Policy. (2003) *Methamphetamine.* Drug Policy Information Clearinghouse, Fact Sheet. Executive Office of the President, November.

U.S. Office of National Drug Control Policy. (2004, Feb 6) Statement of Scott Burns, Deputy Director for State and Local Affairs, White House Office of National Drug Control Policy, Before the House Committee on Government Reform, Subcommittee on Criminal Justice, Drug Policy and Human Resources, "Fighting Methamphetamine in the Heartland: How Can the Federal Government Assist State and Local Efforts?"

U.S. Sentencing Commission. (1999, Nov) Methamphetamine — *Final Report.* Washington, DC: USSC (http://www.ussc.gov/publicat/methreport.PDF).

Volkow, N., Chang, L., Wang, G. et al. (2001) “Higher cortical and lower subcortical metabolism in detoxified methamphetamine abusers.” *American Journal of Psychiatry* 158:383–389. March.

Wiedrich, B. (1987) “San Diego has Become National Center for Manufacture of Methamphetamine.” *Chicago Tribune*, April 20, p.11.

Weisheit, R. (2004) “Methamphetamine hits a small midwestern community.” Paper presented at American Society of Criminology, Nashville, TN, November 18.

Wijetunga, M., Seto, T., Lindsay, J. and Schatz, I. (2003) “Crystal methamphetamine-associated cardiomyopathy: Tip of the iceberg? *Journal of Clinical Toxicology* 41(7): 981–986.

World Health Organization (2004) *Management of Substance Abuse: Amphetamine-Type Stimulants*. Geneva, Switzerland: WHO. (http://www.who.int/substance_abuse/facts/ATS/en/).

Zweben, J., Cohen, J., Christian, D., et al. (2004) “Psychiatric symptoms in methamphetamine users.” *American Journal of Addictions* 13(2): 181–190.