The Economic Cost of Methamphetamine Use in the United States, 2005

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Preface

This monograph presents the first national estimate of the economic cost of methamphetamine (meth) use in the United States. Our analysis suggests that the economic cost of meth use in the United States reached $23.4 billion in 2005. Given the uncertainty in estimating the costs of meth use, this study provides both a lower-bound estimate of $16.2 billion and an upper-bound estimate of $48.3 billion.

The analysis undertaken to generate these estimates considers a wide range of consequences due to meth use, including the burden of addiction, premature death, drug treatment, and aspects of lost productivity, crime and criminal justice, health care, production and environmental hazards, and even child endangerment. There are other potential harms due to meth, however, that could not be included either due to a lack of scientific evidence or due to data issues. Although meth causes some unique harms, the study finds that many of the primary cost drivers are similar to those identified in economic assessments of other illicit drugs. Among the most costly elements are the intangible burden of addiction and premature death, which account for nearly two-thirds of the economic costs. The intangible burden of addiction measures the lower quality of life (QoL) experienced by those addicted to the drug. Crime and criminal justice costs also account for a significant share of economic costs. These costs include the burden of processing and incarcerating drug offenders as well as the costs of additional nondrug crimes generated by meth use. Other costs that significantly contribute include lost productivity, the costs of removing a child from his or her parents' home due to meth, and the cost of drug treatment. One unusual cost captured in the analysis is the cost associated with the production of meth. Producing meth requires toxic chemicals that can result in fire, explosions, and other events.

The study was sponsored by the Meth Project Foundation, a nonprofit group dedicated to reducing first-time meth use. Additional research support was provided by the National Institute on Drug Abuse.

The RAND Drug Policy Research Center

This study was carried out under the auspices of the Drug Policy Research Center, a joint endeavor of RAND Infrastructure, Safety, and Environment and RAND Health. The goal of the Drug Policy Research Center is to provide a firm, empirical foundation on which sound drug policies can be built at the local and national levels. The center's work has been supported by the Ford Foundation, other foundations, government agencies, corporations, and individuals.

Questions or comments about this monograph should be sent to the project leader, Rosalie Liccardo Pacula (Rosalie_Pacula@rand.org). Information about the Drug Policy Research Center is available online (http://www.rand.org/multi/dprc/). Inquiries about research projects should be made to the center's co-directors, Rosalie Liccardo Pacula (Rosalie_Pacula@rand.org) and Beau Kilmer (Beau_Kilmer@rand.org).

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Summary

After marijuana, amphetamines are the most widely used illicit drug worldwide (UNODC, 2008). The United Nations estimates that amphetamine users nearly equal the number of cocaine and heroin users combined (25 million versus 28 million). In the United States, the recent increase in the prevalence of amphetamines, particularly methamphetamine (meth), is cause for concern. The meth situation in the United States is a complicated story of conflicting indicators, however. On the one hand, national reporting systems monitoring drug use among household- and school-based populations suggest that meth is a relatively minor drug of concern (NSDUH, 2006; Johnston and O'Malley, 2007). According to the National Survey on Drug Use and Health (NSDUH), only 0.5 percent of the household population reported use in 2005, far below prevalence rates for marijuana and cocaine and slightly lower than those for heroin (NSDUH, 2006). Similarly, reports from high-school seniors suggest that meth abuse is relatively minor, with annual prevalence rates in 2005 of just 2.5 percent as compared with rates of 5.1 percent for cocaine, 9.7 percent for hydrocodone (e.g., Vicodin®), and 33.6 percent for marijuana (Johnston and O'Malley, 2007).

On the other hand, regional data systems, law-enforcement agencies, and county hospitals indicate that meth is the most significant problem facing the populations they serve (NDIC, 2007b; NACO, 2005, 2006; NIDA CEWG, 2005). According to information reported by the National Institute on Drug Abuse Community Epidemiology Work Group, in 2004, meth was the primary drug of abuse in 59 percent of treatment admissions in Hawaii, 51 percent of treatment admissions in San Diego, and 38 percent of treatment admissions for the entire state of Arizona. (These percentages all exclude treatment for alcohol abuse.) In 2005, 39.2 percent of reporting state and local law-enforcement agencies cited meth as their greatest drug threat, exceeding the percentage reporting cocaine and crack to be the greatest threat (35.3 percent) (NDIC, 2007a).

While it is clear that the prevalence of meth problems is greater in western and rural states, there is evidence of a national problem. Data from the Treatment Episode Data Set (TEDS) show that treatment admissions for meth more than doubled nationally between 2000 and 2005 (NDIC, 2007b). Growth in amphetamine-related treatment admissions, which are dominated by meth, increased in every region between 1992 and 2005. Furthermore, information from the 2005 Drug Abuse Warning Network (DAWN), which monitors drug-related emergency-department (ED) episodes, reveals that stimulant-related admissions, including those due to meth, are just as likely as heroin admissions nationally once the margin of statistical error is taken into account. Yet, meth remains far less part of national discussions than are cocaine, heroin, marijuana, and prescription-drug abuse. Meth has not been the focus of media campaigns like the Marijuana Prevention Initiative. And only with the 2006 reauthorization did the National Youth Anti-Drug Media Campaign require that at least 10 percent of the fiscal year 2007 appropriation focus on reducing meth use.

Meth is a highly addictive substance that can be taken orally, injected, snorted, or smoked. When smoked or injected, the user immediately experiences an intense sensation followed by a high that may last 12 hours or more. Concerns about meth use arise from its highly addictive nature and its association with a number of adverse physical effects, including hypertension and other cardiovascular effects, seizures and convulsions, pulmonary impacts, and dental damage. Users also suffer psychological effects, such as anxiety, irritability, and loss of inhibition, which can lead to risky sexual and other types of behavior. Meth users who inject the drug expose themselves to additional risks related to injection-drug use, including contracting human immunodeficiency virus (HIV), hepatitis B and C, and other bloodborne viruses. Meth production imposes additional health risks on users and nonusers alike. The process for producing meth, a synthetic substance, is hazardous and susceptible to fire and explosion. Moreover, the production of each pound of meth results in 5–6 pounds of toxic by-product. As a result, health and environmental effects may also follow from the production process. Despite the documented harms associated with use, research to date has not attempted to quantify the social cost or burden this drug places on society today.

In this monograph, we attempt to fill the void by building the first national estimate of the economic burden of meth use, based on information available for 2005. We chose to focus on estimating the burden in 2005 because it is the most recent year for which we were able to obtain the data necessary to construct our estimate. Unlike data for other substances of abuse, the data necessary to build such an estimate nationally are far from complete or comprehensive. Furthermore, the scientific literature has yet to develop consistent evidence of causal associations for many of the harms that meth is believed to cause. Thus, calculation of the cost of consequences must be necessarily imprecise, as it can only reflect the state of the knowledge available today, which will change as more research is done in particular areas. To capture the relative imprecision of what is actually known today, we produce lower and upper bounds of all our point estimates. The variation represented in these lower- and upper-bound estimates reflects, in some instances, sampling variability in data sets that are available and, in other instances, the lack of data from which to obtain a precise point estimate. Despite this variability, we attempt to generate a best estimate of these costs based on what we understand of the science today. But we also point out that there are many cost areas that contribute to the economic burden that we are unable to measure and hence have to exclude from our calculations.

Our results are surprising for a substance that has received limited national attention. Even before monetizing the consequences associated with meth use, we see in Table S.1 that the toll in terms of premature death and lost well-being, as measured in quality-adjusted life-years (QALYs), is substantial. We estimate that meth use was responsible for nearly 900 deaths in 2005 and resulted in a total loss of more than 44,000 QALYs. According to data from the DAWN mortality publications, there were far more meth-related deaths than marijuana-related deaths in any given year (SAMHSA, 2007b). Yet, marijuana has remained the focus of the national antidrug campaign (ONDCP, 2008).

Following previous cost-of-illness (COI) studies estimating the burden of other substances of abuse, we consider in this monograph the cost of numerous consequences associated with use, including the cost of meth treatment, the excess health care service utilization

Table S.1
The Burden of Methamphetamine in 2005 in Terms of Premature Death and Lost Quality of Life

Burden	Lower Bound	Best Estimate	Upper Bound
Premature mortality	723	895	1,669
Lost QALYs	32,574	44,313	74,004

associated with meth use and dependence, productivity losses due to the drug, and the cost of meth-associated crime. In contrast to previous COI studies, however, this monograph also considers the cost to society associated with the production of meth, the intangible burden borne by those addicted, and child endangerment.

Using the national data available on each of these cost consequences, our best estimate of the economic burden of meth use in the United States in 2005 is roughly $23.4 billion (Table S.2). This figure includes the estimable costs associated with drug treatment, other health costs, the intangible burden of addiction and premature death, lost productivity, crime and criminal justice costs, child endangerment, and harms resulting from production.

Many of our estimates are subject to substantial uncertainty, however, so for all of our estimates, we provide lower- and upper-bound estimates that help us better understand where paucity of data or scientific research might influence the credibility of our single point estimate. The degree of uncertainty, as indicated by these lower and upper bounds, varies considerably across cost components, with some categories showing much greater uncertainty than others (see Table S.2). When considered together, the uncertainty about each component contributes to the uncertainty about the total. Taking this aggregation of uncertainties into account, we estimate that the true economic burden is likely to be in the range of $16.2 billion to $48.3 billion.

In reviewing the key contributors to the total estimated costs, we found that most of meth's costs are due to the intangible burden that addiction places on dependent users and to premature mortality. We estimate the cost associated with these losses at $16.6 billion, representing nearly two-thirds of our total cost estimate. The majority of these costs are due to the intangible cost of addiction ($12.6 billion). That number is the product of the number

Table S.2
Social Costs of Methamphetamine in the United States in 2005 ($ millions)

Cost	Lower Bound	Best Estimate	Upper Bound
Drug treatment	299.4	545.5	1,070.9
Health care	116.3	351.3	611.2
Intangibles/premature death	12,513.7	16,624.9	28,548.6
Productivity	379.4	687.0	1,054.9
Crime and criminal justice	2,578.0	4,209.8	15,740.9
Child endangerment	311.9	904.6	1,165.7
Production/environment	38.6	61.4	88.7
Total	16,237.3	23,384.4	48,280.9

NOTE: Due to rounding, numbers may not sum precisely.

of people dependent on the drug and the monetary value of the lost quality of life (QoL), measured by a reduction in QALYs. The estimate is subject to great uncertainty, because of assumptions underlying our upper- and lower-bound estimates of the number of people dependent and the valuation of their lost QALYs. The remaining cost ($4.0 billion) is due to premature mortality among users. The uncertainty in this estimate is also significant, reflecting the variation in assumptions as to which deaths are attributable to meth. Moreover, we caution that both of these estimates depend on the value placed on a lost life, which, based on the literature, we take to be $4.5 million. We use $4.5 million as the value of a life rather than ascribe a range of estimates, but we provide our estimates of the number of events so that the reader may recalculate the associated costs with alternative valuations.

Crime and criminal justice costs represent the second-largest category of costs at $2.5 billion to $15.8 billion and a best estimate of $4.2 billion. Meth-specific offenses represent more than half of these costs, totaling $2.4 billion. These are the costs associated with processing offenders for the possession and sale of meth. Meth-induced violent and property crimes that are generally attributable to actions of people under the influence of meth or in need of meth represent an additional $1.8 billion in costs. Finally, an additional $70 million is due to parole and probation violations for meth offenses. It is possible that these costs are significantly underestimated, however, as the scientific literature regarding the causal association between meth and property and violent crime is inconclusive. We conducted our own analyses to explore the causality and association and, in our best estimate, find sufficient support to include an estimate of meth-induced property crime, but not violent crime. The very large bounds on this element are due to alternative assumptions of causality that warrant additional research.

Costs associated with productivity losses represent another substantial category of costs. The best estimate for total productivity losses is $687 million. Most of the productivity losses are due to absenteeism ($275 million) and incarceration ($305 million). Smaller contributors are the costs due to a lower probability of working among meth users ($63 million) and the cost of employer drug testing ($44 million). We do not attempt to estimate any losses embodied in the potential changes in wages paid to meth users vis-à-vis nonusers. Nor can we include any estimates of the higher health care and workers' compensation costs paid by employers because of employees' meth use.

We calculate the costs associated with drug treatment at approximately $545 million, almost all of it in the community-based specialty treatment sector ($491 million). The total also includes $39 million of federally provided specialty treatment, almost entirely through the Indian Health Service (IHS) and the U.S. Department of Veterans Affairs (VA), and $15 million for treatment received in general short-stay hospitals. We did not have access to data on the cost of treatment received in the general, non–hospital-based medical sector, so these costs are omitted.

We estimate approximately $351 million for additional health care costs among meth users. These include $27 million for hospital admissions induced by the use of meth, $14 million for the incremental costs of caring for patients admitted for another cause but whose conditions are exacerbated by meth use, $46 million for ED care of meth patients not admitted to the hospital, and $14 million for hospital inpatient care of suicide attempts to which meth use is a likely contributor. The largest contribution is an additional $250 million for health administration and support. The health care total is likely an underestimate because it includes only the incremental costs for other conditions even though a share of those conditions may have been caused by meth and meth-induced behaviors.

Child-endangerment costs are estimated at $905 million. Our estimates are limited to children who are removed from their homes by the foster-care system, so these costs are likely an underestimate of the full burden of meth abuse. Substance abuse is a key contributing factor in two-thirds of those removals, though we must make some assumptions about the specific role of meth. The largest contributor to these costs is the medical, mental, and QoL losses suffered by children ($502 million), though the burden on the foster-care system is similar in size ($403 million). The substantial uncertainty derives from the uncertainty regarding how many of those substance-associated removals are related to meth and our inability to measure accurately the cost of these episodes.

Potentially unique costs of meth are the harms associated with production. We estimate the social costs associated with the meth-production process at $61 million. About half of those costs are due to injuries and deaths from hazardous-substance events, such as explosions and fires ($32 million). About half the casualties are suffered by responding emergency personnel, but the more serious and costly events are not suffered by first responders. The other half of the production costs are due to cleanup of hazardous wastes at discovered laboratory facilities ($29 million). The substantial range—from $39 million to $89 million—results largely from uncertainty in estimating the number of deaths attributable to meth production.

While our methods are not completely comparable to those of other prevalence-based COI studies for the abuse of other drugs or drugs in general (e.g., Mark, Woody, et al., 2001; ONDCP, 2004b), our results are similar in a few key ways. The major cost drivers for meth, if we ignore the intangible burden of addiction (which is omitted from other estimates of the cost of drug use), are similar to those for other illicit drugs, with losses associated with premature death and crime being major components. Importantly, if we take out the intangible cost of addiction from our estimate (representing $12.6 billion), our revised estimate of the total economic burden of meth use ($10.8 billion) represents 5.5 percent of the total cost of illicit drug use in the United States reported by the ONDCP (2004b). While this might seem like a small fraction, it represents a greater share of the economic burden than simple consumption rates would suggest. According to annual prevalence data from the NSDUH, meth users represent only 3.7 percent of all illicit-drug users (NSDUH, 2006). If we use our upper-bound estimate of the cost of meth use (still excluding intangibles), we find that meth users represent 7.2 percent of the total cost of illicit drug use, approximately twice the burden suggested by consumption alone.

If we consider the cost per meth user, our best estimate translates into $26,872 for each person who used meth in the past year or $74,408 for each dependent user. The per capita cost, like our overall estimate, is sensitive to the inclusion of the intangible burden of addiction. If we ignore this intangible cost, the costs in the past year for each user and meth-dependent user are appreciably smaller at $12,395 and $34,322, respectively. This suggests that the average cost per heavy meth user (ignoring intangible cost of addiction) is at least 75 percent of the estimated average cost per heroin addict in 2005 dollars (Mark, Woody, et al., 2001).

While this monograph highlights key components of the costs of meth that we were able to quantify, further research is needed in a number of areas before a true accounting of the full economic burden can take place. Throughout this monograph, we identify and (whenever possible) provide evidence on the potential magnitude of various cost components that we are unable to include explicitly in our estimate because of data issues and inconclusive science regarding causality. These are obvious areas in which more research would be fruitful. Specific areas that are likely to translate into substantial costs in terms of the overall burden include meth-associated crime, child endangerment in non–foster-care settings, employer costs of hiring meth workers, and health care costs associated with treating meth-induced health problems. Estimates of the total cost and its components do not provide adequate information to inform policymakers regarding the most effective policies to reduce the harms associated with meth use. More research should be conducted to identify cost-effective strategies for dealing with the problem and reducing particular harms associated with use.

In developing policies to address meth, it is also important to recognize the key differences between meth and other substances, such as the harms to persons and the environment that result from meth's unique production process, of which only a fraction are estimated here. Of course, this monograph can only highlight the key components of the costs of meth, in the hope that these will be more salient to policymakers and that their attention will be directed to the more important aspects of the problem. This research cannot directly support one policy or another. Further research is needed to inform policymakers on the most effective strategies to reduce these harms.

A final insight from this study is that, in the case of meth abuse, we should be cautious interpreting evidence from national household surveys and school-based studies as indicators of the problem. Clearly, the burden of meth abuse is substantial, far exceeding what would be implied by simple prevalence measures from either of these populations. Moreover, as is the case with other substances of abuse, it is probably not the recreational meth user who imposes the greatest burden on our society, but rather those who become addicted, engage in crime, need treatment or emergency assistance, cannot show up for work, lose their jobs, or die prematurely. These are the individuals who impose the greatest cost on society, yet they are also generally populations that are not adequately captured in household- or school-based surveys.

Abbreviations

$QALY	dollar value of one quality-adjusted life-year
2SLS	standard two-stage least squares
ACASI	audio computer-assisted self-interview
ACF	Administration for Children and Families
ADSS	Alcohol and Drug Services Study
AHRQ	Agency for Healthcare Research and Quality
AIDS	acquired immune deficiency syndrome
ASI	Addiction Severity Index
ATSDR	Agency for Toxic Substances and Disease Registry
BJS	Bureau of Justice Statistics
BLS	Bureau of Labor Statistics
CCS	Clinical Classifications Software
CDC	Centers for Disease Control and Prevention
COI	cost of illness
CPI	consumer price index
CSAT	Center for Substance Abuse Treatment
DALY	disability-adjusted life-year
DASIS	Drug and Alcohol Services Information System
DATCAP	Drug Abuse Treatment Cost Analysis Program
DAWN	Drug Abuse Warning Network
DEA	Drug Enforcement Administration
DHHS	U.S. Department of Health and Human Services
DoD	U.S. Department of Defense

DSM-IV	*Diagnostic and Statistical Manual for Mental Disorders*
E-code	external-cause code
EAP	employee-assistance program
ED	emergency department
EMT	emergency medical technician
FBI	Federal Bureau of Investigation
FY	fiscal year
HCUP	Healthcare Cost and Utilization Project
HIV	human immunodeficiency virus
HSEES	Hazardous Substances Emergency Events Surveillance
ICD-9	*International Statistical Classification of Diseases*, ninth edition
ICU	intensive-care unit
IHS	Indian Health Service
IV	instrumental variable
LOS	length of stay
LSD	lysergic acid diethylamide
meth	methamphetamine
MIC	methamphetamine-induced caries
MILQ	Multidimensional Index of Life Quality
MRSA	methicillin-resistant *Staphylococcus aureus*
NCRP	National Corrections Reporting Program
NCS	National Compensation Survey
NDACAN	National Data Archive on Child Abuse and Neglect
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
NI	not included
NIS	Nationwide Inpatient Sample
NLSY	National Longitudinal Survey of Youth
NSDUH	National Survey on Drug Use and Health
ONDCP	Office of National Drug Control Policy
PCP	phencyclidine

QALD	quality-adjusted life-day
QALI	quality-adjusted life index
QALY	quality-adjusted life year
QoL	quality of life
QWB	Quality of Well-Being Scale
QWB-SA	Quality of Well-Being Scale, Self-Administered
RVU	relative value unit
SAMHSA	Substance Abuse and Mental Health Services Administration
SATCAAT	Substance Abuse Treatment Cost Analysis Allocation Template
SF-12® SG	SF-12® standard gamble weighted
SIFCF	Survey of Inmates in Federal Correctional Facilities
SILJ	Survey of Inmates in Local Jails
SISCF	Survey of Inmates in State Correctional Facilities
STD	sexually transmitted disease
TC	therapeutic community
TEDS	Treatment Episode Data Set
UCR	Uniform Crime Report
USSC	U.S. Sentencing Commission
VA	U.S. Department of Veterans Affairs
WHO	World Health Organization
WTP	willingness to pay

CHAPTER ONE

Introduction

Methamphetamine (meth), together with cocaine, heroin, and marijuana, is one of the four illegal drugs of most consequence in the United States today. Although lifetime and annual prevalence rates for meth use in the household population are 5 percent and 0.5 percent, respectively (NSDUH, 2006), meth use and abuse have risen substantially in the United States during the past 15 years. From 1992 to 2005, meth-related treatment admissions increased more than tenfold. This increase is due to both significant geographic expansion from west to east and demographic expansion of meth users.

Meth use remains a more significant problem in western states, though states in the Midwest and South contribute a large share of treatment admissions for meth. Western states comprise 65 percent of primary meth treatment admissions nationally, while the Midwest and South contribute 19 percent and 15 percent, respectively (SAMHSA, 2008b). Amphetamine-related treatment admissions also increased by 920 percent in the Midwest, 560 percent in the South, 455 percent in the West, and 45 percent in the Northeast between 1992 and 2002 (Dobkin and Nicosia, forthcoming). Although meth use was originally highly concentrated among white men, users are now increasingly female and Hispanic. The emergence of meth is also a significant concern for the criminal justice system. The majority of county law-enforcement agencies now report meth as their primary drug problem (NACO, 2005). Moreover, the share of meth-related treatment admissions referred by the criminal justice system is approximately 50 percent higher than for other substances (SAMHSA, 2008b).

Concerns about meth use arise from its association with a number of adverse physical and psychological effects. Meth users suffer from of a wide variety of physical symptoms, including headaches and chest pain (Rawson, Huber, et al., 2002; Rawson, Anglin, and Ling, 2002). Use has also been associated with mental health events, such as hallucinations, paranoia, and violent behavior (Rawson, Huber, et al., 2002; Rawson, Anglin, and Ling, 2002; NIDA, 2002). There is also concern that meth-related reductions in inhibition can result in an increase in injuries and sexually transmitted diseases (Sheridan et al., 2006; Schepens et al., 1998; Winslow, Voorhees, and Pehl, 2007; Shoptaw et al., 2003; Lyons, Chandra, and Goldstein, 2006).

Furthermore, meth use is supplied by a production process unique among major drugs. Meth is a synthetic substance produced by numerous labs in a hazardous process susceptible to fire and explosion. Although many of the superlabs[1] have migrated to Mexico in response to tougher precursor-chemical laws, meth production continues in the United States. In addition, the production of each pound of meth results in 5–6 pounds of toxic by-product (DEA,

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[1] *Superlabs* are defined as those capable of producing 10 pounds or more of meth per production cycle. See NDIC (2005).

undated). As a result, health and environmental effects may follow from meth production, which may affect users, nonusers, and the environment.

While estimates have been made of the overall social costs of drug abuse, with several studies examining the specific costs of heroin and cocaine, no estimate has yet been forthcoming for meth alone. Such a cost estimate would be useful for several reasons. First, the estimated cost burden of meth would provide policymakers with valuable information regarding the magnitude of the social burden that this particular drug, as compared with other drugs of abuse, imposes on society. This information will be useful for guiding resource-allocation decisions regarding where to spend limited drug-prevention and drug-enforcement dollars. Second, it could provide insight regarding the need for new policy approaches aimed at reducing the unique harms imposed by meth production and abuse that may not be common with other illicit drugs. Third, it could provide policy analysts with valuable information relevant for the construction of cost-effectiveness analyses evaluating alternative strategies to reduce the problem of meth abuse.

With these benefits in mind, RAND researchers embarked on an effort to calculate the annual economic burden of meth in the United States. Considering the potentially broad scope of this task and the availability of reliable data and literature, we focused on estimating the costs associated with the following:

- meth treatment that is delivered in general, short-stay hospitals and the specialty treatment sector
- health services used in the treatment of medical conditions attributed to or exacerbated by meth use, such as overdose, acute respiratory and cardiovascular problems, accidents and injuries, meth-exposed infants, and mental health conditions
- lost productivity due to absenteeism, unemployment, or premature death
- crimes attributable to meth use as well as criminal justice costs associated with enforcing meth laws
- environmental and personal harms resulting from meth-related production
- meth-related child endangerment, including the burden on the foster-care system, due to parental involvement with meth
- intangible cost of meth addiction.

While we recognize that these domains do not capture all the costs associated with meth use, they represent those components for which we believe that reasonably good data are available and for which a preliminary national estimate could be built. Although other domains are not included in the cost estimate, we make an effort to provide some evidence on their scope.

The calculations provided in this monograph represent an assessment of these costs based on measures of the problem and consequences in 2005. To the extent that use has changed since 2005, the scope of the corresponding costs will follow. But the costs associated with this use will not necessarily increase or decrease proportionally with the level reported in this monograph, as specific costs are tied to particular types of use (e.g., dependence versus regular use) as well as assumptions regarding how that use translates into harms (e.g., crime). For example, the cost of lab cleanup may be declining with a reduction in lab busts, but crime among meth users may be on the rise. Similarly, the fraction of the meth-using population that is represented by dependent or heavy users may change in proportion to light users, thereby affecting costs differentially.

General Approach to the Study

We take a prevalence-based, cost-of-illness (COI) approach to identifying and measuring the costs associated with meth use. This approach generates a monetary value of the economic burden to society in a given calendar year and considers the direct, indirect, and intangible costs associated with meth use and treatment of the problem in that calendar year (Rehm et al., 2007; Harwood, Fountain, and Livermore, 1998; Rice et al., 1990). The prevalence-based COI approach has been used to estimate the cost burden of various physical and mental health conditions, such as asthma, diabetes, and depression, as well as drug use.

COI studies have come under increasing criticism by academics for a variety of reasons. First, they tend to provide a single point estimate of the measure of the problem in a manner that suggests more precision than what is actually inherent in these calculations (Reuter, 1999; Moore and Caulkins, 2006). Rarely are estimates of the degree of a causal relationship, the cost of treating a medical condition, or the fraction of the population affected known with certainty. Second, because COI estimation is embedded in the medical literature, which has traditionally resisted placing a dollar value on pain and suffering, the calculations omit values for these intangible costs even though the research shows they exist. The resistance to assigning monetary values to these intangible costs places health problems at a distinct disadvantage when compared with programs that have other social or economic impacts, as traditions in these literatures are much more likely to include estimates of the intangible costs. For example, in the crime literature, it has been shown that the intangible costs of crime are frequently more than three times the estimated tangible costs (T. Miller, Cohen, and Wiersema, 1996). Third, COI studies applied to substance abuse in particular are inconsistent in their treatment of future costs associated with use of the drug today. While it is common practice to include the full net present value of future lost productivity associated with a premature death caused by drug use in the period in which it occurs, the future costs of incarcerating a person caught in possession or selling a drug today, for example, is not fully considered. Finally, while COI estimates may provide information on the total magnitude of a problem for society, they say little about who bears the brunt of those costs (government, families, or the user). Without knowledge of who bears the burden of these costs, it is difficult to make policy recommendations regarding appropriate places for government to step in.

We attempt to address some of these limitations of prior COI studies. Specifically, when possible, we attempt to capture the uncertainty related to the causal attribution by providing high and low estimates of the causal association between meth and these specific outcomes when the literature or our own analyses support such an approach. In doing this, we produce a range of estimates that enable us to capture the uncertainty inherent in the construction of our estimate as well as in the data that underlie these estimates. Further, in our estimates, we include an estimate of the intangible health burden associated with living with addiction and the welfare loss associated with sending a child to foster care. In addition, we treat criminal justice costs in a manner consistent with the losses associated with premature death, by incorporating the full net present value of future expenditures associated with a current arrest or conviction today.[2] Finally, in the last chapter, we provide some context for our findings and draw a distinction between those costs that are borne by the individual and those that are borne by

[2] It is not possible, however, to include the full present costs for components that are less understood, such as long-term health problems of those convicted.

society, so as to facilitate policy recommendations and to guide policymakers regarding areas in which different policies might reduce the cost to society in general.

A key element of this study is identifying when or how much of each cost should be attributed to meth. Unlike research on other substances of abuse, established attribution factors for meth-specific diseases or other harms are not available.[3] Therefore, we must infer attribution fractions from the scientific literature or from our own analysis of existing data.

When constructing estimates from our own examination of existing data, we discovered a number of methodological issues that are important to keep in mind. First, the data sources used in the analyses identify meth with varying levels of precision. Some identify only stimulants, others only general amphetamines, and still others identify meth use specifically. When meth is not identified separately from other stimulants and amphetamines, we make adjustments to the totals so that our estimates reflect only what we believe to be meth-specific cases. A second problem is the inconsistent measurement of meth use across the data sets. Some data sources capture any use of meth in the past month or year, while other data sources capture more involved measures of use, such as dependence or abuse within a one-year time frame. This creates problems in trying to identify the costs associated with a particular type of use consistently across data sets. Because this work focuses on the costs associated with any meth use, we do our best to use the most appropriate measure that is tied to a given outcome (e.g., meth dependence when looking at drug treatment, meth use when looking at productivity effects). A third and more difficult data problem is that often we are given only the total budget allocated to an issue (e.g., substance abuse treatment, law enforcement) and very little about how those funds are used, specifically those targeting meth users or meth harms. In these cases, we again attempt to use data from outside sources to help us ascertain a reasonable allocation of these total budgets, but our estimates are fundamentally based on assumptions that allocations are made consistently with the data we use.

Clearly, our attempts to deal with these challenges add some imprecision to the estimates we generate. We attempt to highlight this imprecision through the presentation of lower and upper bounds of our best point estimates. But the bounds are influenced by more than just the imprecision related to the issues mentioned here. There are two additional sources of uncertainty underlying the estimates presented in this monograph. The first is statistical uncertainty. Statistical uncertainty comes from sampling and model parameter variation that is natural whenever a probabilistic sample is used to infer information about an entire population. Statistical uncertainty is traditionally demonstrated in statistical analyses through the use of 95-percent confidence intervals, which specify—under the assumption of normality—that the actual population value should be within the range provided by the interval 95 percent of the time.

A second form of uncertainty influencing our estimates, to which we will refer as structural uncertainty, arises from factors influencing the reliability of estimates, regardless of the sample from which they are drawn. For example, when pulling estimates from the literature regarding the value of a crime or a lost life or the average cost for a given length of stay (LOS) for treatment, there are substantial ranges reported. Without having access to the original data from which these are constructed, we are left to infer ranges from those reported in the data.

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[3] For example, Popova et al. (2007) and Collins and Lapsley (2008) provide morbidity-attribution factors for other substances.

While we recognize that these adjustments do not address all the criticisms raised regarding the COI approach, they represent a significant improvement over prior analyses of the cost of illicit drugs in the United States.

Included and Excluded Costs

In addition to explicitly addressing some of the criticisms raised about the COI methodology, this monograph differs from previous estimates of the cost of illicit drug use in that it includes costs that are specific to meth, such as production-related incidents that are never directly considered in general estimates of the cost of drug abuse. Similarly, we explicitly consider the issue of child endangerment, which is so clearly a potential cost of both meth production and meth use when the persons involved are parents. As is indicated in Chapter Two, these meth-specific costs are not trivial. Nevertheless, there are some categories of costs that should be captured in a full assessment of the cost of meth use that are not reflected in our estimate because data are not available on the prevalence or cost of these events. Table 1.1 provides an overview of the cost components that we are able to include and the specific components not included. There may well be additional cost components that are not included. The reasons for exclusion of specific elements are discussed in the chapters that follow. When suitable data sources were not available to generate cost estimates, we make an effort to provide evidence that speaks to the potential scope of the component whenever possible but do not provide direct estimates.

Finally, in some cases, we can include only the current costs associated with use. As is the case for many other COI studies, the longer-term implications are generally less understood and therefore difficult to quantify.

Table 1.1
Costs Included in and Excluded from the Study

Cost	Included	Not Included (NI)
Drug treatment		
Care received in specialty sector	x	
Care received in general hospitals	x	
Other care received in general medical setting		x
Other care received through the U.S. Department of Veterans Affairs (VA), Indian Health Service (IHS), Federal Bureau of Prisons, U.S. Department of Defense (DoD)	x	
Excess health service utilization		
Care received in hospital settings	x	
Care received in other medical settings		x
Dental		x
Health infrastructure	x	
Intangible costs associated with dependence	x	

Table 1.1—Continued

Cost	Included	Not Included (NI)
Productivity losses		
Associated with premature death	x	
Reduced income associated with meth use		
Due to increased unemployment	x	
Due to fewer hours worked	x	
Due to treatment-related absenteeism	x	
Due to other meth-involved absenteeism	x	
Due to lower wages		x
Lost productivity due to incarceration	x	
Employer costs		
Drug testing	x	
Work-related injury		x
Higher health care and benefit costs		x
Crime		
Arresting and adjudicating users and sellers	x	
Property and violent crime by meth users (includes intangible costs)	x	
Nonindex and nondrug crime (e.g., identity theft)		x
Incarceration for misdemeanor possession		x
Crime and violence related to meth market	x	
Harms related to meth production		
Environmental cleanup	x	
Physical injury and death	x	
Additional waste		x
Personal decontamination, shelter, and evacuation		x
Child endangerment		
Foster-care placement	x	
Child malnutrition and victimization	x	
Other costs (e.g., adoption)		x

Organization of This Monograph

Each chapter of this monograph attempts to quantify the identified meth-related costs in a particular area (e.g., health care, productivity, crime, child endangerment, production). The chapters begin with a summary of findings followed by a review of the peer-reviewed scientific literature supporting an association between meth and particular outcomes captured within that chapter. In many places, although the science suggests a relationship between meth and particular outcomes, no cost estimates can be constructed, because the data are insufficient for doing so. It is important that the omission of these costs is not misinterpreted as an inference that the costs are small or zero. Indeed, we dedicate an entire chapter (Chapter Nine) to a discussion of some potentially plausible magnitudes of these costs under differing assumptions and whether their omission is likely to be a large or small factor in terms of the overall estimate. Within the specific chapters, however, we simply note their omission so that the estimates we produce are based on the strongest science available. The specific methods, data sets, and assumptions used to generate these estimates are all contained in the individual chapters, although technical regression results supporting parameters used in estimate construction within the chapter are placed in the appendixes. We conclude the monograph with a discussion of the magnitude of these costs vis-à-vis other substances of abuse and what we can infer regarding who bears the burden of these costs.

We add just a final word of caution regarding the information provided in this monograph. The information is based on the best available national data and the state of the science at the time we wrote this. Given the relatively early stages of the meth epidemic in some states, we anticipate that the knowledge base will change substantially in the next few years, warranting a reconsideration of these costs and updating of these estimates. These are costs based on incidences of meth-related problems in 2005, which will not be reflective of the problem in 2008 or 2010, given that this is an evolving social issue.

CHAPTER TWO

The Cost of Methamphetamine Treatment

In Table 2.1, we provide a summary of our findings with respect to the cost of meth treatment. Numerous calculations, assumptions, and data sources were involved in the construction of these estimates, which are described in greater detail in this chapter.

Care Received in the Specialty Sector

The Substance Abuse and Mental Health Services Administration (SAMHSA) maintains an administrative data system designed to provide annual data on the number and characteristics of persons admitted to public and private nonprofit substance abuse treatment programs. The Treatment Episode Data Set (TEDS), part of the Drug and Alcohol Services Information System (DASIS), collects information from any treatment provider receiving public funding

Table 2.1
Estimated Cost of Methamphetamine Treatment in the United States in 2005 ($ millions)

Cost	Lower Bound	Best Estimate	Upper Bound
Community-based specialty treatment			
Hospital-based treatment	5.6	14.9	14.9
Specialty treatment sector	274.1	491.2	977.2
Care received in other settings	NI	NI	NI
Total for community-based treatment	279.7	506.1	992.1
Federally provided specialty treatment			
DoD	0.2	0.2	0.9
IHS	4.7	24.4	24.4
Federal Bureau of Prisons	5.7	5.7	10.0
VA	9.1	9.1	43.5
Total for federally provided specialty treatment	19.7	39.4	78.8
Total cost of drug treatment	299.4	545.5	1,070.9

NOTE: Data are for treatment in which meth is the primary drug of abuse.

(through block grants, state agencies, or government insurers). The reporting is on all patients, regardless of the funding for any particular patient.[1]

TEDS identifies meth cases using primary, secondary, and tertiary diagnosis. Cases in which meth is the primary drug of abuse are identified as those cases in which the primary diagnosis is meth.[2] As shown in Table 2.2, there were 160,101 cases in which meth was the primary drug of abuse and treatment did not take place in a hospital setting in 2005. Only 40,831 of these were cases involving meth alone.[3] All other cases included alcohol or some other substance of abuse.[4] The number of cases exclusive to meth omits the additional 67,585 treatment episodes that list meth as a secondary or tertiary drug of abuse. As is standard in previous COI studies (ONDCP, 2004b; Harwood, Fountain, and Livermore, 1998; Mark, Woody, et al., 2001), we do not include in our cost calculation those cases in which meth is a nonprimary drug of abuse. Likewise, when meth is the primary drug of abuse but there are other drugs of abuse as well, all costs are ascribed to meth.

Table 2.2
Methamphetamine Treatment Admissions

	Number of Primary Meth Admissions		
Admission Type	Meth as Primary Drug, Other Substances Included in Subsequent Drug Codes	Meth as Primary Drug, No Other Substances Included in Subsequent Drug Codes	Meth as Primary Drug, Combined
Outpatient, methadone maintenance	218	144	362
Standard outpatient	62,425	22,061	84,486
Intensive outpatient	16,413	4,444	20,857
Short-term residential	11,884	3,406	15,290
Long-term residential	18,551	5,688	24,239
Methadone detox	317	163	480
Detox, free standing and ambulatory, nonmethadone[a]	9,462	4,925	14,387
Total	119,270	40,831	160,101

SOURCE: SAMHSA (2007c).

[a] Estimate includes free-standing residential detox and ambulatory, nonmethadone detox. It does not include hospital detox.

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1 SAMHSA estimates that more than 95 percent of substance abuse patients receive treatment from a facility receiving public funds for at least some patients.

2 In TEDS, the primary, secondary, and tertiary diagnosis variables are labeled SUB1, SUB2, and SUB3, respectively. Meth is categorized by any of these having a value of 10. In Oregon, cases involving meth in 2005 were categorized as "amphetamine." Personal correspondence with staff responsible for the Oregon database confirmed that these amphetamine cases could be considered meth cases.

3 Based on this Stata 8.1 programming code: SUB1==10 & SUB2==1 & SUB3==1 & NUMSUBS==1.

4 The category also includes 37 episodes in which meth is likely the only drug but could not be verified as such (i.e., when SUB1<2 & (SUB2==10|SUB3==10) & NUMSUBS==1).

We also report in Table 2.2 the number of cases in which meth is the only reported substance of abuse, so the interested reader could calculate the total cost of meth-only episodes if desired. Similarly, if one is comfortable making an assumption regarding the fraction of cases in which meth were a secondary or tertiary code that had additional costs due to meth, one could use the weighted average cost of a treatment episode across modalities ($3,487, according to the Substance Abuse Treatment Cost Analysis Allocation Template, or SATCAAT) to estimate the additional cost of these episodes. For example, if one assumes that the presence of meth as a secondary or tertiary drug either caused the dependence on the primary drug or raises the cost of treating the cases in which it is secondary or tertiary by, say, 20 percent, one would raise our estimate of the cost of drug abuse by 0.20 × 67,585 × $3,487 = $47.13 million. For consistency with previous estimates of the cost of drug abuse in the United States, however, we include in our costs all cases for which meth is reported as the primary substance of abuse.

Although TEDS provides a census of people receiving treatment from all publicly funded treatment facilities and programs, it does not contain any information on the cost of care received. Thus, information on the cost of each treatment episode must be inferred based on information on the number of treatment episodes (as indicated by admissions into each service setting) and typical per episode costs from other sources. Unfortunately, no current national data system provides information on the cost of treatment by drug and service setting. However, several recent studies provide estimates of the cost of drug treatment by setting for large geographically dispersed areas, including the Alcohol and Drug Services Study (ADSS), the Drug Abuse Treatment Cost Analysis Program (DATCAP), and SATCAAT. These sources do not differentiate treatment costs based on the drug of abuse, but rather examine costs by treatment modality (e.g., inpatient, intensive outpatient, outpatient, methadone maintenance). They differ in the types of costs considered or included and tend to focus on the accounting or economic costs of delivering the services.

DATCAP is a data-collection instrument and interview guide developed in the early 1990s to estimate the economic cost of substance abuse programs (Roebuck, French, and McLellan, 2003; French et al., 1997). It is based on standard accounting and economic principles and, hence, measures both economic and accounting costs. The instrument is designed to capture and organize detailed information on resources used in the delivery of treatment. The DATCAP methodology has been applied in more than 100 different treatment programs since its development. However, most of the programs that have used the instrument have been involved in clinical studies of new treatments or efficacy studies. Thus, the programs that have used the instrument do not represent a random sample of treatment programs or facilities. Nonetheless, the programs that have adopted the costing instrument are geographically dispersed across the United States and therefore do capture some of the geographic variability in cost. Roebuck, French, and McLellan (2003) provide a summary of findings from 85 studies that employed DATCAP over a 10-year period and present average episode cost estimates in 2001 dollars for nine treatment modalities from these studies.

SATCAAT is a unit cost instrument that was piloted in a study of 43 providers representing 406 treatment programs sponsored by Center for Substance Abuse Treatment (CSAT). The study collected cost information from 43 providers in six states and Puerto Rico.[5] The

[5] The six states were Michigan, Massachusetts, Pennsylvania, New York, Florida, and Texas.

SATCAAT instrument considers the accounting cost of delivering treatment services plus the imputed value of donated items; thus, the instrument does capture some of the economic costs associated with the delivery of substance abuse treatment. Average treatment costs are reported by population (women, men, children, and combined for all adults) and service-delivery unit (e.g., residential, detox, intensive outpatient, standard outpatient). For the purposes of this work, we use estimates reported by service-delivery unit for adults in general.

SAMHSA conducted the ADSS study between 1996 and 1999 using information from 280 facilities, consisting of 44 nonhospital residential treatment facilities, 222 outpatient treatment facilities, and 44 methadone maintenance treatment facilities.[6] The cost data were collected through in-person interviews with administrators that took place during site visits and validated using an automated program that tested the relationship of costs to client counts, staffing, and resource and utilization measures. Treatment costs were estimated by each type of treatment facility and modality and reported in constant 1997 dollars.

A critical strength of the DATCAP and SATCAAT instruments is that they attempt to measure more than accounting costs by including in their estimate of unit costs the value of all resources that are donated or shared across programs or facilities. However, estimated service-unit costs using these instruments are publicly available only from a summary of clinical-study results that involved selective populations and facilities that meet specific criteria for the purposes of the clinical study. Hence, because neither the sample of the clinics nor that of the patients is representative, the costs obtained from these studies may not be reflective of the typical costs.

The ADSS is the only study that provides information on the average (and median) cost per episode of drug treatment based on a nationally representative sample of treatment facilities serving regular patients across the country. Thus, the estimates of unit cost from this study are likely to provide a more realistic reflection of the typical accounting costs of serving regular patients. But, to the extent that the treatment facilities and programs rely on donated or subsidized resources, accounting costs (as captured in the ADSS) will clearly underestimate the actual value of resources used in the delivery of treatment services.

In the first column of Table 2.3, we report the inflation-adjusted average unit cost by modality generated from each of these three studies. It is important to note that we have information on the average cost of detox in the specialty sector only from the SATCAAT instrument. For all other treatment modalities, we have information on the average cost per episode from each of these unit-costing methods. In all cases, we inflate the average cost from published studies using 2005 dollars and the medical-care consumer price index (CPI). As can be seen in this table, there are indeed large differences in the average cost per modality when we use different instruments to estimate costs. The ADSS estimate is consistently lower than the other two regardless of the modality, which reflects the fact that the ADSS omits the economic value of donated and volunteer resources used in the delivery of these treatments. What is perhaps even more surprising is how much larger the DATCAP estimates are than the SATCAAT estimates, which reflects some important differences in the method of calculating costs, particularly in short-term residential facilities, as well as possible differences in the types of facilities, programs, and patients observed in the clinical studies adopting these cost instruments.

[6] Some facilities provided treatment through more than one modality.

Table 2.3
Estimated Costs of Outpatient Treatment Episodes, by Service Unit

Treatment Category	Data Source	Service unit	Per Episode Unit Cost Estimate ($)	Episodes with Meth as Primary Diagnosis	Total Service-Unit Cost ($)	Average Cost Per Meth Treatment Episode by Instrument ($)
Detox[a]	SATCAAT	All	1,215	14,867	18,064,892	1,215
Inpatient and outpatient services	ADSS	Nonhospital residential[b]	3,398	38,594	131,128,132	
		Nonhospital outpatient[c]	1,268	96,744	122,684,936	
		Methadone maintenance	6,561	341	2,237,281	
		Total			256,050,349	1,887
	DATCAP[d]	Intensive outpatient[e]	5,178	20,656	106,962,345	
		Standard outpatient[f]	2,339	76,088	177,979,723	
		Long-term residential[g]	21,904	22,655	496,227,870	
		Short-term residential[h]	10,981	15,939	175,025,681	
		Methadone maintenance	8,572	341	2,922,991	
		Total			959,118,610	7,069
	SATCAAT[i]	Intensive outpatient	3,981	20,656	82,241,038	
		Standard outpatient	2,331	76,088	177,361,889	
		Long-term residential	7,885	22,655	178,645,776	
		Short-term residential	2,187	15,939	34,858,912	
		Methadone maintenance	n.a.	341		
		Total			473,107,614	3,487

NOTE: Estimates for meth as primary drug; includes use of other substances. n.a. = not available. Due to rounding, totals may not sum precisely.

[a] Detox includes free-standing residential, ambulatory detox services, and methadone detox in TEDS.

[b] Cost is applied to short- and long-term residential visits in TEDS.

[c] Cost is applied to outpatient and intensive outpatient visits in TEDS.

[d] Rates are weekly, not daily. Thus, unit costs are not directly comparable, but totals are.

[e] Costs are based on estimates for the adult intensive-care unit (ICU).

[f] Estimates are a weighted average of the reported standard and adolescent outpatient services, based on the ratio of adults to children in these services in TEDS. LOS, in days from TEDS, is converted to weeks.

[g] Estimates are those specified as therapeutic community (TC) programs.

[h] Estimates are those specified as adult residential programs.

[i] Estimates are based on programs servicing adults.

In the "Episodes with Meth as Primary Diagnosis" column of Table 2.3, we present the total number of primary meth treatment episodes obtained when the TEDS data are aggregated to reflect the same type of treatment as the average cost estimates.[7] Then, in the "Total Service-Unit Cost" column, we multiply our average cost per modality from each instrument by the number of meth episodes falling into that category and get a total cost of treatment for each methodology of unit costing.

The information on the number of treatment episodes in 2005 from TEDS is reliable, whereas the cost per average treatment episode in the specialty sector is uncertain. Therefore, we construct our lower-, middle-, and upper-bound estimates of the cost of treatment solely from the variation among the three alternative costing methods. The lower bound is given using the estimated average cost per episode from the ADSS, the upper bound is given using estimates from DATCAP, and the best estimate is given using estimates from SATCAAT. Added to each of these average treatment cost values is the cost of detox, which, in all cases, is estimated using the SATCAAT instrument. The choice of SATCAAT as our best estimate of the unit cost of treatment is based primarily on the fact that the estimates from this instrument fall within the range provided by the ADSS and DATCAP. We also have billing information on all patients receiving treatment for meth abuse in the state of Texas, and the mean cost for short-term inpatient care in the state is $2,292.73 for 2005, which is very close to the average episode cost reported by the SATCAAT instrument (for short-term residential care).[8] Thus, we have data from at least one state that suggest that the average cost estimates reported by the SATCAAT instrument are in line with billing charges for meth treatment in that state. That is not to say that the costs calculated from the other instruments are wrong or useless. Further research is needed to help us understand what the appropriate unit-cost estimates are for different types of drug treatment.

Costs of Hospital-Based Drug Treatment

Information on the delivery of hospital-based treatment for meth abuse comes from the 2005 Nationwide Inpatient Sample (NIS) data provided by the Healthcare Cost and Utilization Project (HCUP) for 2005. Diagnosis codes (codes from the *International Classification of Diseases*, ninth revision, or ICD-9s) were used to identify amphetamine-related admissions (see Table 2.4). The two codes used to identify amphetamine abuse and dependence among patients in the NIS are 304.4 and 305.7. The current analysis focuses on the primary diagnosis that defines the stay and the presence of amphetamine on the patient record. For hospital-based treatment costs, the primary diagnosis must be amphetamine dependence or abuse. We use the actual costs for each stay in constructing cost estimates for this segment. We caution that, using ICD-9 codes, it is not possible to distinguish meth specifically from general amphetamines. This is a shortcoming common to hospital and ICD-9–based data sets. In some regions, such as California, the distinction and any potential overestimation is minor, because meth comprises the vast majority of amphetamine abuse. However, this share is likely to be lower in other states where meth is less common and hence result in greater potential for

7 The total number of treatment episodes in Table 2.3 is lower than that in Table 2.2 because hospital-based treatment is excluded. We cost out hospital episodes later in this chapter.

8 Texas treatment data include information on billing charges and were made available to us for research purposes.

Table 2.4
Hospital-Based Drug Treatment

	Low Estimate, Primary Amphetamine Only		Best Estimate, Primary Amphetamine		Upper Estimate, Primary Amphetamine	
Treatment	**Number**	**Cost ($)**	**Number**	**Cost ($)**	**Number**	**Cost ($)**
Detox	681	1,615,107	1,907	7,083,567	1,907	7,083,567
Treatment	1,440	4,360,334	2,790	8,893,426	2,790	8,893,426
Total	2,123	5,971,301	4,697	16,008,996	4,697	16,008,996
Adjusted for meth only		5,559,281		14,904,376		14,904,376

SOURCE: NIS (2005).

NOTE: Due to rounding at various stages and misclassification of a small number of cases, numbers may not add precisely.

overestimation. To address this issue in our estimates, we multiply the national estimates of treatment costs in the hospital sector by a meth–to–total amphetamine adjustment factor that is constructed from TEDS. In the TEDS data, we can identify treatment for meth separately from other amphetamines, so we can use this ratio as our adjustment factor. This ratio, which is 0.931 for 2005, may be biased if the population served in general, short-stay hospitals differs in terms of its likelihood of seeking treatment for meth versus for other forms of amphetamines. However, no other data are available on which to base such an adjustment for 2005 (and the likely variation from a total adjustment factor of 7 percent is probably within this study's margin of error, given other necessary approximations and omissions).[9]

There were 4,697 admissions in which amphetamine abuse and dependence were identified as the primary diagnosis. Of these, approximately 40 percent (1,907 admissions) were for individuals who received detox during their stay. On average, these stays were longer (10 days) than those that did not include detox (four days). The total costs associated with these admissions were $16.0 million for all amphetamines, but our best estimate is $14.9 million after discounting costs to isolate meth from other amphetamines. For cases in which amphetamine was the *primary and only* drug, we obtain significantly smaller estimates of just under $6.0 million for 2,123 cases. After our adjustment for the share due to meth (versus amphetamines), the lower-bound estimate is $5.6 million. Stays for which amphetamine is a secondary drug are not factored into our estimate of amphetamine-related drug-treatment costs, in order to treat them consistently with estimates from the specialty sector.

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[9] When the second wave of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) data becomes available, this might serve as an alternative source of information for adjusting meth to total amphetamine consumption in the general population.

For 2005, TEDS reports 253,836 admissions involving meth, other amphetamines, or other stimulants. There were 248,245 admissions that involved either meth or another amphetamine. With 232,205 meth admissions, this implies that 93.1 percent of all meth- and amphetamine-related treatment episodes are due to meth abuse. Similarly, we can use these numbers to show that 91.1 percent of all stimulant admissions are due to meth (a figure that we will use elsewhere in the monograph).

Other Federal Treatment

Several agencies offer treatment services that are not recorded in the TEDS and NIS data sets. These are primarily federal specialty treatment services provided by such agencies as DoD, the IHS, Federal Bureau of Prisons, and the VA. The total treatment budgets for these four agencies exceeded $550 million in 2005 (ONDCP, 2006a). Unlike the data we have for TEDS and the NIS, we do not have individual patient records for treatment services provided by these agencies to use in constructing estimates of the share attributable to meth. Consequently, our approach is to estimate the share of those agencies' treatment budgets that can be reasonably attributed to meth using drug-use and drug-treatment data from TEDS, National Survey on Drug Use and Health (NSDUH), and a nationally representative survey of federal prison inmates.

The share of the budgets attributable to meth is constructed by examining substance use and treatment patterns in the populations that each agency serves. The treatment budgets for these agencies are used to treat substance abuse other than alcohol except for the IHS budget, which does include alcohol treatment.

For DoD, our lower-end estimate is based on the share of (nonalcohol) treatment admissions in TEDS that are attributable only to meth (3.8 percent). We use the rate for the full population, since DoD covers treatment costs for service members and their dependents. The upper bound is calculated using the share of all TEDS treatment admissions in which meth is mentioned as one of the drugs of abuse (15.9 percent). To determine the appropriate fractions for the VA, we again rely on TEDS, which includes a variable indicating whether the patient is a veteran (because not all veterans are treated in the VA system). Using information on just the veterans in TEDS, we assess what percentage of veterans report meth as their only drug of abuse (2.4 percent) and what percentage report meth as one of their drugs of abuse (11.3 percent). We then apply these fractions to the VA treatment budget to allocate spending to meth. For the IHS, we again use descriptive information in TEDS to help us identify the attribution factors.[10] In TEDS, information is available on ethnicity, including American Indians and Alaska Natives. To determine what fraction of American Indians identify meth as the drug of abuse, we subset the TEDS data to this population and determine the percentage of all American Indian admissions who have meth as the only drug of abuse (3.8 percent) and those who have meth as one of the drugs of abuse (20 percent).

Finally, for the Bureau of Prisons budget, we estimate meth use among federal prison inmates by using data from a nationally representative survey of that population. The lower bound is based on the number of individuals who entered drug treatment since admission to prison and used meth *daily* in the month before arrest (11.7 percent). The upper bound is based on the number of individuals who entered drug treatment since admission to prison and used meth *at least once* in the month before arrest (20.5 percent). The resulting dollar amounts for each agency are shown in Table 2.5.

In almost every case, we adopt the lower bound as our best estimate of these costs because it conservatively accounts for meth users and we really have no way of knowing the true

[10] The 2005 IHS treatment budget was calculated by multiplying all IHS funds spent on alcohol and substance abuse services (prevention and treatment) in 2005 by 87.9 percent. This 87.9 percent was calculated from ONDCP's IHS summary for 2003 (ONDCP, 2002).

Table 2.5
Federally Provided Specialty Treatment

Agency	Lower Bound ($)	Best Estimate ($)	Upper Bound ($)
DoD	205,824	205,824	852,316
IHS	4,681,072	24,432,017	24,432,017
Federal Bureau of Prisons	5,676,521	5,676,521	9,966,746
VA	9,101,364	9,101,364	43,539,998
Total	19,664,781	39,415,726	78,791,077

SOURCES: ICPSR (2007); IHS (2005); ONDCP (2002, 2006a); SAMHSA (2007c).

allocation. However, in the case of the IHS, there is strong evidence that meth is having a dramatic effect on several Indian reservations, especially those in the South and West (Kronk, 2006). Thus, in this instance, we expect the true meth attribution factor to be closer to 20 percent (our upper-bound estimate) than to 4 percent, and we use this as our best estimate.

As noted throughout this section, there are some limitations to our estimates of treatment costs. We capture costs for treatment in the specialty, hospital, and federal sectors. However, we are missing costs from a couple of other relevant sectors, including those receiving care in the general medical sector and those receiving care at a private specialty institution that does not receive any public support. Moreover, there are no currently maintained nationally representative data sets that allow us to cost treatment in the specialty sector. Instead, we must rely on previous studies to provide the unit-cost estimates used in our calculations. Finally, we attribute the costs only for individuals treated for a primary diagnosis of meth. Clearly, there will be individuals with primary diagnoses of other drug use who suffer from meth comorbidities, but it is difficult to determine what share of those costs should be allocated to meth without risk of overestimation. Conversely, some individuals primarily diagnosed with meth use have secondary and tertiary diagnoses of other drug use, and we do not, in those cases, try to subtract the portion of treatment costs owing to the subsidiary diagnoses.

CHAPTER THREE

The Cost of Methamphetamine-Related Health Care Among Methamphetamine Users

A number of significant health concerns and problems beyond dependence and abuse may arise directly from meth use. Drug-induced health issues are yet another direct cost imposed by use of this substance. In this chapter, we provide a summary of our estimates for specific health areas we considered as part of our health cost estimate. Information on the cost of health care services related to meth use comes from several primary sources. Information on hospital-based care received for amphetamine-induced and amphetamine-involved conditions comes from the NIS. Emergency-department (ED) visits that do not result in an inpatient stay and visits to specialty care, general, or other practitioners (e.g., dental) are not captured in the NIS. Information on suicide attempts and ED utilization comes from the Drug Abuse Warning Network (DAWN). Information on health administration costs is drawn from the Office of National Drug Control Policy and SAMHSA.

The scientific literature, summarized in this chapter, provides evidence of meth's association with a wide variety of conditions but cannot always distinguish conditions or particular cases within each condition that are *caused* by meth versus those that are exacerbated, accelerated, or otherwise influenced by meth use. After completing our literature review, we examined information available in the NIS and separated conditions into two groups: First are those for which we are confident the literature supports a causal relationship and in which the full cost of treating that condition is fully attributable to meth (see Table 3.1). We refer to the hospital stays for these conditions as *meth-induced*. Second are those for which the literature supports an association but cannot definitively separate causality from selection effects or other factors. We include only the incremental cost associated with treating these health problems. Specifically, we estimate and incorporate only the additional costs that are caused by having meth use or abuse as a comorbidity rather than the full health care cost associated with treating the primary health problem.

In many cases, patients abuse multiple substances that may also contribute to specific health problems. Because it can be difficult determining what fraction of these health problems are truly due to the use of meth versus use of other substances, we provide alternative measures when the scientific literature is not clear. For example, in our lower-bound estimate of the costs of meth-induced cases, we include only those cases in which meth is the only substance of abuse. These cases have no indication of other illicit drugs or alcohol in the medical record. In our upper-bound estimate, all the cases that include amphetamine, regardless of whether alcohol is also noted on the record, are included in our estimate of costs. Details provided in later tables in this chapter show how these alternative assumptions significantly change the number of cases considered for our lower- and upper-bound estimates.

Table 3.1
Health Care Costs Experienced by Methamphetamine Users (2005 $ millions)

Care Received	Lower Bound	Best Estimate	Upper Bound
Meth-induced hospital stays	27.06	27.06	35.55
Meth-involved hospital stays, incremental only	8.20	14.29	36.70
Suicide attempts	5.51	14.24	22.96
ED visits	23.79	45.91	68.03
Outpatient care	NI	NI	NI
Dental	NI	NI	NI
Health administration	51.71	249.83	448.0
Total, excluding intangible cost of addiction	116.27	351.33	611.19

NOTE: NI = not assessed as part of this project. Due to rounding, totals may not sum precisely.

The cost of health care, excluding the intangible costs of addiction, is estimated at $165.5 million, with a range from $89.4 million to $266.3 million. The combined costs of meth-induced and meth-involved inpatient stays are estimated at $41.3 million, with a range from $35.3 million to $72.3 million. Our best estimate of the costs of suicide attempts from the DAWN data is $14.2 million, with a range of $5.51 million to $23.0 million. Finally, the costs of other ED visits are $45.9 million. The lower and upper bounds for ED visits are $23.8 million and $68.0 million, respectively. Health administration costs range from $51.7 million to $448.0 million, with a best estimate of $249.8 million.

With our data, we are unable to capture the cost of care received from general practitioners outside the hospital and ED setting. We are also unable to include the costs associated with dental care for meth mouth. We do, however, provide some evidence on these cost components in Chapter Nine. These omissions imply that the totals in Table 3.1 underestimate the health costs associated with meth use. Other limitations to these estimates, such as our inability to identify causal versus incremental costs for meth-involved stays, are discussed in the relevant sections in this chapter and in Chapter Nine.

This chapter focuses on the health events and costs associated with meth *use*. The health care costs related to treatment of individuals injured in the *production* of meth are not captured in this chapter because they cannot be readily identified in the hospital and ED data sets. Chapter Seven uses information produced by the Centers for Disease Control and Prevention's (CDC's) Hazardous Substances Emergency Events Surveillance data set to approximate the cost of treating health problems, injuries, and trauma caused by hazardous-substance events associated with meth production. These estimates also do not include other costs (beyond direct health care) associated with deaths caused by meth use. Data on meth-related deaths are available from the CDC National Center for Health Statistics multiple-causes-of-death data file. The loss of life due to premature mortality and the associated economic costs are discussed in Chapter Four, as are the intangible costs associated with meth abuse and dependence.

A Literature Review

Meth use is accompanied by a rush of energy as dopamine and serotonin uptake is inhibited, resulting in euphoria, increased wakefulness, respiration, hyperthermia, physical activity, and decreased appetite (Anglin et al., 2000). With extended use, however, the body adjusts, so that, when the user is not under the influence of meth, he or she experiences the mirror of these usage effects—increased restless anxiety, irritability, fatigue, and dysphoria (Lineberry and Bostwick, 2006). These feed the desire for more of the drug. In addition to this pernicious dependence, there are detrimental physical effects from meth—most prominently, cardiovascular, pulmonary, and dental. Meth also encourages high-risk behaviors that contribute to additional negative physical outcomes. Adverse health effects associated with meth use are not limited to the user, in that they can affect fetal development as well. Finally, there are other effects among nonusers, including risks to health associated with the production of meth, which may affect producers, first-responder personnel, and bystanders. These nonuser costs are considered in Chapter Six.

The cardiovascular effects of meth include acute and chronic damage. Meth use increases the heart rate and blood pressure and has been associated with chest pain and palpitations (Bashour, 1994; Furst et al., 1990; Lam and Goldschlager, 1988), hypertension (Albertson, Derlet, and Van Hoozen, 1999), stroke (McEvoy, Kitchen, and Thomas, 1998, 2000; Perez, Arsura, and Strategos, 1999), acute myocardial infarction (Chen, 2007), cardiovascular collapse, and arrhythmic, sudden death (Wermuth, 2000). There is also some evidence that the risks of acute myocardial infarction are worse when combined with ethanol (Mendelson et al., 1995). Some of the cardiovascular effects may be enduring.[1] For example, it is believed that there is long-term damage from increases in blood pressure as well as cardiac toxicity (Yu, Larson, and Watson, 2003). These chronic effects include myocardial infarction, cardiomyopathy (Winslow, Voorhees, and Pehl, 2007), stroke (Winslow, Voorhees, and Pehl, 2007; Ohta et al., 2005), and cardiac lesions (Yu, Larson, and Watson, 2003; Matoba, 2001). These lesions are associated with increased catecholamine levels (Yu, Larson, and Watson, 2003), and animal experiments have corroborated observed human effects (Matoba, 2001). These effects on the heart may be amplified by comorbidity with acquired immune deficiency syndrome (AIDS) and AIDS medicines (Yu, Larson, and Watson, 2003).

Respiratory effects of meth include dyspnea (Lam and Goldschlager, 1988; Bashour, 1994), pulmonary edema (Lukas and Adler, 1996), and pulmonary hypertension (Albertson, Derlet, and Van Hoozen, 1999). Exact incidence and prevalence of meth-induced respiratory symptoms have not been reported (Albertson, Derlet, and Van Hoozen, 1999). Contaminants have been suggested as the cause for the respiratory issues, although the direct effects of inhaling meth itself have not been eliminated (Albertson, Derlet, and Van Hoozen, 1999; Schaiberger et al., 1993). These respiratory effects may be chronic (Yu, Larson, and Watson, 2003) or fatal, as occurs in complete respiratory failure (Winslow, Voorhees, and Pehl, 2007).

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[1] There is evidence that someone can have a heart attack due to meth years after quitting meth use. According to Kaye et al. (2007, p. 1209), "risk is not likely to be limited to the duration of [patients'] methamphetamine use, because of the chronic pathology associated with methamphetamine use." Increases in blood pressure are one factor, featuring predominantly in strokes, but there are cardiac toxicity factors that extend beyond just the increased blood pressure. The cardiac toxicity includes increased catecholine levels and causes myocardial infarction, cardiomyopathy, and cardiac lesions, as mentioned.

There is a range of other physical effects of meth use. Seizures and convulsions are uncommon but potentially severe (Sommers, Baskin, and Baskin-Sommers, 2006). Meth toxicity contributes to intracerebral hemorrhage (McGee, McGee, and McGee, 2004), hyperthermia, renal failure, and necrotizing angiitis in the kidney, liver, pancreas, and small bowel (Callaway and Clark, 1994; Chan et al., 1994; Sperling and Horowitz, 1994; Screaton et al., 1992; Citron et al., 1970). Hyperpyrexia, an extreme increase in body temperature, has been observed, with readings up to 109 degrees Fahrenheit (G. King and Ellinwood, 1997).

Meth abuse is associated with severe oral damage wherein the teeth are "blackened, stained, rotting, crumbling, or falling apart" (ADA, 2006, cited in Klasser and Epstein, 2005, p. 760). This is called meth-induced caries (MIC), also known as *meth mouth*, and is characterized by extremely bad caries on the outside smooth surfaces of the teeth and the adjoining surfaces of the anterior teeth (Klasser and Epstein, 2005; Shaner, 2002; Duxbury, 1993; Donaldson and Goodchild, 2006). There are several possible mechanisms involved in meth mouth. It is believed that meth-induced hyposalivation, or dry mouth, minimizes the normal protective capacities of saliva and that deteriorates the teeth (Klasser and Epstein, 2005; Saini et al., 2005; Donaldson and Goodchild, 2006). Other research has considered the possibility that the acidity of meth contributes to meth mouth, although this is far from certain (McGrath and Chan, 2005; Klasser and Epstein, 2005; Donaldson and Goodchild, 2006). Additionally, meth users tend to engage in behaviors that may contribute to the dental damage associated with meth mouth, including an increased propensity for excessive chewing, tooth-grinding and -clenching (Klasser and Epstein, 2005; McGrath and Chan, 2005), and indulging in cravings for carbonated, sugared beverages (Brunswick, 2005; Jones, 2005; Klasser and Epstein, 2005; Shaner, 2002). Some of these dental effects may be due to selection rather than causality. Meth users are generally less concerned than other people are with personal or oral hygiene (Klasser and Epstein, 2005; Shaner, 2002; McGrath and Chan, 2005; Wynn, 1997). Still, there is additional evidence supporting a causal relationship between meth use and dental problems from the meth's prior use as a prescription medicine, which may partly address selection concerns (Klasser and Epstein, 2005; Howe, 1995).

In addition to the direct physical effects, meth influences user behaviors, which can lead to additional health conditions. For example, meth use is associated with skin-picking behaviors that are common when the user is in a state known as *tweaking*,[2] occasionally leading to abscesses (see N. Lee et al., 2005). Weight loss is prevalent (Sommers, Baskin, and Baskin-Sommers, 2006; Winslow, Voorhees, and Pehl, 2007), accompanied by malnutrition (Richards et al., 1999). Meth use is also associated with poor hygiene (Winslow, Voorhees, and Pehl, 2007), increased risk-taking behavior leading to motor-vehicle accidents (Schepens et al., 1998), and increased aggression leading to violence and even death (Baskin-Sommers and Sommers, 2006; Kalant and Kalant, 1979; Ellinwood, 1971). To some extent, this is due to selection effects associated with the criminal nature of meth, but animal studies suggest that at least some of the aggression associated with meth is due to use (Melega et al., 2008; Sokolov and Cadet, 2006; Sokolov, Schindler, and Cadet, 2004).

Meth may also influence health by contributing to a lowered immune response (Yu, Larson, and Watson, 2003), and there is evidence of additional comorbidity with human immunodeficiency virus (HIV) infections (Yu, Larson, and Watson, 2003). This amplifies the

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[2] Tweaking is the "most dangerous stage of methamphetamine abuse" and "occurs when an abuser has not slept in 3–15 days and is irritable and paranoid" (CESAR, 2005).

additional risk of sexually transmitted diseases (STDs) due to meth-induced behaviors. Meth use is associated with increased libido and enhanced sexual pleasure (Winslow, Voorhees, and Pehl, 2007; Gibson, Leamon, and Flynn, 2002; Kipke et al., 1995; Meston and Gorzalka, 1992; Gorman, Morgan, and Lambert, 1995), which is believed to lead to high-risk sexual behavior (Winslow, Voorhees, and Pehl, 2007; Shoptaw et al., 2003; Lyons, Chandra, and Goldstein, 2006) and multiple partners (Zule and Desmond, 1999). This greater sexual risk, as well as needle-sharing behaviors (Gibson, Leamon, and Flynn, 2002; Zule and Desmond, 1999; Schoenbaum et al., 1989) and the reduced resistance resulting from meth use, increases the likelihood of infections (Ye et al., 2008; Yu, Larson, and Watson, 2003). Studies link meth use with endocarditis, hepatitis, HIV, tuberculosis (Winslow, Voorhees, and Pehl, 2007; Gonzales et al., 2006; Kipke et al., 1995; Molitor et al., 1998; Anderson and Flynn, 1997; Gorman, Morgan, and Lambert, 1995; Des Jarlais and Friedman, 1987; Schoenbaum et al., 1989), and methicillin-resistant *Staphylococcus aureus* (MRSA) (A. Cohen et al., 2007, cited in Rosenthal, 2006).

The increase in risk-taking behavior is likely to extend beyond sexual activity. There is some evidence of an association with injuries due to thrill-seeking or aggressive risk-taking induced by meth use as well as hallucinations, delusions, and suicide ideation among chronic users. Sheridan et al.'s (2006) review of the literature asserts associations between meth use and injury, including blunt trauma (usually vehicular trauma) and interpersonal trauma resulting from gunshot wounds or stabbings and other assaults, as well as self-inflicted trauma. Schepens et al. (1998) likewise finds an association with motor-vehicle accidents. Interestingly, a review of Hawaiian trauma patients by Tominaga et al. (2004) found not only a link between current meth usage and incidence of injury but also higher incremental costs for the same level of injury with co-occurring meth use. Individuals at the trauma center who were meth-positive were older than meth-negative persons with such injuries, were more likely to have experienced self-inflicted trauma, stayed in the hospital longer, and used trauma-center resources out of proportion to injury severity. While previous studies found no additional costs for injury with co-occurring meth use for life-threatening injuries, these results suggest a potential incremental cost to treating injuries with co-occurring meth use at least at moderate levels of injury.

The physical effects of meth use are a particular concern with regard to expectant mothers because women constitute approximately 50 percent of meth users admitted for treatment.[3] Studies suggest that meth may contribute to intracerebral hemorrhage, cardiovascular collapse, seizures, and amniotic-fluid embolism in pregnant women (Stewart and Meeker, 1997; Catanzarite and Stein, 1995). The effects of meth extend to their children as well; there is evidence that meth can pass through the placenta (Garcia-Bournissen et al., 2007; Smith, LaGasse, et al., 2006; Wouldes, LaGasse, et al., 2004). Developmental effects include premature delivery (Wouldes, LaGasse, et al., 2004; Eriksson, Larsson, and Zetterström, 1981) and smaller size (Smith, LaGasse, et al., 2006; Smith, Yonekura, et al., 2003; Little, Snell, and Gilstrap, 1988; Oro and Dixon, 1987). Children of meth users may remain small even through childhood (Eriksson, Jonsson, et al., 1994; Eriksson and Zetterström, 1994). The smaller size is evident even controlling for other factors that correlate with meth use, including polydrug use and tobacco and alcohol use (Smith, LaGasse, et al., 2006). Research on other effects is limited,

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[3] Pregnant women aged 15 to 44 entering treatment were more likely than nonpregnant women to report cocaine or crack (22 versus 17 percent), amphetamine or methamphetamine (21 versus 13 percent), or marijuana (17 versus 13 percent) as their primary substance of abuse relative to nonpregnant women. See DASIS (2004).

but there is some evidence that prenatal meth use translates into worse neurodevelopmental outcomes (Šlamberová, Pometlová, and Rokyta, 2007; Frisk, Amsel, and Whyte, 2002), hyperactivity, short attention span, learning disabilities (Plessinger, 1998; Woods, 1996), type 2 diabetes and metabolic syndrome, and a collection of heart-attack risk factors, such as high blood pressure and obesity (Wouldes, LaGasse, et al., 2004; Wouldes, Roberts, et al., 2004). There are other observed effects in children. In isolated and rare cases, cardiac defects, cleft lip, and biliary atresia have been observed, although the studies are not conclusive (Plessinger, 1998). There are also cases of low activity (Smith, LaGasse, et al., 2008), poor feeding and tremors (Oro and Dixon, 1987), and even fetal death (Stewart and Meeker, 1997). Animal experiments show similar effects and indicate that these mental and coordination effects may last more than a single generation (Šlamberová, Pometlová, and Rokyta, 2007). Some of the effects on fetal development may follow from poorer parenting behaviors (Derauf et al., 2007), but such diminished behaviors were also seen in randomized trials with mice and may therefore, to some extent, be induced by meth (Šlamberová, Charousová, and Pometlová, 2005).

Health Service Costs Associated with Amphetamine Use

As we noted in our discussion of hospital-based treatment for substance abuse and dependence, it is not possible to distinguish a mention of meth specifically from general amphetamine use and abuse in the NIS data using ICD-9 codes.[4] Thus, as was done in the treatment section, we use our 0.931 adjustment factor calculated from the 2005 TEDS data to determine the proportion of the hospital episodes that are likely due to meth specifically rather than all amphetamines when generating estimates of events and costs.

Amphetamine-Induced Conditions

The literature provides evidence of meth's association with a wide variety of conditions, some of which are clearly generated only by meth use. Using our interpretation of the literature and common use of ICD-9 codes, we identified nine primary conditions in the NIS that we consider meth-induced: fetal dependence, drug-induced neuropathy, drug-induced mental health disorders, mental health and drug screens, poisoning by psychostimulant drugs, skin infections, bacterial skin infections, other skin inflammation, and chronic skin ulcers. Although we recognize that it is possible to suffer many of these skin conditions in the absence of meth use, we elected to include skin conditions in our assessment of meth-induced costs because they have been widely cited as a common consequence of meth use (e.g., N. Lee et al., 2005; Lineberry and Bostwick, 2006; Richards et al., 1999). Meth users are particularly prone to skin infection, lesions (e.g., excoriations and ulcers), and, consequently, cellulitis, potentially stemming from delusion-induced scratching, needle marks, and chemical burns.

For a particular condition to be considered meth-induced, the patient record must include, as a nonprimary diagnosis, the abuse of or dependence on amphetamine. In other words, the costs of admissions for these nine primary diagnoses are allocated to meth only when amphetamines are cited as an additional diagnosis. We are, however, mindful that the presence of an amphetamine mention on the record does not necessarily imply that all the costs should be allocated to meth when multiple substances are present and contribute to the admission. For

[4] The specific ICD-9 codes used to identify these diagnoses in the hospital data are available on request.

example, fetal dependence may result from the mother's use of alcohol as well as amphetamine. Allocating all the costs of these conditions to amphetamine even when other substances are also present could overestimate the role of amphetamines. Therefore, we provide alternative estimates of these costs.

Our lower bound attributes the cost to amphetamine only when no other drugs or alcohol are present. Estimates are then revised downward by our adjustment factor of 0.931 to reduce the total costs proportionately to the share of amphetamines that are due to meth. Table 3.2 shows that the health costs of inpatient hospital stays associated with these conditions are at least $27.1 million. Our upper-bound estimates include all admissions for these diagnoses in which amphetamine alone or amphetamine plus alcohol is present on the record. The inclusion of these additional cases increases costs by nearly $8.5 million. In some cases, such as neuropathy, the numbers of cases are identical. For other diagnoses, such as fetal dependence, the number of cases increases when alcohol is allowed on the record. However, it is not possible to determine whether the diagnosis (e.g., fetal dependence) is due to the mother's alcohol use or to her meth use. As a result, our best estimates are based on the cases in which no other substances (including alcohol) appear on the record.[5]

Our focus on admissions that mention only amphetamine reduces the number of included cases and the associated costs relative to admissions that include amphetamine and other

Table 3.2
Cost of Methamphetamine-Induced Hospital Stays for Which All Costs Were Attributed to Methamphetamine in 2005

	Lower Bound			Upper Bound	
Condition	Admissions	Cost ($)	Best Estimate ($)	Admissions	Cost ($)
Fetal dependence	146	426,756	426,755.99	156	442,231
Neuropathy	5	20,677	20,677.00	5	20,677
Substance-induced psychosis	2,965	9,938,985	9,938,984.62	3,541	13,270,683
Skin, infection, bacterial	5	25,694	25,694.16	5	25,694
Skin, infection, other	2,366	13,895,847	13,895,846.92	2,714	16,583,612
Skin, ulcer	55	970,084	970,084.36	67	1,057,686
Skin, other inflammation	15	84,536	84,535.85	15	84,536
Injury, mental health or drug screen	15	125,126	125,125.56	151	2,155,048
Injury, poison by psychostimulant drug	217	1,569,863	1,569,862.93	282	1,914,593
Total		27,057,567	27,057,567.39		35,554,760

SOURCE: NIS (2005).

[5] Table A.2 in Appendix A measures the increase in the number of inpatient days for meth-induced stays.

substances. The size of the reduction indicates that other substances, particularly alcohol, may prove intrinsic to understanding amphetamine abuse and its health effects.

Amphetamine-Involved Conditions

As described in our literature review, meth has also been cited as a contributing factor in that it may exacerbate or lead to a wider range of health concerns. For these conditions, we cannot credibly use the NIS to distinguish which cases are *caused* by meth use from those that are *exacerbated* by use. Nor can we identify whether meth caused the injury or is simply associated with similar behaviors (e.g., risk-taking). Time does not permit us to thoroughly explore the causal association between amphetamine use and each of the health conditions to which it is related. But we can generate a potentially conservative estimate of these costs by estimating the *incremental* costs associated with each primary diagnosis group when amphetamine is present. That is, how much more does it cost to treat a patient with a cardiac condition who also presents an amphetamine diagnosis than to treat one who presents the cardiac condition alone?[6] We do so in a regression context in order to control for other factors that might influence costs. Failure to control for characteristics of the patient, the stay, and the patient's health behaviors would inappropriately attribute the costs of these complications to amphetamine. For example, a patient with a heart condition may experience complications because of meth use or because of tobacco use. Likewise, costs may be higher for patients who are older or whose stays comprise a greater number of procedures.

Regression analyses were conducted to examine the incremental health care costs as indicated through higher costs (or longer stays; see Appendix A) for 11 general condition types: cardiovascular, cerebrovascular, dental, fetal, injury, liver or kidney, lung, nutritional, sexually transmitted, skin, and mental health.[7] For each of these conditions, we selected only the subconditions that amphetamine could influence, based on our understanding of the literature. For example, clogged arteries are not included in the cardiovascular conditions. We also analyzed the selected subconditions individually. The number of subconditions varied from zero for dental to approximately a dozen for injuries. Focusing on subconditions can reduce the likelihood of finding a significant relationship because conditions co-occurring with amphetamine become rare. However, in other cases, focusing on particular subconditions sensitive to meth use can improve our ability to isolate an effect by excluding conditions that are less sensitive.

The specifications for inpatient costs were estimated in logs with an indicator variable for amphetamine use. The regressions control for a variety of individual characteristics (e.g., age, race or ethnicity, gender), characteristics of the stay (e.g., primary payer, number of procedures), and hospital characteristics (e.g., size, location, region). Importantly, the regressions also control for patient behavior, including use of alcohol, tobacco, and other substances. Regressions for the overall primary condition and those for the sum of the effects across subconditions within each condition category produced similar estimates for most conditions. As the estimates from these two approaches differ by less than $1 million in all but one case, we opt

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6 Unobservable factors may also be generating the differences in incremental costs. However, given that the hospital and attending physicians are the ones making decisions on procedures and LOS (i.e., the two primary drivers of costs), the unobservable factor would have to influence medical decisions regarding treatment differentially. This seems highly unlikely, given that we are focusing on meth as a comorbidity here, not as the primary reason for the visit.

7 The specific ICD-9 codes used to identify these diagnoses in the hospital data are available on request.

for the estimate generated by the overall condition regressions rather than those for the subconditions. The one exception is injuries, which we describe next.

We added an analysis for injuries because injuries can be identified using ICD-9s and external-cause codes (E-codes). In addition to the overall and subcondition analyses, we examined cases with *any* injury diagnosis in addition to cases with only a primary injury diagnosis. There are 12 injury subconditions to which meth might contribute. These include injuries due to contusions, burns, external causes, suicide, cuts, guns, fire, machine, motor-vehicle transport, other transport, falls, and drowning. Only the first four categories can be examined in the same framework as our other conditions because they can be identified using ICD-9s as well as E-codes.[8] The overall injury regression (using primary condition only) showed no incremental costs due to meth. However, the first four subconditions (based on primary ICD-9 only) showed incremental costs totaling at least $2.3 million resulting from injuries due to external causes and, to a lesser extent, contusions. We also use the lower bound of the confidence interval from this analysis to generate our lower bound of $1.6 million. However, in our upper bound, we want to accommodate the use of E-codes. Outcomes specific to injury classifications were re-estimated for cases in which any injury-related code (ICD-9 or E-code) was present on the record. This approach results in significantly higher incremental costs due to amphetamine use ($18.9 million), but the lack of consistency with the primary diagnosis results makes these regressions suspect. Consequently, we use the point estimate of the "any injury" results only to inform our upper bound.

With the exception of injuries, the best estimate for each meth-involved condition is generated using the point estimates from regressions of the increase in costs associated with having amphetamine present on the record for that condition. The estimates yield a total increase of $14.3 million after our 0.931 adjustment (see Table 3.3).[9] The lower bounds for the estimates are constructed using the lower bound of a 95-percent confidence interval around point estimates. Thus, the incremental costs of hospital stays complicated by meth are at least $8.2 million. The upper-bound estimate is based on the upper bound of the 95-percent confidence interval and yields an upper bound of $36.7 million. The exception to this methodology is the calculation of injury costs, which are discussed in the preceding paragraph. Most of the difference between our best and upper estimates is due to an increase in injury costs based on our alternative analysis. However, the alternative analysis increases our best estimate by less than $1 million.

Table 3.3 does not include any incremental costs for skin conditions because all four relevant skin conditions are already included in the meth-induced admissions (Table 3.2), in which 100 percent of the costs associated with treating the cases with meth as a comorbidity were included in our estimate of meth-induced costs. The table also excludes fetal meth dependence for the same reason, although other meth-related fetal conditions were examined. We did not identify any statistically significant additional incremental costs for other fetal conditions.

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[8] Our methodology relies mainly on primary diagnosis. But E-codes are sometimes used to identify the external cause of injury. For example, those injured in a motor-vehicle accident have a primary diagnosis (e.g., ICD-9) indicating the type of injury (e.g., concussion) as well as the nature of the accident (e.g., motor-vehicle accident).

[9] Table A.2 in Appendix A measures the increase in the number of inpatient days in meth-involved stays.

Table 3.3
Incremental Cost of Methamphetamine-Involved Hospital Stays: Conditions for Which Methamphetamine Use Affects the Cost of Care Received, 2005

Condition	Admissions	Lower Bound ($)	Best Estimate ($)	Upper Bound ($)
Cardiovascular	4,446	2,708,003	5,569,334	8,598,777
Cerebrovascular	1,064	3,085,548	4,676,675	6,453,663
Dental	31	0	0	0
Other fetal problems	250	0	0	0
Injury	7,538	1,599,697	2,294,411	18,867,523
Liver or kidney	1,123	0	0	0
Lung	388	0	0	0
Nutrition	73	0	0	0
STDs	922	809,015	1,745,356	2,779,855
Skin[a]				
Mental health	26,146	0	0	0
Total		8,202,265	14,285,777	36,699,819

SOURCE: NIS (2005).

[a] Skin costs are already accounted for in the meth-induced costs (see Table 3.2).

Suicide Attempts

The DAWN data system, managed by SAMHSA, provides estimates of the number of meth-involved suicide attempts nationally each year, along with a 95-percent confidence interval that considers sampling issues involved in generating those national estimates. According to the 2005 DAWN report (SAMHSA, 2007b), there were 3,155 ED cases involving attempted suicide in which meth was the primary drug and primary reason for visit. The 95-percent confidence interval surrounding this point estimate for 2005 ranged from 1,221 to 5,088 suicide attempts nationally. While there is clear evidence that meth-dependent individuals have high rates of depression and suicidal ideation (Kalechstein et al., 2000; Zweben et al., 2004; Glasner-Edwards et al., 2008), it cannot be determined from the current science what fraction of suicide attempts involving meth use are truly caused by meth. In the absence of information to guide how to adjust these numbers, we simply take these estimates as our best estimates of the number of meth-related suicide attempts (see Table 3.4). To the extent that meth is simply used coincidentally by individuals attempting to commit suicide rather than being the factor that caused the depression or behavior that led to the suicide attempt, our estimates of costs using these numbers will overstate the true burden of meth in this respect. However, it is also true that not all suicide attempts result in a visit to an ED. Some suicide attempts may simply result in visits to a mental health professional or other medical professional or require no medical attention. Hence, it is also likely that the DAWN ED data on meth-involved suicide attempts underestimate the total number of meth-involved suicides in the nation. It is impossible to know to what extent these two biases offset each other, if at all. Future research should investigate this association between meth use and suicide attempts more carefully.

Table 3.4
Calculating the Medical Cost of Methamphetamine-Involved Suicide Attempts

Component of Cost Calculation	Lower Bound	Best Estimate	Upper Bound
1 Number of meth-involved attempts	1,221	3,155	5,088
2 Median cost per episode (2005 $)	8,174	8,174	8,174
3 Average ED episode cost (2005 $)	701	701	701
4 Total cost of suicide attempts (0.51 × row 1 × row 2 + 0.49 × row 1 × row 3) (2005 $)	5,509,641	14,236,622	22,959,092

To calculate the cost associated with these suicide attempts, we rely on work by Corso et al. (2007), who show that the medical cost in 2000 dollars for a nonfatal, hospitalized suicide attempt is $7,234.[10] Although we do not know from DAWN-published reports whether all meth-involved suicide-attempt cases were admitted to the hospital, we know that, in general, about half (51 percent) of all substance abuse–involved suicide attempts were admitted for inpatient hospital care. To the extent that meth-involved suicide attempts resemble other suicide attempts once the patient is hospitalized, we can use the median cost for all suicide attempts (reflecting the cost of a hospital admission) to help us approximate the total cost of these suicide attempts. Inflating Corso et al.'s estimate to 2005 dollars using the medical CPI, we find that the medical cost associated with a nonfatal, hospitalized suicide is $8,174.

For the other half of the episodes, which do not generate a hospitalization, we use information from a recent study by the Agency for Healthcare Research and Quality (AHRQ) presenting findings from the Household Component of the Medical Expenditure Panel Survey regarding the average expenditure for a hospital ED visit (Machlin, 2006). The study reports that, in 2003, the average expenditure for an ED visit, from all sources (e.g., private insurance, Medicaid, Medicare, out-of-pocket payments) was $560. This estimate was highly sensitive to the services received, however. For example, the average expenditure among patients needing surgery was $904, while that involving just special nonsurgical services (such as laboratory tests, X-rays, and radiological services) was $637. The average expenditure for visits during which no special services were provided and no surgery was required was only $302. Given that it is common procedure to perform lab tests on patients who come into the ED intoxicated, to confirm what substances have been ingested, we use the average expenditure estimate including special services of $637. Inflating this estimate to 2005 dollars using the medical care–services CPI gives us an average cost per ED episode of approximately $700.

To get the estimated cost of meth-involved suicide attempts, we take the weighted average cost of the meth-involved suicide attempts, for which it is assumed that 51 percent of all attempts result in hospitalization and the other 49 percent result in release from the ED to home. We estimate that it costs more than $14.2 million to medically treat someone having made a meth-involved suicide attempt, although there is some uncertainty around this estimate, as indicated by the lower and upper bounds.

[10] It should be noted that there is no reason that a meth-involved suicide attempt would cost the same as other suicide attempts. However, in the absence of good cost data for these ED events, we rely on the average for all suicide-attempt events.

This estimate captures only the medical costs associated with unsuccessful suicide attempts. It does not reflect the medical costs of successful suicide attempts nor the productivity losses associated with them.[11] Because it is not possible to know the extent to which medical care was involved in the emergency response to meth-involved deaths, we do not attempt to approximate these costs here. Instead, we consider the additional cost of a full emergency response to successful suicide attempts in a later chapter, in which we consider other direct costs associated with meth-involved death.

Emergency-Department Care

According to the 2005 DAWN data report (SAMHSA, 2007b), there were an estimated 108,905 meth-related ED visits in 2005 (note that DAWN reports estimates for general stimulants and then breaks them out by all amphetamines and meth separately). The 95-percent confidence interval reported for meth-specific ED episodes ranges from 58,469 to 159,340 visits. However, included in these ranges are meth-involved suicide attempts that were considered in the previous section. To make sure we do not double-count these cases, we subtract these suicide attempts from our estimates of ED visits, to give us a count of nonsuicide meth-involved ED episodes (see Table 3.5, row 3).

Although we can identify these cases as being meth-involved, we do not know what fraction of these are due purely to meth use. DAWN tracks a number of alternative reasons for the ED visit, but, after 2003, reports separate estimates only for those having attempted suicide and those seeking detox. As shown in row 4 of Table 3.5, only a small number of the nonsuicide meth-involved ED mentions involve detox. However, one can confidently presume that at least these cases can be causally attributed to meth use.

That leaves, in the "other" category, a number of indications, including overdose, unexpected reactions, and withdrawal, that could also be reasonably attributed to meth use.

Table 3.5
Methamphetamine-Involved Emergency-Department Episodes, 2005

Episode Type	Lower Bound	Best Estimate	Upper Bound
1 Total number of meth-involved ED episodes	58,469	108,905	159,340
2 Meth-involved suicide attempts	1,221	3,155	5,088
3 Nonsuicide meth-involved ED episodes	57,249	105,750	154,252
Detox	4,744	15,088	25,432
Other meth-involved cases	52,505	90,662	128,820
4 Presumed number of meth-caused episodes (0.556 × other cases + detox cases)	33,937	65,496	97,056
5 Unit cost ($)	701	701	701
6 Total ($)	23,786,783	45,906,852	68,027,521

SOURCE: SAMHSA (2007b).

[11] Successful suicide attempts are captured as premature mortality in Chapter Four.

In an attempt to capture at least some of these cases, we went back to the DAWN report for the third and fourth quarters of 2003 (SAMHSA, 2004) and examined the extent to which the conditions represented in the "other" category are clearly drug related. According to the 2003 report (SAMHSA, 2004, p. 58, Table 19), out of a total of 225,345 patients in what would now be the "other" category, 125,351 (55.6 percent) had medical diagnoses clearly attributable to drug use (i.e., abuse, dependence, overdose, toxic effects, and withdrawal). Unfortunately, it does not break these down by specific drugs involved. Because no further information can be obtained, we use this ratio (55.6 percent) to adjust down the number of meth-involved ED cases falling into our "other" category to come up with the probable number of meth-caused ED episodes for that category. We then add this to the total number of meth-involved detox cases to generate our estimates of the presumed number of meth-caused ED episodes, as shown in row 4 of Table 3.5.

As done previously, we use the AHRQ estimate of a hospitalized ED episode as our best estimate of the cost of an ED visit. Multiplying this unit cost per ED visit by our estimate of meth-caused ED visits generates a best estimate of the cost of ED-related care of $45.9 million.

Health Administration and Support

Table 3.6 shows how we calculate the share of the health administration and support dollars that can be attributed to meth use. These costs include federal and state prevention efforts,

Table 3.6
Health Administration and Support

Category and Source of Budget Information	Total Cost (2005 $ millions)	Attributable Share (%)		Meth-Related Costs (2005 $ millions)		
		Lower	Upper	Lower Bound	Best Estimate	Upper Bound
Federal prevention (ONDCP, 2006b)	1,530.1	0.50	12.42	7.65	98.84	190.04
State prevention (ONDCP, 2006a)	108.3	0.50	12.42	0.54	6.99	13.45
Prevention research (ONDCP, 2006b)	621.2	0.50	12.42	3.11	40.13	77.15
Treatment research (ONDCP, 2006b)	422.0	3.00	12.42	12.66	32.54	52.41
Training (ONDCP, 2004a)	74.9	3.83	15.86	2.87	7.37	11.88
Insurance administration (Mark, Levit, et al., 2007)	649.6	3.83	15.86	24.88	63.95	103.02
Total	3,406.06			51.71	249.83	447.95

SOURCES: ONDCP (2006a, 2006b, 2004a); Mark, Levit, et al. (2007).

NOTE: Due to rounding, numbers may not sum precisely.

prevention and treatment research, training, and administration (ONDCP, 2006a, 2006b, 2004a; Mark, Levit, et al., 2007). To calculate our lower-bound estimates of federal and state prevention efforts as well as federal prevention research, we use the annual prevalence of meth use in the general household population from the 2005 NSDUH (0.5 percent) (NSDUH, 2006). We base our upper-bound estimate on the percentage of people entering treatment in 2005 who reported meth use (12.42 percent).[12] The same upper bound is used to allocate treatment research dollars to meth. The lower-bound estimate for treatment research is the share of admissions in which meth is the only substance mentioned (3.0 percent). We also use the TEDS data to construct fractions for the training and insurance administration budgets, but these shares are constructed by excluding admissions in which alcohol is the only substance mentioned (thus raising both the lower and upper attributable percentages to 3.83 percent and 15.86 percent, respectively).

Limitations

The health care costs appear quite low, in part because it is not possible to determine causality for many conditions and thus our approach is to err in a conservative fashion. For example, we include information on incremental hospital costs alone in cases in which causal relationships are not definitive. For some conditions we explored, we did not find a statistically significant effect of meth use for conditions in which the scientific literature suggests we should find an effect. Mental health is a good example. This is not entirely surprising, as there may be factors offsetting a meth-involved result. We might reasonably expect that substance use exacerbates mental health conditions. But efforts on the part of addicted mental health patients to exit the hospital more quickly, for example, can negatively influence our ability to identify or quantify additional costs associated with their stays. Similarly, when considering national data regarding ED visits, we do not include all meth-involved mentions, as we cannot be certain that these ED visits were caused by meth use directly.

Of course, a significant omission in our estimate of the cost of meth-related health conditions is the lack of accounting of health-related costs for conditions treated outside the hospital setting. For example, the lack of a finding for dental costs in a hospital setting is perhaps not very surprising, as most people are likely to be seen in a dental office for these types of conditions. However, we are unaware of any national data that would enable us to estimate the number of meth-induced dental visits in the general population, let alone information on the average cost of those dental visits. The omission of such care as this, as well as other urgent care received in physicians' offices and private urgent-care clinics, is a major limitation of our results and the primary reason that we interpret these estimates as a lower bound of the actual health-associated costs of meth use. We do, however, provide some thoughts on the potential magnitude of these omitted costs in Chapter Nine.

[12] Treatment for alcohol is included in the denominator. This percentage assumes that all amphetamine mentions from Oregon are for meth.

CHAPTER FOUR

Premature Death and the Intangible Health Burden of Addiction

A major criticism of previous COI studies evaluating the economic cost of substance abuse is that they ignore the intangible costs associated with drug abuse (Moore and Caulkins, 2006; Cook and Moore, 2000). Cook and Moore (2000) explain that this is because the COI accounting framework is production-based rather than consumption-based. Hence, the subjective value that individuals place on their health and on consuming these substances is ignored. From a practical perspective, the primary justification for ignoring these costs is that adequate data for estimating them have been difficult to come by. Methods have been developed in other literatures to capture them, however. In the crime literature, for example, monetary estimates of fatality-related losses in quality of life (QoL) are constructed using information on the amount that people regularly spend reducing their risk of death (Viscusi, 1993). In the case of nonfatal injuries, estimates of the cost of pain, suffering, and fear as well as reduced QoL are based on jury awards in trials involving nonfatal injuries (M. Cohen, 1990; M. Cohen and Miller, 2003). Estimates of the economic cost of crime that employ these methods to account for intangible costs are substantially larger than estimates ignoring intangible costs. For example, T. Miller, Cohen, and Wiersema (1996) find that the intangible costs of violent crime are nearly twice the total tangible losses.

In this chapter, we break from previous COI studies and consider the intangible costs associated with both premature death and the health burden of addiction. We present these losses in their natural units (specifically, the number of deaths and quality-adjusted life-years, or QALYs), so that our estimates of premature mortality and QALYs can be easily compared with those from other studies that might put different monetary valuations on these outcomes. The cost of premature mortality is generated using an estimate of the value of life that is based on a review of the literature employing the revealed preference approach rather than the human capital approach (described below) (Viscusi and Aldy, 2003; Aldy and Viscusi, 2008). Although the human capital approach is the more commonly used method for valuing premature mortality in the substance abuse literature, recent international studies are more frequently adopting alternative methods that capture some of the consumption value or intangible value of life (Collins and Lapsley, 2002, 2008; Godfrey et al., 2002; Priez et al., 1999). We estimate the intangible health burden associated with being addicted, which represents the reduced welfare experienced by individuals who must live with addiction. In doing so, we employ a dollar conversion of QALYs that is based on the same statistical value of life used in the valuation of premature mortality so that the two are internally consistent.

Our attempts to capture these nontraditional intangible costs generate estimates that are, in fact, more consistent with unit-cost estimates being applied in other chapters of this monograph, including our estimates of the cost of crime and child endangerment, which both similarly incorporate the intangible burden of these problems. However, by incorporating these costs, particularly the costs considered in this chapter, our estimates become less comparable to previous estimates of the cost of illicit drugs in the United States.

Our findings in terms of the number of lives affected and their monetized value are summarized in Table 4.1. In terms of premature mortality, we estimate that 895 deaths in 2005 were caused by meth use and abuse, although the number is estimated imprecisely because of uncertainty about the role that meth played in cases in which other substances (e.g., alcohol) were also present or other conditions contributed (e.g., heart problems). Placing a monetary value on these lives is a difficult and controversial thing, as discussed in the next section, but if we take a conservative value of a statistical life from the revealed preference approach of $4.5 million, we estimate that the dollar value of premature death is on the order of $4 billion. Although substantial, even these costs are dwarfed by what we estimate to be the dollar value of the intangible health burden associated with meth use, which is nearly $12.6 billion. The intangible health cost of living with addiction is significantly greater than that associated with death because substantially more people are affected by addiction. We conservatively estimate that 44,313 QALYs were lost in total by individuals living with addiction in 2005.

In the next section, we describe how we reached our estimates of lost lives, lost QoL for those living with addiction, and the monetary values placed on these lives. Clearly, the monetization of these values is necessary for them to be included in a full cost estimate but is something that is highly debatable and open to critique. We do our best to make the estimates as transparent as possible so that others who prefer alternative monetary values for life years and QALYs may insert their preferred values into our calculations and generate their own estimates.

Table 4.1
Summary of the Cost of Premature Mortality and Intangible Health Burden of Methamphetamine

Cost	Lower Bound	Best Estimate	Upper Bound
Premature mortality			
Lives lost to meth-caused premature death	723	895	1,669
Value of one statistical life ($ millions)	4.50	4.50	4.50
Value of premature death ($ millions)	3,253.50	4,027.50	7,510.50
Health burden of living with meth addiction			
Lost QALYs associated with living with addiction	32,574	44,313	74,004
Value of one QALY ($)	284,283	284,283	284,283
Value of intangible health burden ($ millions)	9,260.23	12,597.43	21,038.08
Total lost well-being due to health and mortality ($ millions)	12,513.73	16,624.93	28,548.58

Premature Death

We begin our assessment of the burden of premature death by identifying the number of deaths that can reasonably be attributed to meth use or abuse. Once we have identified our estimate of these deaths, we discuss how we arrive at our valuation of premature mortality.

Number of Methamphetamine-Related Deaths

Our definition of *meth-involved death* is based in large part on the World Health Organization (WHO) definition of *drug-related death*, relying on identification using WHO and WHO Collaborating Centers for the Family of International Classifications for North America (1992–1994). A case is counted as meth use–related when its underlying cause of death was mental or behavioral disorders due to psychoactive-substance use or poisoning of accidental, intentional, or undetermined intent.

The WHO identifies *substance-related harms* as harmful use, dependence, and other mental and behavioral disorders resulting from use of opioids (F11), cannabinoids (F12), cocaine (F14), other stimulants (F15), or hallucinogens (F16); multiple drug use (F19); or accidental poisoning (X41, X42), intentional poisoning (X61, X62), or poisoning by undetermined intent (Y11, Y12) by opium (T40.0), heroin (T40.1), other opioids (T40.2), methadone (T40.3), other synthetic narcotics (T40.4), cocaine (T40.5), other unspecified narcotics (T40.6), cannabis (T40.7), lysergide (T40.8), other unspecified psychodysleptics (T40.9), or psychostimulants (T43.6). The T-codes are selected in combination with the respective X-codes and Y-codes shown in Table 4.2 (EMCDDA, 2007).[1]

The multiple-cause-of-death file attempts to identify those who died of the immediate consequence of use (e.g., overdoses) as well as those who died from complications of long-term substance abuse. There may be individuals for whom only the immediate consequence was recorded (e.g., cardiac failure, fatal accident) without the history of substance use. Those deaths would not be identified. The cause-of-death file also does not include the deaths of nonusers who were victims of meth production or trafficking. Some of these deaths are captured later in this monograph. For example, in Chapter Eight, we include deaths related to hazardous events due to meth production, and deaths due to drug-related violence would be considered under crime in Chapter Six.

Table 4.2
Codes for Underlying Cause of Death, by WHO Definition

Cause of Death	Selected ICD-10 Code
Disorders	F11–F12, F14–F16, F19
Poisoning, accidental	X42[a], X41[b]
Poisoning, intentional	X62[a], X61[b]
Poisoning, undetermined intent	Y12[a], Y11[b]

[a] In combination with the T-codes T40.0–9.
[b] In combination with T-code T43.6.

[1] X-codes identify various types of intentional self-harm or assault that is related to the injury. Y-codes indicate that the external event causing the injury is undetermined.

As we cannot strictly identify meth (or even amphetamine) in the ICD-10 codes used to classify deaths, we first sum up all deaths involving psychostimulants. Our upper bound involves all cases for T43.6 (psychostimulants) in which just the X- and Y-codes specified in Table 4.2 are included along with the I-codes (those for cardiovascular conditions). This captures all F15 cases that result in death as well. Our lower-bound estimate captures only T43.6 cases in which no other substance and no alcohol is included and just our X- and Y-codes are included. Cross-tabulations created for us by staff at the CDC result in a lower-bound estimate of 771 and an upper bound of 1,779 (see Table 4.3). Our middle estimate of 954 is based on a total number of T43.6 cases in which no other substance and no alcohol was included but additional codes using the X-, Y-, and I-codes were captured (for example, cardiovascular conditions). Consultation with staff at the CDC suggests that this is likely an accurate reflection of meth-induced deaths even though these additional codes are not captured in the WHO definition of *meth-related death*.

In order to isolate meth's role, we use information from the 2005 TEDS, which shows that meth was the only psychostimulant reported in 93.8 percent of psychostimulant-only treatment admissions. Thus, to adjust the CDC estimate to account only for meth-related deaths, we take 93.8 percent of these totals (see the second row of Table 4.3). Thus, our best estimate of the number of meth-induced deaths in 2005 is 895 deaths, but there is some uncertainty about this estimate as indicated by the range given by our lower- and upper-bound estimates. This uncertainty stems from our attempt to reduce the potential effect of alcohol on these deaths, as both our lower and best estimates exclude cases also involving alcohol.

Placing a Value on Premature Mortality

There are three primary methods for estimating the value of a human life: the human capital approach, the contingent-valuation approach, and the revealed preference approach. The human capital approach bases the value of an individual life on the individual's earnings forgone due to the premature mortality. While this approach has the advantage of being based on readily observable data for an individual, group of individuals, or even a society, it places more weight on the lives of wealthy individuals than on those of poorer individuals. Moreover, it does not capture the additional welfare that people gain (beyond production) from being alive. The contingent-valuation approach, often referred to as *willingness to pay* (WTP), is one of two alternative methods that attempt to measure the additional welfare gain associated with living. The contingent-valuation method infers an individual's willingness to pay to avoid death or risk of death through answers to hypothetical questions and trade-offs presented to the individual and uses this to construct a value of life. Critics of this approach argue that answers

Table 4.3
Calculation of Methamphetamine-Involved Deaths and Costs

Cost	Lower Bound	Best Estimate	Upper Bound
Psychostimulant deaths	771	954	1,779
Adjustment to capture meth-only cases	723	895	1,669
Assumed value of one life ($ millions)	4.5	4.5	4.5
Total economic value ($ millions)	3,253.5	4,027.5	7,510.5

SOURCE: MCOD (2005).

obtained from hypothetical questions are unreliable and biased because people may not answer truthfully if not actually faced with that decision. Thus, the revealed preference approach has emerged as yet a third alternative for valuating life. In the revealed preference approach, information on the value of life is inferred from actual behaviors people take to reduce their risk of death or injury. It overcomes the problem of contingent valuation by using real economic decisions, such as paying for a burglar alarm, moving to a safer neighborhood, and extra compensation for riskier jobs.

There are strengths and limitations to each approach, and scientists have not developed a consensus on a single preferred approach. None of these approaches generates a single point estimate for the value of life, as each is influenced by population characteristics, variation in population income, risk preferences, and life expectancy. A study by Hirth et al. (2000) provides a review of studies adopting a variety of approaches and shows that estimates of the value of life vary substantially both within and across methods. Estimates of the value of a life using the human capital approach range from $460,511 to $611,151, while estimates from the revealed preference approach, which includes WTP, range from $679,224 (using safety risk) to $19,352,894 (using job risk), all measured in 1997 dollars. While it is clear that valuations using the WTP approach are generally higher than those using the human capital approach, substantial variation in the value of a life remains even when using the same basic approach.

For this study, we base our estimate of the value of a statistical life on findings from a review conducted by Viscusi and Aldy (2003). They reviewed the economics literature examining the value of a statistical life based on revealed preference decisions and conclude that current estimates of the value of life fall within the range of $4 million and $9 million per statistical life in 2000 dollars. This range far exceeds the $1 million valuation that has been widely adopted in previous studies, but many studies employing this $1 million valuation have failed to adjust for inflation since the original study year from which the $1 million valuation arose. Because we wish to include the consumption value of life (and intangible cost) but still wish to take a conservative approach, we adopt the lower-bound estimate of $4 million per statistical life identified by Viscusi and Aldy (2003). We inflate this value of a statistical life to 2005 dollars to get $4.537 million but then round the estimate to the nearest hundred thousand to get our final estimate of $4.5 million.

Using this somewhat conservative value of $4.5 million for a human life, we estimate that the economic value of premature mortality associated with meth in 2005 exceeds $4 billion ($4,027 million). To demonstrate the variability in this estimate due solely to our uncertainty regarding the actual number of meth-induced deaths, we show in Table 4.3 upper- and lower-bound estimates of the economic value of premature death, which ranges from $3.2 billion to $7.5 billion. Thus, even when we assume a constant value of a lost life, we still see a rather substantial range in estimates of the value of these lost lives because of the enormous value that each life has in this calculation.

The decision to use $4.5 million as the value of life has considerable influence on our estimates. If we instead use the midpoint range provided by Viscusi and Aldy (2003) ($6.5 million) and inflate it, we get a 2005-dollar estimate of $7,057,700. Naturally, when multiplied by the lower-, best-, and upper-bound estimates of meth-related deaths, this life value generates an even larger total range of economic values of lost productivity ranging from $5.1 billion to $11.8 billion. Alternatively, if we employ an extremely conservative value of $1 million (which has been applied in COI studies for 20 years without adjusting for inflation), we get a smaller overall economic value of $895 million but still with a considerable range of $723 million to

$1.7 billion. These examples demonstrate the sensitivity of our estimates to alternative assumptions regarding the value of a statistical life, which remains a highly contentious issue in the scientific field with no general consensus (Hirth et al., 2000; J. King et al., 2005; Aldy and Viscusi, 2008).

The Cost of the Health Burden Associated with Being Addicted

Addiction and drug dependence reduce the QoL of those suffering from the condition, independent of its potential effects on productivity, employment, or health-service utilization. Health improvements (recovery from addiction) translate into direct welfare gains for those affected by the illness as well as indirect gains for those who care for or live with the individuals afflicted. It is difficult to place a monetary value on the burden that addiction creates, but failing to do so significantly underestimates the full burden of the disease. We now attempt to place bounds on the probable loss associated with the health burden of addiction as a disease. We provide estimates of this burden in terms of lost QALYs and in terms of the economic (monetary) value of this health burden. Additional welfare losses are also borne by those addicted, their family members, and other nonusers. Some of these losses, such as reduced employment and increased involvement in crime, are captured elsewhere in this monograph, but others, such as family burden, remain unmeasured.

A number of methods have been used to try to quantify the loss in well-being associated with various health conditions, including cancer, multiple sclerosis, liver disease, hypertension, and HIV/AIDS. By far, the most common method that has been adopted in the international health literature is QALYs.[2] The QALY approach presumes that the impact of health problems on the overall QoL can be quantified through trade-offs that people would be willing to make between alternative health states, given variations in the length of time they would live with each. In one formulation, respondents are asked the amount of lifetime they would be willing to sacrifice in order to be relieved from a health problem (i.e., time trade-off). In another formulation, respondents are asked about whether they would prefer some imperfect health state with certainty, or a gamble between life and death with varying weights on each (i.e., standard gambles). QoL measures are then constructed using weights obtained from these questions and believed to measure a person's own valuation of his or her current or alternative health states. QoL, therefore, represents the valuation an individual places on his or her QoL when living with a particular disease state or health condition; it is equivalent to 1 minus the loss in QoL caused by having the disease.

Several health state–classification systems, such as the EuroQol (EQ-5D), SF-36® health survey, the Multidimensional Index of Life Quality (MILQ) instrument, and the Quality of Well-Being Scale (QWB), have been developed by researchers to assist in the translation of health functioning into numerical scales (Drummond et al., 1997; Gold et al., 1996). The results elicited can differ substantially based on who is making the trade-off (J. King et al., 2005; Dolan et al., 1996; Read et al., 1984) or the time units in which they are calculated (Sin-

[2] QALY is a subset of a full class of quality-adjusted life indexes (QALIs) that have been developed to try to measure loss in quality of life. What is unique about QALYs is that they measure QoL in terms of both the degree of the disability and the survival probability of living with the illness. So the index is measured in terms of years of quality life. Other QALIs can measure changes in well-being in terms of functioning or disability (disability-adjusted life-years, or DALYs).

delar and Jofre-Bonet, 2004). As is the case with valuations of human life, individual preferences related to time preference, risk aversion, income, and wealth effects can all influence the weights, as can the current health status of the individual.

Although QALYs are used broadly in the health literature, very little work has been done applying QALYs to the burden of addiction. Most of the U.S. studies that have been done on drug abuse focus on heroin addiction and the relative benefits of methadone maintenance as an alternative form of treatment (Barnett, 1999; Barnett and Hui, 2000; Zaric, Barnett, and Brandeau, 2000). Given the availability of a pharmaceutical therapy for heroin, one cannot be sure that estimates of QALYs would apply to other drugs for which pharmacotherapies are not widely available. Furthermore, addiction researchers have harshly criticized the main classification systems used to develop QALYs in the literature so far (e.g., the EQ-5D and the QWB) because they do not capture the improvements in well-being that result from substance abuse treatment that are nonmedical in nature, such as improved employment outcomes, obtaining a supportive peer group, or reduced involvement in crime.[3] Only the Addiction Severity Index (ASI) has attempted to capture some of these non–health-related aspects of the burden of the disease, but its use for these purposes is just now becoming more common (Pyne et al., 2008; Sindelar and Jofre-Bonet, 2004).

Given the debate regarding appropriateness of scales and their applicability to addiction, we draw our estimates of the effect of dependence on QALYs from a recent study that set out to investigate the construct validity of two generic preference-weighted measures for substance use disorders (Pyne et al., 2008). Examination of preference-weighted scores for substance use–disorder patients and other patient groups suggests that those suffering with a lifetime substance use disorder and currently experiencing symptoms have a reduction in well-being of 0.126 or 0.141 depending on which preference-weighted index was used (Pyne et al., 2008). The self-administered QWB (QWB-SA), which is constructed from responses to questions on the ASI, generated a reduction of 0.126, while the SF-12® standard gamble weighted (SF-12 SG), which constructs the index based on responses to the SF-12, generated a reduction of 0.141. The difference in lost QoL between these two alternative measures is fairly small, but both suggest a somewhat smaller reduction than the 0.20 reduction in QALY based on samples of heroin users (e.g., Zaric, Barnett, and Brandeau, 2000).

While the difference in QALYs in the Pyne et al. (2008) study suggests that the variation across scales is fairly small, we cannot be certain that the small differences in lost QALYs generated by the Pyne et al. study are not just a function of the preference-weighted scales used or of the population surveyed (the full population, not heroin users). Thus, we take an agnostic approach regarding which of these numbers is a better indicator of lost well-being and simply use the Zaric, Barnett, and Brandeau (2000) estimate for our upper-bound estimate, the QWB-SA for our lower-bound estimate, and the SF-12 SG as our best estimate, because it falls within the range given by the other two (see row 1 of Table 4.4).

To calculate the total health burden caused by dependence, we now need to multiply the reduction in QALYs due to dependence by the total number of people suffering from meth addiction in 2005. Using TEDS, we reported in the previous chapter that there were

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[3] Indeed, even being an addict in recovery via nonmedicinal treatment is not the same as never having been dependent. Having cravings that are held in check is still worse than not having cravings at all, even if it is much, much better than the outcome of giving in to the cravings. Likewise, recovering addicts who change their lifestyles to avoid cravings (e.g., not seeing friends who continue to use) still suffer some disutility from their condition.

Table 4.4
QALY Approach to Estimating the Health Burden Associated with Methamphetamine Dependence

Cost Element	Lower Bound	Best Estimate	Upper Bound
1 Reduction in QALY due to meth dependence	0.126	0.141	0.20
2 Dependent users (TEDS)	160,101	160,101	160,101
3 Dependent users (NSDUH)	155,243	243,173	331,102
4 Percentage of meth-dependent users who were not in treatment in the past year (NSDUH)	63.4	63.4	63.4
5 Nontreated meth-dependent users (NSDUH)	98,424	154,172	209,919
6 Estimated total number of dependent users (TEDS from row 2 + NSDUH from row 5)	258,525	314,273	370,020
7 Total QALYs lost due to meth dependence	32,574	44,313	74,004
8 Value of one QALY in 2005	284,283	284,283	284,283
9 Total value of the intangible health burden per year ($ millions)	9,260.23	12,597.43	21,038.08

160,101 individuals in treatment in 2005. We need to add to this the number of people in the general population experiencing dependence and not getting treatment. We need to rely on another data source to capture information on individuals in need of treatment, so we turn to the NSDUH. Each year, the NSDUH reports the number of people meeting *Diagnostic and Statistical Manual for Mental Disorders* (DSM-IV) criteria for abuse or dependence for meth as well as other drugs, in addition to reporting information on whether those individuals received any drug treatment in the past year. According to the 2005 NSDUH, the population-weighted average number of people meeting DSM-IV criteria for dependence was 243,173 people (with a 95-percent confidence interval given by 155,243–331,102; see row 3 of Table 4.4). However, more than one-third (36.6 percent) have had a previous treatment episode in the past year. To avoid double-counting individuals already captured through TEDS, we want to subtract these individuals from the number in NSDUH. In other words, we want to include in our total only the 63.4 percent of individuals who met DSM-IV criteria for dependence but had not been in treatment (see row 4 of Table 4.4). In row 5, we report the number of people in NSDUH meeting DSM-IV criteria for dependence but who did not report going to drug treatment in the past year. We then combine the total untreated dependent population reported in NSDUH (row 5) with the total number of individuals receiving treatment for meth dependence in TEDS (row 2) to get our total estimated number of meth-dependent individuals in 2005 (row 6).

Note that this number is almost certainly an underestimate, because there are most likely some out-of-treatment meth-dependent users who fall outside the household-survey sampling frame or who underreport conditions of their use in the survey (e.g., homeless users would fall outside a household-based survey's sampling frame). We have no empirical basis for estimating the extent of this undercount. However, it is noteworthy in that the number of people known to be receiving meth treatment (160,101) substantially exceeds the number of household-survey respondents who report being meth dependent and receiving treatment.

We multiply the number of meth-dependent individuals by the reduction in QALYs associated with meth dependence to get our estimate of the number of QALYs lost due to meth dependence. As reported in row 7 of Table 4.4, our calculations suggest that those dependent on meth lost 44,313 QALYs. We have a lower- and upper-end estimate of the total number of QALYs lost based on the range of reductions in QALYs provided by the different studies and the estimated total number of dependent individuals. The range is pretty broad, from a low of 32,574 QALYs to a high of 74,004 QALYs, a breadth created by the near doubling in estimated reduction in QALYs (from 0.13 to 0.20) as well as the significant variation in estimates of the number of dependent users in the household population.

To assess monetarily the health burden associated with dependence, we start with estimates provided by French and his colleagues (French, Mauskopf, et al., 1996; French, Salomé, et al., 2002). French, Salomé, et al. (2002) report that the dollar value of a quality-adjusted life-day (QALD) for a 38-year-old white male with an average life expectancy and a $1 million value-of-life estimate (assuming a 5-percent discount rate of future income) is $173.[4] If we multiply this dollar value per QALD by 365 days, we get a dollar value per QALY of $63,174. This dollar value per QALY, or $QALY, presumes a statistical value of a life of $1 million, which was based on a literature review of the value of a life conducted in the early 1990s. As discussed previously, more recent reviews of the literature place the value of a statistical life much higher, in the range of $4 million to $9 million in 2000 dollars (Aldy and Viscusi, 2008; Viscusi and Aldy, 2003). Thus, we need to scale up the $QALY estimate used by French, Salomé, et al. (2002) to reflect this higher value of a statistical life. To generate a $QALY value assuming a statistical value of life of $4.5 million, we can simply multiply the $63,174 by 4.5 to get a $QALY of $284,270. This estimate is substantially larger than that suggested by Cutler and Richardson (1997) and Tolley, Kenkel, and Fabian (1994) but well within the range of plausible values of a QALY based on the review conducted by Hirth et al. (2000). The larger value merely demonstrates the sensitivity of these estimates to alternative assumptions regarding the value of a statistical life.[5]

We can now calculate the dollar value of a reduction in QALYs by simply multiplying the reduction in QALYs associated with meth dependence (row 7) by the dollar value of a reduction in QALY (row 8). As can be seen by the final row of Table 4.4, the estimated cost of the intangible health burden of living with meth addiction in the United States in 2005 is quite substantial. Our best estimate of these costs is $12.6 billion, with a range from $9.3 billion to $21.0 billion. The QoL lost due to dependence, therefore, represents by far the biggest cost component considered thus far.

The substantial variation between our low and high estimates implies that these estimates are imprecise and merit further research. Indeed, our upper-bound estimate is more than twice as large as our lower-bound estimate, and the difference between the bounds exceeds $10 billion. The variation in cost estimates is driven by two factors: (1) the estimated number of

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4 French, Salomé, et al. (2002) selected the 38-year-old white male as a reasonable characterization of the modal person in treatment for the time period they examined. According to our analysis of the 2005 TEDS, the typical (median) individual in treatment with a primary diagnosis of meth was male, white, and between the ages of 30 and 34, so this representation is not too far off that for the median meth-dependent individual in treatment.

5 It is interesting to note that our $QALY of $284,270 is very close to the statistical value of a life year estimated by Aldy and Viscusi (2008) for a 38-year-old, using a cohort-adjustment model (value of a statistical life year is approximately $310,000, assuming a 3-percent discount factor).

people who are dependent and (2) $QALY, which is measured imperfectly. While both sources of uncertainty are important and generate substantial variation by themselves, the uncertainty related to the proper value for a QALY is an area in significant need of further research (J. King et al., 2005).

Limitations

While these estimates represent our best attempt to quantify the costs associated with premature death and the intangible burden of addiction, the numerous assumptions and qualifications clearly influenced the estimates we obtain. Perhaps the assumption having the largest effect on both of these estimates is the assumed value of a statistical life ($4.5 million), which affects both the valuation of premature mortality as well as our dollar conversion of QALYs. While we believe that this is a fairly conservative estimate of the value of a life, we recognize that others, particularly those in favor of the more traditional human capital approach, might deem this too large. Still others might consider this value too low. Given the significant debate surrounding the issue of the value of life, we did our best to make our calculations as clear as possible so that others can generate estimates with their own preferred values.

It is important to note that precision in estimating the number of meth-induced deaths is also critical to reducing the variability in our estimates. Our current estimates, while variable because of alternative assumptions regarding the inclusion of cases involving alcohol, still exclude numerous other conditions in which meth might have played a critical role in the death, such as highway fatalities and explosions and physical assaults ending in death. Thus, future work should consider other external causes of death that might be highly associated with meth use to get a better sense of the extent to which meth plays a role.

The tremendous size of the intangible health burden suggests that careful attention and consideration should go into future construction of this estimate. This value is sensitive to assumptions regarding the loss in QALYs due to meth dependence, the dollar value of that loss in QALY, and the estimated number of individuals addicted to meth. Each of these could be explored in greater detail to reduce the variability. More accurate attempts to estimate the number of people living with addiction need to be considered, as household populations clearly omit arrestees and marginalized populations that are likely to exhibit higher rates of dependence. Thus, future work that can help in the estimation of addiction in these missing populations would be tremendously useful for all of these estimates. And clearly, the magnitude of these costs will be dramatically influenced by the dollar value per QALY. Future work that can help narrow the range of plausible estimates for these values may improve the precision of future estimates of these costs.

Finally, we should note that there are other components of lost welfare caused by addiction that are not captured in these estimates, including the burden placed on family members or friends who live with a loved one suffering with meth addiction. These intangible costs, which have yet to be reflected in any of the estimates provided thus far, may prove to be quite substantial and, consequently, may represent a fruitful area for further research.

CHAPTER FIVE

Productivity Losses Due to Methamphetamine Use

Although there is a widespread belief that drug use reduces productivity, the scientific literature examining the relationships between drug use and wages is inconclusive (French, Zarkin, and Dunlap, 1998; Kaestner, 1998, 1994a, 1994b). Several economists have offered theories as to why, but difficulties in measuring true differences in individual's abilities, selection effects related to job choice and early job entry, and the importance of nonmonetary compensation (e.g., health benefits, flexible hours) make it difficult to truly identify the reason for the different findings. Thus, efforts have increased to consider alternative ways of measuring productivity effects, including decisions related to labor supply, schooling, and absenteeism. Our estimate presented in this chapter follows these efforts and attempts to quantify the costs associated with meth-related productivity losses in four key areas: (1) higher probability of unemployment (and the lost earnings associated with that reduced employment), (2) absenteeism from work, (3) lost productivity associated with incarceration, and (4) other employer costs. Although this last category does not really represent a reduction in productivity of workers, it does capture the value of resources that companies expend to deal with costs caused by meth-using employees and hence represents resources that might otherwise be dedicated to increasing production or production efficiency. Thus, we include them here.

Table 5.1 summarizes our lower, upper, and best estimates of the cost associated with lost productivity. In looking at the costs included in our estimate, the biggest factors in our measure of lost productivity come from general absenteeism (missed workdays) and incarceration,

Table 5.1
Summary of Productivity Losses Associated with Methamphetamine Use ($ millions)

Loss	Lower Bound	Best Estimate	Upper Bound
Lower probability of working	15.26	62.53	93.46
Absenteeism			
Time in treatment	25.37	25.37	25.37
Other missed workdays	40.02	249.73	422.06
Incarceration	274.75	305.35	336.11
Additional employer costs			
Drug testing	24	44	177.92
Higher health care and benefit costs	NI	NI	NI
Total	379.40	686.98	1,054.92

which, according to our best estimate, together represent more than half a billion dollars. The range provided for these numbers is equally insightful, however, and indicates the relatively better data we have available on the processing of drug offenders than on the productivity effects of meth users. The considerably larger variation observed for missed workdays due to absenteeism is driven by uncertainty in a number of the components that make up these costs, and future research in this area would dramatically improve these estimates and reduce the uncertainty.

Most of the estimates provided in Table 5.1 were constructed through our own analysis of key measures from available data sets. Information on lost productivity due to unemployment and absenteeism at work comes from the NSDUH, while information on absenteeism related to time in treatment comes from TEDS. Information on lost productivity due to incarceration of sales-related offenses comes from the Bureau of Justice Statistics (BJS) and State Court Processing Statistics. Information on weekly wages and earnings, which is our primary method for valuing the lost work time, comes from the Bureau of Labor Statistics (BLS). Information on the number of people subject to employee drug testing comes from the U.S. Department of Transportation and the NSDUH, while information on the cost of a drug test comes from summary information provided by the Office of National Drug Control Policy (ONDCP). Full details regarding these estimates and what is considered in them are provided next.

Literature Review

There are no published peer-reviewed articles examining the effects of meth use specifically on wages or other direct measures of productivity on a nationally representative or probabilistic sample. Quite an extensive literature exists examining the impact of substance use more generally on worker productivity and labor market participation. Substance use is believed to diminish productivity and lead to poor labor market outcomes for several reasons. First, it may delay initiation into the work force, thereby reducing experience and human capital accumulation associated with on-the-job training. Second, it may decrease the probability of being employed, which, again, may interfere with human capital accumulation (Gill and Michaels, 1992; Register and Williams, 1992). Third, it may increase absenteeism, which directly influences the productivity of not only the drug user, but also those individuals who work with that user (French, Zarkin, and Dunlap, 1998; Bass et al., 1996). Finally, substance abuse may reduce an individual's productivity on the job, which should translate directly into lower wages if wages are indeed a good indicator of marginal productivity (Hoyt, 1992).

Empirical studies that analyze the direct effect of substance use and abuse on earnings have generated very mixed findings, however. Even after accounting for the endogeneity of substance use, earnings of substance users are found to be higher by some researchers (Kaestner, 1991, 1994a; Gill and Michaels, 1992; Register and Williams, 1992; French and Zarkin, 1995), lower by others (Burgess and Propper, 1998; Hoyt, 1992), and either statistically insignificant or not determinable by others (Kaestner, 1994b; Zarkin et al., 1998). The lack of a robust finding has led many economists to focus on other measures of productivity, such as the probability of being employed or unemployed (Bray, Zarkin, Dennis, and French, 2000; Register and Williams, 1992; Kandel and Davies, 1990). Here, too, the evidence is mixed. Using the 1984 and 1985 waves of the National Longitudinal Survey of Youth (NLSY), Kandel and Davies (1990) find that use of marijuana and cocaine in the past year is positively associated with the total number of weeks unemployed. However, using data from the 1984 wave of the NLSY, Register and Williams (1992) find that use of marijuana on the job in the past year and long-term use of marijuana both have a positive impact on the probability of being employed. Higher frequency of marijuana use in the past month, however, did lower the probability of being employed.

A number of factors contribute to the lack of a robust finding. First, studies examine the impact of substance use on earnings and labor market outcomes for populations of varying ages. While some studies focus on young adults (Kandel and Yamaguchi, 1987), others focus on mature young adults (Kandel and Davies, 1990; Register and Williams, 1992), and still others focus on the full adult population (Bray, Zarkin, Dennis, and French, 2000; Zarkin et al., 1998). It is quite possible that the nature of the relationship between substance use and labor market outcomes changes over the life cycle as job-market experience and job tenure begin to dominate the effects of other individual determinants of labor market outcomes. Indeed, a few studies have explicitly considered this fact and noted the differential effects of substance use on wages conditional on age (Mullahy and Sindelar, 1993; French and Zarkin, 1995), but it is not a factor that has been consistently considered in the literature.

A second factor complicating the interpretation of findings from the literature is the inconsistent treatment of indirect mechanisms through which substance abuse could affect earnings—for example, through educational attainment, health, fertility, or occupational choice. Given that these inputs have been established as important determinants of labor market participation and wages (Becker, 1964; Mincer, 1970; Willis and Rosen, 1979) and that there are strong associations between these measures and drug use (Chatterji, 2006; Bray, Zarkin, Ringwalt, and Qi, 2000; Kenkel and Wang, 1998; Cook and Moore, 1993; Mullahy and Sindelar, 1994), it is important to consider whether analyses looking at the impact of substance abuse on earnings consider the indirect effects as well.

Finally, the literature is inconsistent in its definition of *substance use*. *Current use* has been defined as daily use (Kandel and Yamaguchi, 1987), use in the past month (Chatterji, 2006; Cook and Moore, 1993), and use in the past year (Kandel and Davies, 1990; Register and Williams, 1992; Mullahy and Sindelar, 1993). A few studies attempt to differentiate the effects of chronic use from casual use (Roebuck, French, and Dennis, 2004; Kenkel and Ribar, 1994) or to proxy chronic use with measures of early initiation (Bray, Zarkin, Ringwalt, and Qi, 2000; Ringel, Ellickson, and Collins, 2006). Given all the different ways in which substance use can be operationalized, with some representing more chronic or persistent use and others more casual use, it is not surprising that findings vary across the studies.

It is clear that the relationship between substance use and abuse and labor market outcomes is dynamic and can be potentially influenced by the relationship between early substance use and human capital production. The potential for reverse causality, however, is also real. Just as substance use and abuse can lead to job separation and other poor labor market outcomes, job separation may lead to increased substance use and abuse. In light of the potential for feedback loops, it is important to use appropriate statistical methods that can isolate the true nature of the relationship. Our own analyses attempt to do this through the use of instrumental variable techniques (Greene, 2003; Angrist, Imbens, and Rubin, 1996; Bound, Jaeger, and Baker, 1995).

In the sections that follow, we examine the impact of self-reported meth use in the past year on a variety of labor market outcomes using data from the 2005 NSDUH. The NSDUH is a nationally representative household survey of individuals 12 years and older conducted by SAMHSA. The primary purpose of the survey is to accurately estimate the prevalence of illicit drug, alcohol, and tobacco use in the United States among the household population. The NSDUH sample is drawn from a clustered, multistage sampling design, resulting in a nationally representative sample of noninstitutionalized civilians each year. Interviews occur continuously throughout the calendar year and take roughly one hour to complete. To ensure confidentiality, respondent names are not used, interviews are conducted in private, and sensitive questions about drug use are completed through audio computer-assisted self-interview (ACASI) technology, with which the respondent keys answers directly into a laptop computer in response to prerecorded instructions. Further information on survey methodology is provided in the annual NSDUH findings report (NSDUH, 2008).

In recent survey years, respondents have been asked whether they have ever used meth and the timing of use (i.e., in the past month, in the past year, more than a year ago). Table B.1 in Appendix B shows the unweighted and weighted average frequency of responses. It is clear that self-reported use of meth is somewhat low, especially when compared with that of other substances, such as alcohol or marijuana use. Given that the data are self-reported, there may be significant underreporting, despite attempts to ensure protection of privacy and truthful reporting. The impact of underreporting on the analyses would bias the estimated relationships toward zero. Thus, to the extent that underreporting occurs, our estimates should be viewed as conservative estimates of the true relationship. Unfortunately, no other externally validated data (i.e., drug tests) are available on a national scale.

Lower Probability of Being Employed

We begin with an examination of the likelihood of being unemployed among individuals between the ages of 21 and 50. By restricting our sample to individuals within this age range, we hope to reduce the confounding effects caused by part-time students and those who are retired or partially retired. In the 2005 NSDUH, respondents are asked whether, in the past 12 months, there was ever a period during which they did not have at least one job or business. Respondents who reported an unemployment spell during the past year and did not previously state that they were a full-time student or out of the labor force were then asked how many weeks in the past year they were without a job. These two questions provide us with information for our main assessment of the impact of meth use on employment.

Substantial consideration was given to the proper specification of the empirical model. Through a series of diagnostic tests, we identified the bivariate probit model as the most appropriate methodology for estimating the joint probability of being unemployed in the past year and reporting meth use in the past year. The bivariate probit explicitly considers the unobserved correlation that is believed to exist between the decision to use meth and the probability of being employed and explicitly models this correlation in the error terms using an assumption of joint normality. Empirical tests of that assumption support the adoption of this model.

For the productivity models, all the models include as additional controls the individual's gender, race or ethnicity, educational attainment, age bracket, marital status, general health status, number of children in the household under the age of 18, number of prior jobs, and population density. The instruments used for identification of the causal association between meth use and unemployment status include indicators of religious attachment (specifically, the number of times in the month the respondent attends religious services), whether the respondent has been offered drugs in the past 30 days, and the age of first use of marijuana, a substance commonly believed to be a gateway drug to other illicit substances, including meth

(Yamaguchi and Kandel, 1984; Kandel and Yamaguchi, 1993). All of these instruments were assessed in terms of their validity, exogeneity, and exclusion criteria using standard assessments (see Appendix B).

The first row of Table 5.2 shows the results from our estimates of the impact of meth use on the probability of being unemployed. Estimates reflect the percentage-point increase in the probability of being unemployed, conditional on meth use in the past year. As the analyses in Appendix B show, we consistently find that self-reported meth use in the past year has a positive and statistically significant association with unemployment in the past year. These findings hold even when the use of other substances is accounted for. Results from our preferred models show that the additional probability of a meth user being unemployed in the past year is 0.97 percentage points, which is about a 10-percent increase in light of the baseline unemployment rate of 9.72 percent. The inclusion or exclusion of other variables does very little to change the magnitude of the effect. The low and high values for the change in predicted probability are relatively close to our best estimate.

In the second row of Table 5.2, we provide information on the population-weighted number of people between the ages of 21 and 50 who reported meth use in the past year (i.e., our best estimate) in the 2005 NSDUH. The 95-percent confidence interval surrounding this population estimate is used to generate the low and high estimates.

To construct an estimate of the cost of the unemployment spell, we must know the average number of weeks for which meth users are unemployed. An examination of weighted means for meth users and non–meth users in the past year reveals that meth users do not have, on average, longer unemployment spells, although there is a lot more variability around their mean. Additional regression analyses confirm that there is no statistical difference in average weeks unemployed. In light of the lack of a statistically significant difference in weighted means, we use the average number of weeks unemployed for the entire population in our estimate of the

Table 5.2
Impact of Methamphetamine Use on Income Due to Unemployment, Population Ages 21 to 50

Effect	Low Estimate	Best Estimate	High Estimate
1 Increased likelihood of being unemployed (from regression analysis) (%)	0.92	0.97	1.03
2 People using meth in past year (weighted counts from the NSDUH)	647,195	870,205	1,093,216
3 Total number of meth-induced unemployed (row 2 × row 1)	5,954	8,441	11,260
4 Average number of weeks unemployed (weighted mean from the NSDUH)	12.75	12.75	12.75
5 Median weekly wage (from the BLS) ($)	201	581	651
6 Lost income per average spell (row 4 × row 5) ($)	2,563	7,408	8,300
7 Total lost income due to meth-related unemployment (row 3 × row 6) ($)	15,260,102	62,530,928	93,458,000

effects of meth on unemployment (12.75 weeks). We multiply this average number of weeks by the average wage[1] to generate the average loss per user attributable to his or her meth use.

Information on the median weekly wage comes from the U.S Department of Labor, which collects information on wage and salaries through the National Compensation Survey (NCS). In light of the significant skewness that exists in wage data, we use the median weekly wage as our measure of lost income rather than the mean weekly earnings, as we think that the former better approximates the typical wage lost by the average employee. The median weekly earnings of full-time wage and salary workers for individuals 16 years and older in 2005 is $651. The median weekly earnings of part-time workers in the same age group in 2005 is $201. To know which estimate should be used as our measure of lost income for meth users, we need to know whether meth users are more or less likely to be employed full time or part time. Using information available in the 2005 NSDUH, we estimated the effect of self-reporting meth use in the past year on the probability of working full time, conditional on working. We found that meth use had no statistically significant effect on the probability of working full time. In light of this, we decided that we would use the part-time median wages as a lower-bound estimate of the cost of unemployment due to meth use and the median weekly wage for full-time and salaried workers as an upper-bound estimate. Our best estimate takes a weighted average of the full-time and part-time wages, where the weights are given by the fraction of the meth-using population who work full and part time $\left(\$580.80 = \left[0.156 \times \$201\right] + \left[0.844 \times \$651\right]\right)$. We then calculate the typical lost income associated with the average-length unemployment spell by multiplying results in rows 4 and 5 (results are rounded to the nearest dollar). The total lost income associated with meth-induced unemployment is the product of the number of meth users unemployed because of meth (row 3) and the typical income lost (row 6).

The estimated range reflects the significant uncertainty in the effect of meth on the probability of a spell, number of meth users, and weekly wages. The best estimate is around $62.5 million, but the bounds on our estimates range from $15.2 million to $93.5 million.

Absenteeism

The literature suggests that employee drug use is associated with increased absenteeism (Bass et al., 1996; Bross, Pace, and Cronin, 1992; Normand, Salyards, and Mahoney, 1990), though the causality of the relationship is not established. The only economics study examining the relationship between illicit drug use and absenteeism that explicitly dealt with the issue of causality found no statistically significant effect between past-year drug use and absenteeism (French, Roebuck, and Alexandre, 2001). However, the study did not explicitly examine meth use. Given the lack of research on causality, we conducted our own analyses and identified two potential sources of absenteeism: missed work due to time in treatment and missed work due to other reasons.

We begin by estimating the lost productivity associated with time spent in drug treatment. We know from the 2005 TEDS that there were 28,055 individuals in treatment with a primary diagnosis of meth abuse who worked full time at the time of their admission. Another

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[1] We have no information in the NSDUH that would enable us to estimate whether meth users have lower wages than do non–meth users. Furthermore, there are inconsistent findings in the general literature on substance use. Given the lack of better information, we presume that the average wage for the population is a suitable approximation for the loss associated with increased unemployment.

12,689 patients reported being employed part time at the time of admission. Although not all of these individuals were receiving therapy in a manner that would preclude them from working, those participating in residential or intensive outpatient therapy would most certainly miss work. This time away from work spent dealing with the drug problem represents a real cost to the employer in terms of lost productivity and can be cleanly attributed to drug use itself.

We attempt to capture these losses by using information on the number of full-time and part-time employees engaged in intensive drug treatment (either inpatient or intensive outpatient) and use information on average LOS by type of service setting to derive the average time spent away from work. If we assume that it is only those individuals in residential treatment (hospital-based or free standing) or those receiving intensive outpatient therapy who are unable to work during their time in treatment (largely because they are physically unable to go to work), we find that there were 6,832 meth patients who were full-time employees missing work and 2,894 part-time employees missing work because of their drug treatment in 2005. However, the typical course of treatment in terms of LOS varies quite substantially even among these more intensive forms of drug treatment. Thus, instead of assuming that all full-time and part-time employees missed the same number of days independent of service setting, we consider the LOS by service modality and construct a weighted average number of days of missed work.

In Table 5.3, we show the breakdown of full-time and part-time primary meth clients admitted to TEDS and receiving care in a residential treatment facility or intensive outpatient treatment facility. The median LOS for each modality, from the 2005 TEDS Discharge Report (SAMHSA, 2008a), is shown in the final column. Given the significant skewness in the distribution of LOS even within modalities, we use the median LOS rather than the mean LOS as an estimate of the actual time spent in treatment in the third column of Table 5.3.

If we take a weighted average of the number of employees times the median LOS (measured in days), we have an estimate of the total number of days missed by full-time and part-time employees while they attended drug treatment. Full-time employees missed 239,501 days of employment, and part-time employees missed 107,805 days of employment (see Table 5.4, row 1).

The first step in our calculation involves converting the number of days in treatment into workweeks so that we can use median weekly wages for full-time and part-time employees to generate our estimate of lost productivity in dollars. The second row of Table 5.4 divides

Table 5.3
Full-Time and Part-Time Employed Methamphetamine Patients in Treatment Facilities, 2005

Service Setting	Full-Time Employees	Part-Time Employees	Median LOS (days)
Rehab, residential, hospital (nondetox)	117	41	3
Rehab, residential, short term	1,524	558	21
Rehab, residential, long term	1,271	660	46
Ambulatory, intensive outpatient	3,540	1,562	42
Total[a]	6,832	2,894	

SOURCE: SAMHSA (2008a).

[a] Totals are slightly lower than stated in the text because information on where the patient is treated is not identified for all individuals in the TEDS data.

Table 5.4
The Value of Lost Work Time Spent in Treatment for Methamphetamine

Time Lost	Full-Time Employed	Part-Time Employed	All Employed
Total number of days absent due to treatment	239,501	107,805	
Weeks absent due to treatment (divide first row by 7 days per week)	34,214.43	15,400.71	49,615.14
Median weekly salary (from the BLS) ($)	651	201	
Economic cost of time spent in treatment ($)	22,273,594	3,095,543	
Total lost productivity caused by time spent in treatment ($)			25,369,137

these days by 7 to generate the number of weeks absent. In the third row, we again report the median weekly wage for full-time and part-time employees, as reported by the BLS. We multiply these median weekly wages by the number of missed workweeks to get the total value of lost work time for full-time and part-time employees separately (row 4). Summing these together generates our total estimated cost associated with absenteeism of $25.4 million.

A major assumption in the construction of this estimate of absenteeism associated with treatment is that the earnings of meth users are similar to those of the average person, as we use the median wage of all employees, which includes meth users and non–meth users. Meth users may have systematically lower earnings, so the use of a measure like the median weekly wage might overstate the actual value of lost productivity. Unfortunately, we do not have data available that will allow us to empirically test whether meth users who work earn less than nonusers do. Thus, in the absence of any empirical support for this notion, we simply rely on aggregate statistics for the population of workers as a whole. The implication of this assumption, if it is true, is that our estimate of lost productivity associated with absenteeism due to treatment may overstate the actual value of lost productivity.

A second major limitation of this calculation is that it assumes that everyone entering treatment retains his or her job and cannot work if in intensive or residential therapy. Thus, it assumes that the time spent in treatment represents productivity that is actually lost, and this is an assumption that cannot be validated in our data. If the assumption is not true, then we may be overstating the productivity losses of those in treatment. However, we also do not capture those who lose their jobs because of treatment, either due to missing too much work or as a penalty for being identified as a drug user. Thus, one could also argue that our estimates of lost productivity are understated. We do not have data that could adequately inform us as to which of these is more likely to be true, so our estimates must be viewed with these alternative interpretations unanswered.

To consider the effect of meth use on absenteeism beyond days lost to treatment, we examine self-reported days of missed work from the NSDUH. The 2005 NSDUH asks respondents about missed workdays through two specific questions:

- How many days in the past month did you miss work because of injury or illness (i.e., “sick/injury days”)?
- How many days in the past month did you miss work because you just did not feel like going to work (i.e., “blah days”)?

In the first and second rows of Table 5.5, we report the estimated effects (obtained from regressions in Appendix B) for the number of workdays missed due to feeling blah and due to sick and injury days, respectively. The low and high estimates in the first row (for blah days) represent the limits of the 95-percent confidence interval for the estimated coefficient, which represents our best estimate. In the case of sick and injury days (second row), the estimated coefficient was not statistically significant at conventional levels of significance in all models. Hence, in this case, we use 0 as our lower and best estimate (reflecting the lack of a statistically significant result from the main instrumental variables [IV] model), and the high estimate is based on the estimated coefficient from using the treatment regression model approach and including substance abuse and income measures. In the third row, we just sum up the total number of missed workdays, on average, per month due to meth use.

In the fourth row, we convert the missed workdays to total number of weeks missed. To generate these measures, we multiply the estimate of workdays missed in the past month by 12 months and divide by 5 days. We use 5 here instead of 7 because most people work only five days per week. In the case of our high estimate, the estimated number of weeks using this method (11.66 weeks) exceeds that which a company would allow the typical worker to miss unless the person was out on disability. Hence, for our upper-bound estimate, we impose the restriction that the employee would not remain employed if he or she missed more than four weeks of work in the year. This also ensures that we reduce the potential effect of double-counting individuals who are out due to illness related to their drug dependency, which was captured in the previous table.

Table 5.5
The Value of Lost Work Time Due to Other Methamphetamine-Related Absences

Loss	Low Estimate	Best Estimate	High Estimate
1 Average effect of meth use on days absent because feeling blah in the past 30 days	0.92	1.42	1.93
2 Average effect of meth use on days absent because of illness or injury in the past 30 days	0	0	2.93
3 Average effect of meth use on days absent per month (row 1 + row 2)	0.92	1.42	4.86
4 Total number of weeks per year missed due to meth ([row 3 × 12 months]/5 workdays per week)	2.21	3.41	4.0[a]
5 Median weekly salary (from the BLS) ($)	201.00	580.80	651.00
6 Number of working meth users who worked all year, ages 21–50 (from NSDUH)	250,284	350,253	450,221
7 Adjustment for percentage of working meth users who use meth at least once a week (36% of row 6)	90,102	126,091	162,080
8 Total cost of lost productivity caused by other absenteeism ($)	40,024,209	249,726,756	422,056,320

[a] Upper bound of four weeks was imposed due to the implausibility of a person retaining his or her job after missing more than four weeks of work in a year without going on disability leave.

We again use the BLS measures of median weekly salary (row 5) to calculate the value of this lost work time. The best estimate for the median weekly salary is constructed as a weighted average of the full-time and part-time salaries, based on the fraction of the population working each as reported in the 2005 NSDUH. We use population weighted estimates, and the 95-percent confidence interval surrounding these, for our best, low, and high (respectively) estimates of the number of people between the ages of 21 and 50 employed and using meth in the past year. However, not all of these working meth users report using meth at a frequency that would cause them to miss two or more weeks of work. In fact, more than one-third of the employed meth users (35.0 percent) report use at a rate of only once a month, and another 29 percent report using less than once a week, making it highly unlikely that their meth use would cause them to miss two weeks of work per year (our low-end estimate). Therefore, in row 7 of Table 5.5, we adjust these population estimates of employed meth users by the fraction of that population that reports using meth at least once a week (36.0 percent).

Finally, we multiply the value of the lost work time (the product of rows 4 and 5) by the number of meth users who were employed during the full year, as reported in the NSDUH. Given these calculations, our best estimate of the lost productivity associated with sick and blah days is about $249.7 million.

Lost Work Due to Incarceration

It is standard practice in previous studies of the cost of drug abuse to consider the value of lost productivity associated with the incarceration of nonviolent drug-market participants (i.e., simple possession and sales offenders) (Harwood, Fountain, and Livermore, 1998; ONDCP, 2001). It is reasonable to argue that these costs are best considered outside of an evaluation of the cost of drug use or abuse because these costs are a function of the policy response to the problem (i.e., prohibition) rather than a direct consequence of meth use itself. Even if meth use continues, the costs associated with lost productivity could change just by changing our policy response to the meth problem. Thus, these costs truly are more a reflection of our policy response than of drug use itself. Nonetheless, so that we can construct an estimate in a fashion that is comparable to other studies on the cost of drug abuse, we consider these costs here.

We begin by trying to estimate the total number of meth-involved offenses that could generate a prison or jail sentence and then cost out the expected sentence served. As discussed in greater detail in Chapter Six, it is extremely difficult to determine the number of simple meth-possession arrests that result in a prison or jail sentence. The vast majority of simple possession arrests, which are misdemeanor charges, result in probation or some other community service. However, there are people in jail and prison with possession offenses. Some of these may be the result of a plea bargain, however. Given the difficulty of trying to approximate the fraction of possession arrests that end in incarceration, we focus our attention here on the lost productivity associated with incarceration for meth-related sales. Unlike possession offenses, there are very good data on the number of meth-related sales arrests from the BJS and the State Court Processing Statistics. According to data from the BJS, there were 52,584 total meth-related sales arrests made in 2005 (row 1 of Table 5.6). Information on the disposition of these sales arrests comes from the State Court Sentencing of Convicted Felons, 2004 Statistical Tables (BJS, 2007), which show that about 73 percent of arrests end in conviction. Of those convicted, 37 percent of those get sentenced to prison (row 3), while 38 percent are sentenced to jail (row 8). Lower and upper bounds come from confidence intervals around these point estimates.

Table 5.6
The Value of Lost Work Time Due to Methamphetamine-Related Incarceration

Loss		Lower Bound	Best Estimate	Upper Bound
1	Total number of meth-related sales arrests	52,584	52,584	52,584
2	Probability of conviction for sales offense	0.71	0.73	0.75
3	Probability of being sentenced to prison for sales offense	0.35	0.37	0.39
4	Total number of meth-related sales arrests resulting in prison term (row 1 × row 2 × row 3)	13,067	14,203	15,381
5	Average prison-sentence length served for a sales offense (years)	1.74	1.74	1.74
6	Average annual income (based on minimum wage) ($)	10,712	10,712	10,712
7	Total cost in lost productivity caused by time spent in prison (row 4 × row 5 × row 6) ($)	243,554,245	264,728,013	286,684,613
8	Probability of being sent to jail for sales offense	0.30	0.38	0.45
9	Total number of meth-related sales arrests resulting in jail term (row 1 × row 2 × row 8)	11,200	14,587	17,747
10	Average jail-sentence length served for sales offense (years)	0.26	0.26	0.26
11	Total cost in lost productivity by time spent in jail (row 9 × row 10 × row 6) ($)	31,183,344	40,626,545	49,427,525
12	Total cost in lost productivity caused by incarceration (prison and jail) ($)	274,747,589	305,354,558	336,112,138

Information on the average prison and jail sentence served (not given) comes from analyses of the 2002 National Corrections Reporting Program, the most recent year of data available. According to these data, the typical meth-sales offender served 1.74 years of his or her prison sentence and 0.26 years of his or her jail sentence (thus we use the actual time served as opposed to time given to calculate our estimate of lost productivity). To value the opportunity cost of the time spent in prison and jail, we use information on the 2005 federal minimum wage to construct an estimate of the annual salary for a full-time worker receiving minimum wage. We use information on minimum wage instead of the median weekly salary used in previous tables because it is well known that people who have been convicted of a criminal offense have a harder time finding a job (and hence being employed) than those who have not and generally are able to get only low-level jobs because of their criminal record. In 2005, the federal minimum wage was $5.15, so assuming that a person could work 40 hours per week 52 weeks per year, the annual income associated with a minimum-wage job would be $10,712. To generate our total loss in productivity due to prison (row 7), we multiply this estimate of the value of lost employment time by the number of years served (1.74) and the number of people convicted to prison. Similarly, to get our total loss in productivity due to jail (row 11), we multiply this average annual income by the number of years served (0.26) and the number of people sentenced to jail. Our total cost of incarceration, therefore, is given as the sum of lost productivity due to prison and jail (row 12). The total cost estimate is $305.4 million with a range from $274.7 million to $336.1 million. The majority of costs, as expected, are generated by lost productivity due to prison rather than jail time.

In Table 5.6, there is not much variation in the lower- and upper-bound estimates of lost productivity associated with incarceration. This is due to the fact that the only variation captured in this calculation is in the number of meth-related sales arrests that result in a prison term (i.e., conviction and sentencing variation).

Employer Costs of Hiring Methamphetamine Users

Employers may also incur costs trying to screen out meth users from employment. Although screening costs comprise a relatively small fraction of the total burden, it is possible to approximate these costs with existing data, as shown next.

Although workplace drug testing is becoming more common, accurate assessment of the extent to which it occurs and the fraction that can be attributed to meth use specifically is not really known. Quest Diagnostics, a national firm that specializes in diagnostic testing, information, and services, reports that it conducted more than 7.3 million drug tests in 2005. According to Quest Diagnostics (2006), more than 12 million employees in safety-sensitive positions, such as truck drivers, airline pilots, mass-transit operators, and mariners, are subject to mandatory drug testing under the U.S. Department of Transportation guidelines. Data from the NSDUH, however, suggest that the number may be even larger, as 32.02 million employees work for companies that conduct random drug testing of current employees (NSDUH, 2006). Nearly 50 million workers report that their employers require a drug test prior to hiring. This suggests that the total number of drug tests conducted by and financed by employers could easily exceed 30 million (assuming that companies do not test everyone in the company every single year but that they do test potential new hires). But how much of the cost of this testing can be attributable to meth specifically? Testing of a single urine sample or hair specimen often involves the identification of multiple substances. For example, Quest Diagnostic's standard urine-specimen tests use a five- or nine-drug panel screen, checking for the presence of a range of drugs or drug classes, including cocaine, marijuana, opiates, amphetamines, and phencyclidine. The marginal cost of testing for meth in a urine sample, therefore, is not the full cost of the test but rather the cost of the extra work required to identify the meth in the specimen. According to information from SAMHSA on workplace drug testing, additional effort is exerted to identify each chemical in a urine specimen even in a multisubstance panel test (SAMHSA, undated). While no information is available on the marginal cost of conducting these subtests, we can approximate the marginal cost using information on the average cost of a drug test.

According to information available from the ONDCP related to student drug testing, individual tests for a range of target drugs can cost anywhere from $10 to $50, depending on the type of test used (e.g., urine, hair, fluids, sweat patch). If we assume that the lower price would pay for the urine test including only a five-drug panel, then the cost of identifying each of the five drugs would be $2. The $2 estimate is less than an average cost, however, because it does not attribute any share of the employee's or testing company's time to meth directly. In effect, the cost is marginal, because we assume that those costs are sunk because testing would have been done in any case for other substances. Similarly, if we used the higher cost estimate of $50 and presumed that this represented the cost of a nine-drug panel, we would get a marginal cost of $5.56 per meth-specific test.

Table 5.7 reports the employer's cost of drug testing under varying assumptions about the cost approach for screening employees. We chose as a lower bound the number of employees subject to mandatory drug testing under the Department of Transportation guidelines and, as an upper bound, the number of people who report that their employer conducts random drug testing of all employees. Our best estimate is simply given as the average of this upper- and lower-bound number of employees tested. Using the conservative estimate of $2 per meth test for both the lower-bound estimate and our best estimate, we get a lower and best estimate of $24 million and $44 million, respectively. In the upper-bound estimate, we instead assume that the cost of a drug test is $50 per test, reflecting a nine-drug panel, which suggests a marginal cost per drug tested of $5.56. The higher cost per drug test in addition to higher number of employees tested generates our much larger estimate for the upper bound of about $178 million paid by employers nationwide.

Limitations

There are a number of limitations of the calculations and assumptions made that should be noted when examining the numbers just presented. First, our work developing an estimate of the value of lost productivity associated with unemployment, absenteeism, and jail and prison time assumes that median wages in the population (or minimum wage, in the case of the incarceration losses) are a good approximation of the wages of meth users. This is an assumption that we had to make because there is little empirical evidence on the effect of meth on wages directly and we had no way to estimate the effect ourselves. Thus, our estimates of the value of time not spent working may, in fact, be biased. Another major limitation of our productivity calculations is the lack of information on other employer costs for employing meth users. To the extent that meth users make greater use of health care services or employee-assistance program (EAP) services that are partially paid for by employers, these meth users may impose a greater cost on employers beyond those calculated thus far. Furthermore, we have not captured the cost to employers of replacing meth employees who are fired because of their meth use. We are unaware of any data from which we can attempt to bound these costs, however, so we are left simply recognizing the fact that they are missing and should be considered in future work if possible.

Table 5.7
Employer Costs of Drug Testing Attributable to Methamphetamine

Cost	Lower Bound	Best Estimate	Upper Bound
Employees tested (millions)	12	22	32
Cost per test ($)	2	2	5.56
Total cost of testing ($ millions)	24	44	177.92

CHAPTER SIX

The Cost of Methamphetamine-Related Crime

There is a strong belief that meth use causes crime and imposes serious costs to the criminal justice system and the rest of society. For example, in 2005, the National Association of Counties released results from a survey of law-enforcement officials from 500 counties in 45 states suggesting that meth-induced crime was increasing, and more than half reported that meth was their county's greatest drug problem. The media have also raised concerns that the expansion of meth use has increased crime (Butterfield, 2004; Suo, 2004) and possibly contributed to the rise of new types of crime, such as identity theft (e.g., Sullivan, 2004).

This chapter focuses on the economic costs associated with what we refer to as *meth-specific offenses* (possession, sales, and meth-related community corrections violations) and *meth-induced offenses* (property and violent crimes) that occurred in 2005. We review the scientific literature on the meth-crime relationship, analyze criminal justice data from several sources, and present a range of cost estimates that we believe to be conservative but credible.[1] The costs we consider fall into three categories:

- costs associated with new arrests for meth possession and sales
- costs associated with meth-specific parole and probation revocation
- costs associated with property and violent crimes caused by meth use.

These components do not encompass all potential costs. We do not consider the effect of meth use on every type of offense (e.g., vandalism) or community corrections violation, nor do we consider all the costs associated with meth-related convictions (e.g., denial of some welfare benefits, denial of student aid, removal from public housing) (GAO, 2005). Quantifying these consequences is important for understanding the full costs of meth use, but data limitations prevent their inclusion here. Even our focus on the three primary cost categories just listed requires significant assumptions to generate estimates of the prevalence of events and their costs.

Table 6.1 summarizes the cost categories considered as well as a range of possible cost estimates. Our best estimate is that meth generated approximately $4.2 billion in crime and criminal justice costs in 2005. The greatest share of costs is due to arrests for meth possession and sales, at $2.4 billion.

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[1] We do not consider the costs associated with those who committed a meth-related offense before 2005 (e.g., someone who was incarcerated for meth sales in 2004 and still serving the sentence in 2005). As noted in Chapter One, we treat criminal justice costs in a manner consistent with the losses associated with premature death, by incorporating the full net present value of future expenditures associated with an offense in 2005.

Table 6.1
Cost of Methamphetamine: Crime and Criminal Justice, 2005 ($ millions)

Cost Category	Lower Bound	Best Estimate	Upper Bound
Meth-specific offenses			
State and local possession offenses	332.2	737.5	2,400.7
State and local sales offenses	757.9	892.5	1,186.8
Federal possession and sales offenses	729.5	745.2	761.0
Meth-related parole and probation revocation for technical violations	14.8	70.4	125.9
Other parole and probation violations	NI	NI	NI
Meth-induced crime			
Index crimes	743.6	1,764.2	11,266.5
Identity theft	NI	NI	NI
Other crimes	NI	NI	NI
Total	2,578.0	4,209.8	15,740.9

There is a tremendous amount of uncertainty surrounding these estimates, as evidenced by the large difference between our low and high estimates (i.e., the range). It is noteworthy that neither the best estimate nor the range includes consideration of meth-induced identity theft. We discuss this issue in Chapter Nine.

Cost of Methamphetamine-Specific Arrests

Methamphetamine Offenses at the State and Local Levels

Possession and sale of meth is illegal in all 50 states and the District of Columbia, although the statutory penalties vary considerably (ImpacTeen, 2002). Because federal law also prohibits the possession and sale of meth, any meth offense can be adjudicated at the federal level; however, federal law-enforcement agencies typically focus on trafficking and high-volume cases. This means that state and local law-enforcement agencies handle the bulk of the possession and sales cases in the United States.

Possession. We begin by calculating the number of arrests for meth at the state and local levels. Because Federal Bureau of Investigation (FBI) statistics lump meth with other dangerous, nonnarcotic drugs (e.g., other types of amphetamine, benzodiazepines), we apply the ratio of meth to the total number of dangerous, nonnarcotic mentions from the treatment population (SAMHSA, 2007c) to generate our meth-specific count.[2] As shown in Table 6.2, the estimated number of meth arrests in 2005 is then approximately a quarter of a million. The lower and upper bounds for the cost of these arrests come from a drug-court cost study (for one jurisdiction; NIJ, 2006) and an analysis of the marginal cost of a drug arrest in

[2] Using TEDS 2005 that was last updated on April 25, 2008, and assuming that all amphetamine mentions for Oregon in 2005 are actually meth mentions (based on personal communication with treatment officials in Oregon), we put this figure at 71.2 percent.

Table 6.2
State and Local Possession Offenses, Misdemeanor Arrests

Cost Element	Lower Bound	Best Estimate	Upper Bound
Cost per arrest, police ($)	477	1,085	1,693
Cost per arrest, court ($)	680	1,287	1,895
Probability of conviction	0.31	0.61	0.61
Average probation-sentence length (years)	2.10	2.10	3.17
Probation served (%)	50	75	100
Probation served (years)	1.05	1.58	3.17
Cost per year ($)	701	730	3,450
Net present value of probation sentence ($)	735	1,137	10,478
Number of arrests	240,572	240,572	240,572
Total cost ($)	332,234,780	737,549,339	2,400,713,222

SOURCES: FBI (2006); Carlson (undated); DCJS (2008); NIJ (2006); Fischer (2005); analyses of SAMHSA (2007c).

Washington state (Aos et al., 2004), respectively. Each study has its strengths (e.g., one figure is more recent and was published in an NIJ report, and the other is a true marginal cost based on multivariate regressions), and, for lack of better information, we simply take the midpoint of these estimates for our best estimate.

Because there is no nationally representative database that will allow us to track conviction rates and sentences for misdemeanor offenses, we pull these estimates from a variety of sources and make some simplifying assumptions.[3] We assume that all possession arrests are charged as misdemeanors and that the only punishment is probation. Obviously, some offenders are incarcerated for possession (before or after trial), so this is a conservative assumption that will underestimate the true cost of a possession arrest. The probability of conviction given a possession arrest is set to equal the conviction rate published for all misdemeanors in the state of New York in 2005 (61 percent; DCJS, 2008). This number could be high or low if drug crimes have lower or higher rates of conviction than do other misdemeanor charges. Regardless of whether it is high or low on that account, the number is likely an overestimate because it is based on those cases that actually make it to court, thus excluding cases in which the charge was not filed. That factor is difficult to quantify,[4] so, for a low estimate, we assume that the conviction rate for meth is 30.5 percent—half the all-misdemeanor, complaint-only rate for New York. Sensitivity analyses reveal that using this more conservative figure reduces the total crime costs by only about 3 percent.

The next step is to determine the sentence length. The lower and upper bounds for probation sentences come from a meth-specific report from Wisconsin (Fischer, 2005) and the average probation sentence for those convicted of felony sales in state courts (BJS, 2007), respec-

[3] There is tremendous variation in state and local policies with respect to what constitutes misdemeanor versus felony possession.

[4] For example, for California, we can identify the share of misdemeanor arrests for which law enforcement sought a complaint, but this does not mean that the prosecutor actually filed the complaint. Calculating this figure for misdemeanor drug arrests is also complicated by court diversion programs and how they are handled in each substate jurisdiction.

tively. In the eyes of the law, selling is more harmful than possession, so this seems like a credible upper bound. Because the Wisconsin figure is specific to meth, we use it as our best estimate. It is also important to note that we cannot assume that the full probation sentence will be served. Technical violations and new arrests are not uncommon for probationers, especially those with substance use problems. For the cost estimates, our best guess assumes that, on average, 75 percent of the sentence will be served.[5]

For the annual cost of probation, we begin with a report from Minnesota suggesting that annual probation costs for a meth offender were $701 (Carlson, undated). Probation costs are likely to differ within and across states, but this figure is consistent with our belief that county probation generally costs about $2 per day. Data from the Georgia Department of Corrections (undated) suggest that "Standard probation supervision costs $1.43 per probationer per day. Intensive or Specialized Probation Supervision costs $3.46 per day." So for lack of a precise estimate or a breakdown for regular and intensive cases, our best estimate is that probation costs are $2 per day, for an annual cost of $730. The upper bound is the annual cost for federal probation for all offenses (U.S. Courts, 2006). This is an upper bound because one would expect federal probation to be more resource intensive because it is dealing with more serious offenders. We use a discount rate of 4 percent to generate the net present value of the sentence.

This approach generates a best estimate of $737.5 million attributable to state and local arrests for meth possession. The uncertainty in our factors is substantial, as is indicated by the range of $332.2 million to $2,400.7 million.

Sales and Trafficking. Table 6.3 reports the costs associated with sales and trafficking arrests made at the state and local levels. Many of the estimates and sources are the same as those used for the possession calculation, so this section will highlight only those that differ. We assume that all arrests for sales are felonies, but we do not assume that all subsequent convictions are for felonies (e.g., the defendant could plea-bargain down to a misdemeanor possession offense and serve a jail sentence or probation).

Unlike misdemeanor possession, there are good data available about felony sales arrests in state and local courts. There are two major sources for information about felony conviction rates and type of sentence: *Felony Defendants in Large Urban Counties, 2004* (Kyckelhahn and Cohen, 2008) and *State Court Sentencing of Convicted Felons* (Durose, 2007). Unfortunately, neither of these sources is perfect for our purposes. First, neither source includes information specific to meth—we must rely on general information about drug-trafficking convictions. Second, the information from urban counties may not reflect the sentencing practices for meth, a drug that is popular in rural areas. Third, the information for convicted felons does not account for those who were charged with a felony but convicted of a misdemeanor. Since the information from Durose (2007) generates the largest upper-bound costs, we use these figures for the conviction rate and distribution of sentences conditional upon conviction (prison with parole, jail, or probation) for our upper bound.[6] We use the information from Kyckelhahn and Cohen (2008) for the lower bound and, for lack of better information, use the midpoint as our best estimate.

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5 Some offenses are more likely to be detected when someone is being supervised in the community (e.g., drug use via drug testing). Since we do not include these costs in our calculations, we err on the side of being conservative.

6 This is attributable to the higher prison and parole rates and the fact that, in the upper bound, the net present value for probation is larger than the net present value for jail.

Table 6.3
State and Local Sales Offenses, Felony Arrests

Cost Element	Lower Bound	Best Estimate	Upper Bound
Costs per arrest, police ($)	477.00	1,084.93	1,692.85
Costs per arrest, court ($)	680.00	1,287.25	1,894.50
Percent convicted[a]	75	73	71
Probability sentenced to prison[a]	0.35	0.37	0.39
Average prison-sentence length (years)	4.25	4.25	4.25
Prison sentence served (%)	41	41	41
Prison sentence served (years)	1.74	1.74	1.74
Cost per year, prison ($)	23,579.53	23,579.53	24,977.67
Net present value of prison sentence ($)	40,357.27	40,357.27	42,750.24
Average parole-sentence length (years)	2.17	2.33	2.50
Cost per year, parole ($)	1,062.16	3,031.08	5,000.00
Net present value of parole sentence ($)	2,250.41	6,870.37	12,119.08
Probability sentenced to jail[a]	0.45	0.38	0.30
Average jail-sentence length (years)	0.50	0.50	0.50
Jail sentence served (%)	52	52	52
Jail sentence served (years)	0.26	0.26	0.26
Cost per year, jail ($)	21,845.66	21,845.66	24,977.67
Net present value of jail sentence ($)	5,679.87	5,679.87	6,494.19
Probability sentenced to probation[a]	0.19	0.24	0.28
Average probation-sentence length (years)	3.17	3.17	3.70
Probation sentence served (%)	50	75	100
Probation sentence served (years)	1.58	2.38	3.70
Cost per year, probation ($)	700.00	730.00	3,450.00
Net present value of probation sentence ($)	1,090.38	1,688.39	12,103.95
Number of arrests	52,584	52,584	52,584
Total cost ($)	757,938,084	892,501,455	1,186,831,103

SOURCES: Aos et al. (2004); BJS (undated, 2004, 2006b, 2007); FBI (2006); Kyckelhahn and Cohen (2008); Carlson (undated); NIJ (2006); DCJS (2008); analyses of SAMHSA (2007c).

[a] We use figures from Durose (2007) for the upper-bound estimates of the conviction rate and distribution of sentences conditional upon conviction (prison with parole, jail, or probation). We use the information from Kyckelhahn and Cohen (2008) for the lower bound and, for lack of better information, use the midpoint as our best estimate.

The length of prison, jail, and probation sentences imposed is based on the mean sentences for all felony drug offenses reported by BJS (2007; BJS, undated, Table 5.48.2004). The one exception is the upper-bound estimate for the average probation sentence: This is specific to meth sales in Wisconsin and is considered the upper bound simply because it is higher (3.7 years) than the average from the state-court statistical tables.

Actual time served for dangerous-drug convictions was calculated to be 41 percent and 52 percent for state prison and local jail sentences, respectively, from our analyses of 2002 National Corrections Reporting Program (NCRP) data.[7] The lower-bound estimate of the cost of incarceration (prison and jail, separately) is based on the marginal resource operating costs for one year of supervision in a Washington State Department of Corrections institution (Aos et al., 2004). The upper bound is based on the average annual operating cost per state inmate published by BJS (2004). The lower bounds are calculated separately for jail and prison; the upper bound is based only on prison and applied to both. The low and high estimates are very close for prison, and we use the lower bound as the best estimate for jail and prison, since it captures the marginal cost. Once again, we use a discount rate of 4 percent to generate the net present value of the sentence.

Finally, we also consider that many of those released from prison will be subject to parole supervision. If we assume that those leaving prison serve the rest of their time on parole, then the average parole sentence would be nearly 30 months (4.25 years minus 1.74 years). This is close to the 26-month average reported by the BJS for parolees released after spending at least one year in state prison (BJS, 2004). We use these figures as the upper and lower bounds, respectively, and use the midpoint (28 months) as the best estimate. For the lower-bound costs, we use the annual rate from Georgia ($1,062) (Georgia State Board of Pardons and Paroles, undated), and, for the upper bound, we use the annual rate reported by the Massachusetts Executive Office of Public Safety and Security ($5,000) (EOPSS, undated). Taking the midpoint as the best estimate seems reasonable, since these seem like reasonable bounds and $3,000 is consistent with some of the other estimates we have uncovered.[8]

The economic cost of parole includes more than government expenditures on supervision, drug testing, and possibly programming. There is also the risk that a parolee will be caught for a criminal offense, which would result in another round of adjudication and sanction costs to the criminal justice system. While this monograph does explore the costs of parole and probation violations directly related to meth (see "Cost of Community Corrections Revocations," later in this chapter), we do not consider the other costs.

The best estimate for the total cost of felony arrests for state and local sales offenses is approximately $892.5 million, with a range from $757.9 million to $1,186.8 million.

Methamphetamine Offenses at the Federal Level

Table 6.4 reports the figures used to calculate the costs associated with federal drug arrests. The number of federal meth-related arrests in 2005 is based on a Drug Enforcement

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[7] Based on NCRP offense code categories 350 and 390. Time served was calculated by dividing time served on current admission by total prison sentence.

[8] Parole cost estimates for other states appear to fall in this range (in 2005 dollars)—e.g., New York, $3,000 (Prisoner Reentry Institute, undated), and Washington, $3,542 (Aos et al., 2004).

Table 6.4
Federal Methamphetamine Offenses

Cost Element	Lower Bound	Best Estimate	Upper Bound
Number arrested and booked	6,090	6,090	6,090
Cost per arrest ($)	477	1,693	1,693
Adjudication and trial costs per arrest ($)	680	1,895	1,895
Number incarcerated	5,035	5,035	5,035
Average prison-sentence length (years)	8.03	8.03	8.03
Average prison sentence served (%)	85	85	87
Average prison sentence served (years)	6.83	6.83	6.99
Cost per year, prison ($)	23,432	23,432	23,432
Net present value of prison sentence ($)	143,117	143,117	146,080
Number sentenced to probation	347	347	347
Average probation-sentence length (years)	3.17	3.17	3.17
Average probation sentence served (%)	50	75	100
Average probation sentence served (years)	1.58	2.38	3.17
Cost per year, probation ($)	3,450	3,450	3,450
Net present value of probation sentence ($)	5,374	7,979	10,478
Total ($)	729,505,478	745,210,370	760,996,105

SOURCES: Aos et al. (2004); BJS (2006a, 2006b); NDIC (2007a); Carlson (undated); USSC (2006); U.S. Courts (2006).

Administration (DEA)–sourced table published in the National Drug Intelligence Center's *National Drug Threat Assessment 2008* (NDIC, 2007a, Appendix C, Table 4).

The low and high estimates for arrest and court costs are the same as those used for the state courts. However, the best estimate now reflects the high marginal cost estimate, because we would expect, on average, that the federal cases would be more expensive: They often involve more serious offenders. The cost of incarcerating someone in a federal prison in 2005 was calculated by the Bureau of Prisons and the Administrative Office of the U.S. Courts (U.S. Courts, 2006).

The U.S. Sentencing Commission (USSC) publishes detailed information on the number of individuals incarcerated in a federal prison for meth (these figures do not distinguish between sales and possession offenses) as well as the average sentence length. The data for January 12, 2005, through September 30, 2005, suggest that 3,614 individuals were sent to prison for meth for an average of 96.4 months each. Annualizing this total to estimate the full year $\left(\left[3{,}614/262\right]\times 365\right)$ generates a figure of 5,035 federal defendants sent to prison for meth in 2005. Truth-in-sentencing laws mandate that at least 85 percent of the sentence be served, and Sabol and McGready (1999) estimate that an average of 87 percent of each sentence is served.

To estimate how many individuals were sentenced to probation, we take the number of drug offenders sentenced to probation and divide it by the number of suspects arrested for drug offenses in fiscal year (FY) 2004 $\left(\left[1{,}879/32{,}980\right]=0.057\right)$ (BJS, 2006b). We then multiply this rate by the number of individuals arrested for meth at the federal level in 2005 (6,090) to generate an estimate of 347 individuals sentenced to probation.

This approach generates a best estimate of $745.2 million attributable to federal arrests for meth. The range is fairly narrow, from $729.5 million to $761.0 million.

Cost of Community Corrections Revocations

It is not uncommon for a parolee or probationer to be incarcerated before completing his or her term of community supervision. While some of these individuals are sentenced to prison or jail for committing a new crime, others are incarcerated for violating a condition of their supervision (e.g., do not use drugs, do not associate with gang members). A publication from the BJS (2008b) reports the percentage of parolees who were reincarcerated because of a positive drug test. Table 6.5 presents these results for the seven states listed in the report. The shares range from 3 percent in Florida to 16 percent in South Dakota. It is important to note that these reincarceration rates would likely be higher if all possible technical violations were considered.

The percentages shown in Table 6.5 are probably smaller than the percentages failing a drug test. Probationers and parolees usually do not have supervision revoked after the first technical violation, especially if it is a positive drug test (see, e.g., Deschenes et al., 1996; Kleiman et al., 2003). Instead, revocation usually occurs after there have been several technical violations or the individual commits a new crime. This section focuses on the costs associated with revocation only for a technical violation that leads to imprisonment—we do not consider the costs and consequences associated with other violations.

In 2005, almost 192,000 individuals were discharged from parole and returned to incarceration for a technical violation or a new offense (BJS, 2006b). Furthermore, more than 350,000 probationers, or 16 percent of the total,[9] left probation because they were incarcerated.

Table 6.5
Adult Parolees Returned to Prison Because of a Positive Drug Test

State	Parolees (%)
Florida	2.9
Hawaii	9.7
Michigan	6.3
Pennsylvania	3.6
South Dakota	15.8
Utah	9.4
Wyoming	5.4

SOURCE: BJS (2008b).

NOTE: This figure was reported for only seven states.

[9] Sometimes, probation is revoked but the individual is not incarcerated. This accounts for 13 percent of the probation exits in 2005.

To determine what share of these individuals were returned to prison or jail for a meth-related technical violation (e.g., failed a drug test or did not show up to drug treatment), we turn to the BJS inmate surveys. The BJS conducts nationally representative surveys of inmates within the state and federal correctional systems, as well as those in jails. The Survey of Inmates in State Correctional Facilities (SISCF) and Survey of Inmates in Federal Correctional Facilities (SIFCF) were most recently collected in 2004, and the Survey of Inmates in Local Jails (SILJ) was collected in 2002.[10] (We assume no change in percentages returned for a meth violation between the 2002 and 2004 surveys and the 2005 year of interest.)

Our analyses of the 2004 state and federal prison inmate surveys suggest that 253,736 and 324,088 of all prison inmates were on parole and probation, respectively, when they started serving their time in prison. They could have been incarcerated for a new crime or a technical violation. Our analysis of the 2002 jail inmate survey suggests that 24,247 and 107,566 of these inmates were on parole and probation, respectively, when they started serving their time in jail. To determine the share of these revocations that are attributable to meth-related technical violations, we constructed slightly different criteria for our low and high estimates, based on the information available in the inmate surveys.

- low
  - used meth regularly
  - did not use other illegal drugs regularly
  - was not incarcerated for a new offense
  - had one of the following technical violations:
    - failed drug test
    - drug possession
    - not taking drug test
    - failing to report to treatment
- high
  - used meth regularly
  - was not incarcerated for a new offense
  - had one of the following technical violations:
    - failed drug test
    - drug possession
    - not taking drug test
    - failing to report to treatment
    - failing to report to counselor
    - failing to report to officer
    - leaving jurisdiction.

While the violations considered in the *low* definition are drug-specific, the additional violations considered for the *high* definition could be drug related if the individual was trying to avoid a drug test or the consequences of testing positive, but we cannot be certain of this. The individual could be a regular meth user who absconded for another reason. For lack of better information, we use the midpoint between these figures for our best estimate.

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[10] While the jail survey includes those who are being held for trial, we limited the sample to those who were currently convicted offenders serving sentences in local jails or awaiting transfer to prison.

The typical sentence for parole revocation depends on the state. In California, the maximum sentence for a technical violation is one year (CDCR, undated). In other states, parolees can be sent back to prison to serve out the remainder of their term, which can exceed one year.[11] To generate a range, we use data from the 2002 National Corrections Reporting Program on actual prison time served for those whose were incarcerated for a parole or probation violation.[12] The 95-percent confidence intervals are 8.25–10.1 months and 4.01–5.46 months for parole and probation violations, respectively. Data from California show that parolees returned to prison for a drug-related technical violation serve, on average, four months in prison (Travis, 2003). Because California accounts for a large share of all prisoners nationally who are returned to prison for a technical parole violation, we will consider four months to be the lower bound for parole. We use the 95-percent confidence intervals for the best estimate and upper bound. We do the same for the probation numbers, again adopting the California parole figure for the lower bound. For lack of better information, we use these same sentences for parolees and probationers sent to jail. We use the court costs discussed in the preceding section for processing new arrests to approximate the cost of a revocation hearing (see Table 6.6).

Table 6.6
Cost of Methamphetamine-Related Parole and Probation Revocations

Parole and Probation Revocations	Lower Bound	Best Estimate	Upper Bound
Parolees incarcerated before completing sentence	191,800	191,800	191,800
Share of these parolees returned to prison for meth-related technical violation	0.0030	0.0110	0.0190
Share of these parolees returned to jail for meth-related technical violation	0	0.0001	0.0003
Probationers incarcerated before completing sentence	353,552	353,552	353,552
Share of these probationers returned to prison for meth-related technical violation	0.0027	0.0051	0.0075
Share of these probationers returned to jail for meth-related technical violation	0.0006	0.0009	0.0013
Parole served for technical violation (years)	0.33	0.76	0.84
Probation served for technical violation (years)	0.33	0.33	0.46
Cost per year, prison ($)	23,579.53	23,579.53	24,977.67
Cost per year, jail ($)	21,845.66	21,845.66	24,977.67
Cost per revocation hearing ($)	680.00	1,287.25	1,894.50
Total ($)	14,817,119	70,370,070	125,923,022

SOURCES: Aos et al. (2004); BJS (2006b); CDCR (undated); Travis (2003); author analyses of SISCF, SIFCF, and SILJ (see Appendix D for more information on the calculations).

[11] For example, the Delaware Board of Parole (2007) notes, "Offenders on parole or conditional release are under the jurisdiction of the Board of Parole and may be returned by the Board to prison to serve the balance of their sentence if they fail to abide by the conditions of supervision."

[12] Based on the item inquiring about the offense with the longest sentence.

These costs are, by far, the smallest of our included categories. The best estimate of meth-related parole and probation violations totals $70.4 million. The upper and lower bounds are $14.8 million and $125.9 million, respectively.

Cost of Methamphetamine-Induced Crime

The meth-specific crime costs just discussed reflect the control regime. In contrast with all the other costs estimated in this monograph, the costs of the control regime would disappear if the regime were removed. The cost of meth-specific crime is thus not a cost of meth use in the same sense as all the others are. In this section, however, we discuss crime costs that are not specific to the control regime and that are presumably kept in check by it.

Background: Methamphetamine's Link to Property and Violent Crime

The academic literature supports an association between meth use and a variety of property and violent crimes. A survey of 655 meth users in Queensland found that a substantial number had committed property and violent crimes; these users often cited meth use or the need to pay for meth as the cause (Lynch et al., 2003). A substantial share of respondents also reported that their meth use had caused them to be violent toward partners (35 percent), close friends (29 percent), friends or acquaintances (33 percent), family members (27 percent), or strangers (29 percent) at least once.

Similarly, Sommers, Baskin, and Baskin-Sommers's (2006) survey of meth users found that users were substantially involved in criminal behavior, including drug use and sales, nonviolent (economic) crime, and violent crime. Cartier, Farabee, and Prendergast (2006) found that 20 percent of parolees reported having used meth in the 30 days prior to the interview. They were also significantly more likely than nonusers to have been returned to custody or to self-report having committed a violent act (including robbery) in the previous 30 days. However, there was no difference in the probability of being returned to prison for a violent offense. Past-30-day use was significantly associated with self-reported violence regardless of controls for involvement in drug trade. Logistic regressions suggest that use was associated with a greater likelihood of return to prison in general (with and without controlling for drug-trade involvement) but not for return due to a violent offense. Furthermore, our tabulations of positive drug tests among arrestees in the Arrestee Drug Abuse Monitoring data show that meth use is significantly higher among those arrested for property crimes and violent crimes relative to the general population, with 13.53 percent of violent offenders and 21.68 percent of property offenders reporting use of meth in the past year (IPCSR, 2004).

But correlation is not the same as causality, and the limited literature on this topic provides little support for a causal link between meth use and crime. A forthcoming article by Dobkin and Nicosia leverages exogenous variation from a significant supply shock for meth precursors to examine this issue. The instrumental-variable regressions do not provide strong evidence of a significant causal link between meth use (proxied by hospital admissions for meth use) and property and violent crimes. There are two potential explanations. The first is that there is not a causal relationship. The second is that the supply shock did not reduce meth use among those users who commit property and violent crime.[13] Unpublished dissertation work by Rafert (2007) likewise finds no association with violent crime but a potential link to property crime.

Another approach to understanding the relationship between meth use and other crimes relies on offender self-reports. The BJS inmate survey data sets include information about the type of crime committed, the inmate's use of meth and other substances, whether the inmate was under the influence of meth at the time of the offense, and whether the inmate was in need of money for drugs at the time of the offense. However, there are several limitations to using the inmate surveys to determine the effect of meth on crime:

- Individuals incarcerated for a crime may be different from those who commit the same type of offense but are not incarcerated.
- Recall and social-acceptability biases may reduce the accuracy of the self-reported information.
- Being under the influence does not necessarily mean that the inmate would not have committed the offense if he or she were not using meth.
- It is hard to establish meth causality if the inmate was a polysubstance user.

That being said, these surveys represent the best available data for understanding the relationship between meth use and crime.

The goal is to estimate the number of crimes that are caused by meth and then generate an estimate of their costs. We focus primarily on the seven index crimes from the FBI's Uniform Crime Report (UCR): murder and nonnegligent manslaughter, forcible rape, aggravated assault, robbery, burglary, motor-vehicle theft, and larceny.

First, we estimate the attribution factor—that is, the percentage of inmates whose actions can be attributed to their meth use. We conservatively define an offense as meth-induced if the inmate meets the following criteria:

1. not a regular user of other illicit drugs
2. not under the influence of other illicit drugs at time of offense
3. not under the influence of alcohol at time of offense
4. (regular meth user *and* committed crime in order to obtain drugs or money for drugs) *or* (under the influence of meth alone at time of offense).

We generate a best and low estimate of the attribution factors for each offense category based on the mean and the lower bound of the 95-percent confidence interval associated with the inmate survey data. For the high estimate, we drop criteria 1 through 3 and focus only on cases that meet the fourth and use the upper bound of the 95-percent confidence interval. Second, we use these shares to generate the number of incarcerated persons in 2005 with incarcerations attributed to meth and, from that, the number of crimes in 2005 attributed to meth. Finally, to calculate the economic cost of the crime, we multiply these counts by the crime-specific social costs per offense. These cost figures come from French, McCollister, and

[13] For property crime, it is also possible that fewer users were committing crimes but that the increased crime committed by remaining users to support the rising cost of addiction offset the other users' drop in crime.

Reznik (in review) and include the criminal justice costs as well as the intangible costs imposed on crime victims.

Approach and Results

First, from the inmate surveys, we estimated the percentage of the inmate population being held for each of the seven index crimes. We assigned each inmate to an offense category based on his or her controlling (i.e., most serious) offense. One concern with this approach is that the crime that the inmate reports as being principally responsible for his or her sentence may differ from the most serious crime committed, which is the one in which we are interested. Moreover, given the nature of the plea-bargaining and the selection of charges for trial, it is unclear whether meth users face more severe, less severe, or similar charges for the crimes committed as compared with non–meth users. It would be very difficult to tease meth use out of the multitude of sentencing considerations. We thus assume that the offense committed is the one driving the sentence and that the effect of meth usage on the selection of crimes brought for trial is negligible. These are, however, potential areas for further study.

Having obtained the share of the inmate population in each institution that was being held for each controlling index offense, we then multiplied these percentages by the total inmate population by type of institution in 2005 as obtained from BJS (2006a) documents. Relying on the assumption that the distribution by crime has not changed between the survey years and 2005, we were able to calculate the number of inmates for each controlling offense category. These inmate percentages and populations can be found in Table 6.7.

Our second step was to estimate the percentage of inmates being held for each controlling offense whose offense was attributable to meth. To do this, we implemented the four criteria given in the preceding section. First, we needed to identify the subpopulation of inmates who were current regular meth users. The survey asks specifically about use of meth ("such as ice or crank"), as distinguished from other amphetamines. *Current regular use* was defined as the use

Table 6.7
Convicted Inmates in Correctional Institutions in 2005, by Offense

	Institution					
	Jail		State Prison		Federal Prison	
Crime	Percent	Number	Percent	Number	Percent	Number
Murder or manslaughter	1.3	3,298	13.4	166,180	2.9	5,057
Rape, forcible	0.9	2,348	3.6	44,950	0.2	350
Assault	9.8	25,909	7.7	95,349	1.3	2,345
Robbery	2.6	6,860	12.7	157,636	8.6	15,048
Burglary	5.2	13,825	8.3	102,284	0.5	787
Motor-vehicle theft	0.9	2,322	1.2	15,231	0.1	210
Larceny	7.0	18,495	3.9	48,294	0.5	805
Total		263,837		1,238,300		174,972

SOURCE: Author analysis of inmate surveys. See Appendix D for a description of the calculations.

of meth on average at least weekly in the month before arrest. Similar definitions were used to define *current regular use* of other drugs, such as heroin, other amphetamines, cocaine, ecstasy, and marijuana.

It is unrealistic to assume that every crime committed by a current meth user is committed because of meth.[14] Two questions about the offense provide additional evidence on the cause of the crime. Inmates were asked whether they intended to commit the crime in order to obtain drugs or money for drugs and whether they were under the influence of meth when the crime was committed. We calculated the share of those responding positively to one or both of these two questions for each offense category.[15] Multiplying these percentages by our shares of current, regular meth users, we developed estimates of the share of each offense category that could be attributed to meth, together with 95-percent confidence intervals.

For the lower-bound and best estimates, we wanted to incorporate the idea of causality. We interact the lower bound of the confidence interval from the approach just described with the results of regressions assessing potential causality. These regressions, shown in Appendix C, examine the relationship between each offense category and a proxy for meth prevalence. If a significant association is found, we use the lower bound of the confidence interval as our lower-bound estimate. If no significant relationship is identified, we use 0 as our lower bound. These regressions suggest a relationship with income-generating property crime but not violent crime. As a result, we set our lower bounds as well as our best estimates for violent crimes to 0. The lower-bound, best, and upper-bound estimates for the share of inmates whose crimes can be attributed to meth can be found in Table 6.8 for each type of institution.

Next, we combine the percentages from Table 6.8 with the number of inmates from Table 6.7 to calculate the number of inmates incarcerated for each offense category attributable to meth. These estimates can be found in Table 6.9.

This calculation produces the number of inmates whose incarcerations were attributable to meth in each of the institutional settings in 2005, but not the number who were sentenced in 2005 in each offense category. As a result, it is useful for determining correctional costs in 2005 owing to meth but less so for estimating the societal costs that emanated from meth-induced criminality in 2005.

To estimate ranges for the numbers of crimes committed attributable to meth, we apply the distribution of inmates across index crimes that are attributable to meth (from Tables 6.7 and 6.9) to the counts of index crimes reported in the 2005 UCR (BJS, 2008a). Table 6.10 reports these figures for 2005.

The last step is to convert the estimates of the number of incarcerations and number of crimes attributed to meth into dollar estimates of the costs. To do so, we need estimates of the costs—tangible and intangible—of each offense category. We use the most recent estimates available in the literature (French, McCollister, and Reznik, in review). French and his coauthors use COI and jury compensation methods to generate their estimates. *Intangible costs* are defined as "indirect losses suffered by crime victims, including pain and suffering, decreased quality of life, and psychological distress" (p. 2) and are adjusted for the risk of homicide. The tangible costs include direct crime-victim costs, criminal justice–system costs,

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[14] And, as a reviewer notes, we cannot rule out that former users may commit meth-related crimes if past meth use contributes to current unemployment.

[15] Those for whom these questions were refused or left blank were excluded.

Table 6.8
Percentage of Incarcerations Attributable to Methamphetamine, by Offense and Institution Type

	Institution (%)								
	Jail			State Prison			Federal Prison		
Crime	Low	Best	High	Low	Best	High	Low	Best	High
Murder or manslaughter[a]	0	0	0.0	0	0	2.5	0	0	0.7
Forcible rape[a]	0	0	0.0	0	0	2.0	0	0	0.0
Assault[a]	0	0	4.7	0	0	3.3	0	0	1.1
Robbery[a]	0	0	0.8	0	0	3.3	0	0	0.9
Burglary[b]	0.7	4.7	9.9	1.9	3.0	6.3	0	0	0
Motor-vehicle theft[b]	0	16.2	33.2	4.8	9.9	20.6	0	0	0
Larceny[b]	0	1.6	5.9	1.8	3.4	6.3	0	8.4	20.3

SOURCE: Author analysis of inmate surveys. See Appendix D for a description of the calculations.

[a] Lower bounds are based partially on regressions. For murder or manslaughter, forcible rape, assault, and robbery, where regression estimates suggest no causality, our lower bounds are 0.

[b] Lower bounds for shares were bounded at 0 when confidence intervals provided negative estimates.

and crime career costs. French, McCollister, and Reznik (in review, pp. 1–2) define these cost components as follows:

- *victim costs:* "Direct economic losses suffered by crime victims, including medical care costs, lost earnings, and property loss/damage"

Table 6.9
Number of Incarcerations Attributable to Methamphetamine, by Offense and Institution Type

	Institution								
	Jail			State Prison			Federal Prison		
Offense	Low	Best	High	Low	Best	High	Low	Best	High
Murder or manslaughter	0	0	0	0	0	4,154	0	0	35
Forcible rape	0	0	0	0	0	899	0	0	0
Assault	0	0	1,218	0	0	3,147	0	0	26
Robbery	0	0	55	0	0	5,202	0	0	135
Burglary	97	650	1,369	1,943	3,069	6,444	0	0	0
Motor-vehicle theft	0	376	771	731	1,508	3,138	0	0	0
Larceny	0	296	1,091	869	1,642	3,043	0	68	163

SOURCE: Author analysis of inmate surveys.

Table 6.10
Offenses Attributable to Methamphetamine

Offense	Total Offenses from UCR	Share of Offenses That Are Meth Induced			Number of Meth-Induced Offenses		
		Low	Best	High	Low	Best	High
Murder or manslaughter	16,740	0	0	2.4	0	0	402
Rape, forcible	94,347	0	0	1.9	0	0	1,780
Aggravated assault	862,220	0	0	3.6	0	0	30,624
Robbery	417,438	0	0	3	0	0	12,537
Burglary	2,155,448	1.7	3.2	6.7	37,619	68,562	144,056
Motor-vehicle theft	1,235,859	4.1	10.6	22	50,866	131,081	271,931
Larceny	6,783,447	1.3	3	6.4	87,239	201,266	431,241

SOURCES: Offense figures are from the 2005 UCR, and meth attribution factors are based on analyses of the inmate surveys.

- *criminal justice–system costs:* "Local, state, and federal government funds spent on police protection, legal and adjudication services, and corrections programs, including incarceration"
- *crime career costs:* "Opportunity costs associated with the criminal's choice to engage in illegal rather than legal and productive activities."

Table 6.11 shows the wide dispersion in the costs of index crimes, from $1,583 for larceny to $7.9 million for murder. In Table 6.12, we multiply the total cost for each offense category by the number of offenses that were attributed to meth. This represents a significant

Table 6.11
Costs by Offense Category, 2005 ($)

Offense	Cost ($)		
	Tangible	Intangible	Total
Murder	1,128,082	7,437,000	7,927,088
Rape and sexual assault	36,884	174,162	210,901
Aggravated assault	19,179	100,216	111,431
Robbery	23,227	26,947	48,095
Motor-vehicle theft	8,521	431	8,913
Household burglary	3,812	255	4,044
Larceny and theft	1,573	11	1,583

SOURCE: French, McCollister, and Reznik (in review).

NOTE: The intangible crime costs calculated for household burglary, motor-vehicle theft, and larceny and theft are based solely on the corrected risk-of-homicide cost; thus, they may not accurately reflect the cost of the trauma associated with being a victim of these crimes.

Table 6.12
Cost of Offenses Committed in 2005 That Were Attributable to Methamphetamine

	Cost ($)		
Offense	**Low**	**Best**	**High**
Murder and manslaughter	0	0	3,185,596,730
Rape, forcible	0	0	375,423,188
Assault	0	0	3,412,429,562
Robbery	0	0	602,970,552
Burglary	152,131,236	277,264,728	582,562,464
Motor-vehicle theft	453,368,658	1,168,324,953	2,423,721,003
Larceny	138,099,337	318,604,078	682,654,503
Total	743,599,231	1,764,193,759	11,266,461,085

SOURCES: Offense figures are from the 2005 UCR, and meth attribution factors are based on analyses of the inmate surveys. Costs are based on French, McCollister, and Reznik (in review).

component of crime and criminal justice costs, at $1.76 billion. The range is substantial and is primarily the result of alternative assumptions about causality. We discuss this issue in more detail in Chapter Nine and in Appendix C. Our lower bound is $744 million, and our upper bound $11.3 billion.

Despite our efforts to measure these costs conservatively, it is important to keep in mind the limitations of our approach. First, the limited availability of research on causality forces us to rely on inmate self-reports to examine the relationship between meth use and other crimes. Even if the inmates respond truthfully and are not subject to recall problems, there are still concerns about whether individuals incarcerated for a crime are different from those who commit the same type of offense but are not incarcerated. Second, we assume that we can use the shares of inmates whose crimes are attributed to meth to estimate the share of crimes committed in a particular year (2005) that are attributable to meth. Third, our estimated ranges are very large (implying substantial uncertainty) even though the only uncertainty we include is that due to the share of crimes attributable to meth. We rely on estimates of the costs of crime from the literature and take these costs as given (i.e., no uncertainty). Those cost estimates, however, are not certain and rely on a number of assumptions that may or may not hold. For example, when generating the productivity losses incorporated in career costs, the estimates assume that offenders would have earned only the minimum wage. To the extent that meth-using offenders earn more (or less), cost estimates are likely to be biased by this assumption.

CHAPTER SEVEN

The Methamphetamine-Related Cost of Child Maltreatment and Foster Care

There is no denying that chronic meth use and production by parents can negatively influence the well-being of children in the home.[1] As with the systematic abuse of other addictive substances, chronic meth use can cause parents to neglect the basic needs of children—for example, during binge-induced absences from the home. Unlike other substances, however, meth is sometimes produced in home laboratories, so children growing up in households in which meth is produced face the additional risk of exposure to hazardous chemicals.

In 2005, nearly 900,000 children were determined to be victims of abuse or neglect (DHHS, 2007, Table 3-2), and more than 300,000 children entered the foster-care system (Children's Bureau, 2008). Abuse and neglect generate important social costs regardless of whether abused children enter the foster-care system. Difficulties arise when trying to measure these social costs. In order to credibly estimate these costs, we need to answer the following questions: (1) What is the causal effect of meth use by parents on how they treat their children? And (2) What are the social costs of maltreatment? Data limitations make these questions difficult to answer.

This chapter addresses the costs attributable to meth-induced foster-care admissions in 2005. We raise more questions than we can credibly answer and urge researchers and practitioners to devote more attention to these issues.[2] We begin with a framework for thinking about these costs and conclude with a crude calculation of (1) the government costs associated with removing children from the home because of meth use and (2) a monetary estimate of the medical, mental health, and QoL costs for these child victims.

This rudimentary approach produces a best estimate of $904.6 million, with a range from $311.9 million to $1,165.7 million (see Table 7.1). The large range is attributable to assumptions about the types of maltreatment associated with meth and the number of affected children.

Social Costs of Child Maltreatment

There are several costs associated with substance-induced child maltreatment. Focusing only on the costs associated with foster care, as done in this analysis, thus presents a very

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1 For readability, *parent* is used instead of *parent or legal guardian*.

2 Just before this report went to press, a new working paper on parental methamphetamine use and foster care was published (Cunningham and Rafert, 2008). The paper uses an instrumental-variables approach and finds that meth use causes an increase in foster-care admissions, largely because of neglect and parental incarceration. We applaud this effort and hope that more analytic work is done in this area.

Table 7.1
Child-Maltreatment and Foster-Care Costs of Methamphetamine ($ millions)

Cost Category	Lower Bound	Best Estimate	Upper Bound
Foster care	201.4	402.8	470.7
Medical, mental health, QoL			
Children admitted to foster care	110.5	501.8	695.0
Other children	NI	NI	NI
Other costs: adoption, productivity	NI	NI	NI
Total	311.9	904.6	1,165.7

conservative estimate. This section provides a framework for thinking about all of the social costs associated with meth and child maltreatment.

- *Medical costs of maltreatment:* Examples include providing care to those born prematurely or with substance-induced complications, addressing the physical health outcomes of meth-related assault (e.g., broken limbs), and covering the medical expenses associated with meth-related fatalities.[3]
- *QoL and psychological costs of maltreatment:* This includes one's willingness to pay to avoid trauma as well as the cost of addressing mental health concerns. Depression and post-traumatic stress disorder increase the risk of suicide (see review in Karney et al., 2008), and these costs should also be considered.
- *Cost to the social-welfare system:* This would include the costs for social workers to investigate the case, render a decision, admit a child to foster care or another out-of-home placement, and help reunite children with their parents. This category also includes the costs of conducting and addressing drug-test results.
- *Cost of removing children from homes:* While being removed from one's home is a traumatic event, it would be an overall net benefit to the child if he or she winds up in a more stable environment. If a child is placed out of the home, this would impose costs on the new caregivers, but they often receive a stipend from the government. Since this would be included in the costs to the social-welfare system, this transfer would not be included in a social cost estimate.
- *Lost productivity for the children:* If meth-inflicted abuse or neglect influences human capital development (e.g., contributes to negative school outcomes), this may reduce the future productivity of these children.[4]
- *Lost productivity for the parents:* This category would include the lost workdays associated with parents going to court or attending counseling for child maltreatment and possibly being incarcerated. Additional costs would be incurred if a parent loses a job and has to spend time and resources looking for a new one.

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[3] Some of these costs, such as meth-induced fetal dependence and injuries or fatalities due to meth-related production incidents, are captured elsewhere in this monograph.

[4] It could also influence current productivity for those children in the formal and informal labor markets. Any time out of the labor market that can be attributed to being abused or neglected should be included.

- *Criminal justice costs:* This would include the costs associated with arrest and prosecution for child maltreatment, adjudication, and attending adoption hearings. Time spent by the children, parents, and possibly relatives would be included in the other categories.

This list is not exhaustive. While much of the discussion focuses on parents maltreating their children, siblings and other individuals living in the home can also initiate abuse. A comprehensive assessment of these costs would need to make sure costs are not doubly counted here and in Chapters Five and Six.

Attributing Child Maltreatment and Neglect to Methamphetamine

Just as calculating the costs associated with child maltreatment and neglect is daunting, it is also difficult to generate a national estimate of the number of children adversely affected by chronic meth use and production. There are no recent national victimization surveys of children, and the national administrative data sets on maltreatment have serious limitations for addressing this issue. While the child-level maltreatment files from the National Data Archive on Child Abuse and Neglect (NDACAN) do include some drug-related variables, they do not report information about the specific drug involved. Moreover, some states do not report information on whether drugs were involved in the case, and many others report more missing values than known values. But even if we did have this information, we would still have a difficult time estimating the causal effect of meth use on child maltreatment and abuse. A few of the issues complicating identification are listed here:

- *Polysubstance use:* The vast majority of problematic meth users consume other substances, especially alcohol. Determining whether the child would have been removed from the home absent meth use is a very difficult question to answer in the aggregate.
- *A third contributing factor:* There could be some factor beyond the use of another substance that plays a role by causing the parent to use meth and to abuse the child. For example, an extremely stressful situation (e.g., being laid off) could contribute to short tempers and a desire for intoxication. In this case, the child might have been abused and consequently removed from the home even absent meth use.
- *Distinguishing between a mention and a causal attribution factor:* Just because meth was mentioned in a report or considered a factor does not necessarily mean that it is responsible for the child's removal from the home. It could have been the case that the child would have been removed anyway. Indeed, the abuse could have occurred during a period of nonuse.

Fundamentally, we are interested in the counterfactual: If meth were not present, would the maltreatment and possibly the removal of the child from the home still have occurred? Data limitations undermine our ability to definitively identify those cases. However, we attempt, as in other chapters, to place plausible bounds on this estimate so as to move forward in attempting to understand how important these costs are vis-à-vis other cost components.

A Crude Calculation of the Cost of Methamphetamine to the Foster-Care System

Given the tremendous uncertainty associated with determining the causal effect of meth on maltreatment and calculating the associated social cost, this section provides a very conservative estimate of meth's effect on maltreatment by focusing exclusively on those involved with the foster-care system. As mentioned previously, this captures only one-third of all cases involving abuse or neglect.

Number of Children Entering the Foster-Care System in 2005

The Child Welfare Information Gateway (Children's Bureau, 2008) reports that 311,000 children entered foster care in FY 2005, with a median age at entry of 7.7 years. For these purposes, *foster care* is defined as "24-hour substitute care for children outside their own homes . . . which include non-relative foster family homes, relative foster homes (whether payments are being made or not), group homes, emergency shelters, residential facilities, and pre-adoptive homes" (Children's Bureau, 2008).

Nationally, a U.S. Department of Health and Human Services (DHHS) (1999) report to Congress suggests that substance use was a factor in two-thirds of cases that ended up in foster care. We are not aware of more recent national estimates, but a study examining a random sample of 443 children with a substantiated abuse case in an urban county found that 68 percent of them had a mother who abused alcohol or drugs (Jones, 2005). And although not directly comparable, interviews and surveys of practitioners and experts in this field suggest that "parental substance abuse and addiction is the chief culprit in at least 70 percent—and perhaps 90 percent—of all child welfare spending" (CASA, 1998). Using the available national evidence, we use two-thirds as our estimate of the number of foster-care cases that involve substance use.

The next step is determining what share of these cases involved meth at the national level. One possibility is to assume that the distribution of substances involved in foster-care cases mirrors the distribution of primary substances reported among the treatment population. To determine whether this is a valid assumption, we are forced to use data circa 1990. In a report to Congress on substance abuse and child protection (DHHS, 1999), the primary drug of abuse for maltreating families with identified substance-use problems was reported for 1989 (Westat and James Bell Associates, 1993). Alcohol was the primary substance in 64 percent of the cases, cocaine was implicated in 23 percent of the cases, and 13 percent were attributed to other drugs (including meth). Table 7.2 compares these figures with information about the distribution of the primary drugs of abuse reported at admission to specialty substance abuse treatment.

The national treatment information from TEDS has been collected since 1992. The differences in the distribution of primary drug in 1989 and 1992 are small (64 versus 61 percent for alcohol; 23 versus 18 percent for cocaine and crack), suggesting that, around 1990, TEDS provided a reasonable approximation of the types of primary drugs involved in substantiated child-maltreatment cases. If we believe that the distribution of primary drugs in TEDS still mirrors the primary drugs in maltreating families, then we can use more recent TEDS data to determine the percentage of substance abuse–related child-removal cases involving meth in 2005. The last column in Table 7.2 presents TEDS data for 2005, which suggest that meth was the primary drug in 8.94 percent of the cases.

Table 7.2
Primary Drug of Abuse for Maltreatment and Treatment Admissions

	Data Set (%)		
Primary Drug	**1989 Maltreatment Cases**	**1992 TEDS**	**2005 TEDS**
Alcohol	64	61	40
Cocaine (including crack)	23	18	14
Heroin	—	11	14
Marijuana	—	6	16
Meth	—	1	9
Other	13	3	7
Total	100	100	100

SOURCES: Westat and James Bell Associates (1993); SAMHSA (1992, 2007c).

The DHHS (1999) report to Congress on substance use and child welfare also referenced a study examining the primary drug of abuse for mothers with children in foster care in California and Illinois in 1997 (GAO, 1994). The shares attributable to meth were 27 percent and 1 percent, respectively, highlighting what we know about meth use being concentrated in the West (especially in 1997). For comparison, we examine the TEDS admissions among women in these states in 1997, and meth was the primary drug in 23.6 percent of the cases in California and 0.6 percent of the cases in Illinois. While these numbers are not directly comparable (e.g., TEDS includes women without children, and those with children are not necessarily maltreating their children), they provide more evidence that TEDS does a reasonable job of characterizing the meth problem among households from which children in foster care come.[5]

The final step is determining the portion of that 8.94 percent that is directly attributable to meth. For the upper bound, we assume that meth is responsible in all cases in which it was a factor—that is, 8.94 percent. For our lower-bound estimate, we presume that half of the cases (i.e., 4.47 percent) are due to meth, which we arbitrarily pick because we have no data on which to base the lower-bound estimate. We believe that the best estimate is closer to 8.94 percent, since our calculations do not directly account for home-based meth production that affects many children of meth users. These assumptions yield a low estimate of 9,272 children and a best and high estimate of 18,545 children (Table 7.3). These estimates seem plausible given that the DEA's El Paso Intelligence Center estimates that, in 2005, 1,660 children were affected by meth production alone (Hinojosa, 2007). Our estimate of the number affected by meth use and production are, as expected, substantially higher.

Cost of Sending a Child to Foster Care

These costs rely on a host of factors, most importantly the type of placement and duration. Scholars in this field have noted that there is very little information on the precise costs of

[5] This is not necessarily the case with other substances. For example, TEDS suggests that heroin dominates cocaine for women in California, and this is the opposite of what is published in the report.

Table 7.3
Children Entering Foster Care in 2005 Because of Methamphetamine

Children	Low	Best	High
Entering foster care in FY 2005	311,000	311,000	311,000
Entries attributable to substance use (%)	66.7	66.7	66.7
Substance use cases attributable to meth (%)	4.47	8.94	8.94
Sent to foster care because of meth	9,272	18,545	18,545

SOURCES: Children's Bureau (2008); DHHS (1999); SAMHSA (2007c).
NOTE: Due to rounding, numbers may not sum precisely.

removing children from the home and placing them into foster care.[6] The Urban Institute reports that, in FY 2004, federal, state, and local governments spent more than $23 billion on child welfare (Scarcella et al., 2006), but it does not provide an estimate of the per-child costs. This is not surprising, as some of this money is targeted at prevention efforts, thus making it difficult to determine the appropriate denominator.

For this analysis, we want to know the administrative and court costs associated with entering a child into the foster-care system as well as the average amount the state pays for foster-care services. Using figures from a variety of sources, Barth et al. (2006) approximate these court and administrative costs to be $1,000 and $2,000, respectively, per child-year (total in 2005 dollars, $3,845). As for foster-care services, the Administration for Children and Families (ACF) reports that 70 percent of children in the foster-care system are placed in foster homes (with relatives or nonrelatives), 8 percent are in group homes, 10 percent are in institutions, and the other 12 percent are in supervised independent living, pre-adoptive homes, or elsewhere. The mean time spent in foster care for those exiting in FY 2005 was 21 months (DHHS, 2007).

Using data on those who were in the foster-care system for at least three years in North Carolina, Barth et al. (2006) calculated the average annual cost for out-of-home placement to be $10,902 (in 2005 dollars). Aos et al. (2004) generate a similar cost for the state of Washington but do not limit the analysis to those who were in foster care for at least three years. They estimate the average annual costs of foster care to be $8,775 (365 × $24.04).[7] Since we are more interested in the full population rather than those in foster care for at least three years (especially since the mean time in foster care is 21 months), we will use the Washington figures as our low and best estimates (Table 7.4).

If we multiply the number of affected children by the expected foster-care costs per child, we generate a best estimate of $402.8 million per year for all affected children. The range is substantial, with a lower bound of $201.4 million and an upper bound of $470.7 million (Table 7.5).

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6 Barth et al. (2006, p. 129) note, "There is a paucity of information not only on precise estimates but also concerning the basic comparison of the costs of foster care placements and adoptions."

7 This is very similar to the figure published by the Montana Meth Project for meth-related foster-care cases ($9,000 per year; Montana Meth Project, undated).

Table 7.4
Expected Foster-Care Costs per Child

Cost Element	Low	Best	High
Annual administrative and court costs ($)	3,845	3,845	3,845
Annual foster-care cost ($)	8,775	8,775	10,902
Mean time in foster care (months)	21	21	21
Expected cost per year ($)	21,721	21,721	25,382

SOURCES: Aos et al. (2004); Barth et al. (2006); DHHS (2007).

NOTE: This does not include costs associated with adoption, health care, or independent living. A discount rate of 4 percent is used to generate the net present value of these costs.

Table 7.5
Costs Attributable to Methamphetamine-Induced Foster-Care Admissions in 2005

Cost Element	Low	Best	High
Children sent to foster care because of meth	9,272	18,545	18,545
Expected foster-care cost per child in 2005 ($)	21,721	21,721	25,382
Total cost, all children admitted in 2005 ($)	201,397,112	402,815,945	470,709,190

SOURCES: Children's Bureau (2008); DHHS (1999, 2007); SAMHSA (2007c); Aos et al. (2004); Barth et al. (2006).

Medical, Mental Health, and Quality-of-Life Costs for Victims of Abuse and Neglect

The previous section accounted only for the cost that was borne by the foster-care system. But there are also likely to be significant medical, mental health, and QoL costs for the victims of abuse and neglect. Aos et al. (2004) adapted these figures from an article about youth violence published by T. Miller, Fisher, and Cohen (2001). Miller, Fisher, and Cohen use a jury compensation method to account for the pain, suffering, fear, and lost QoL. In their calculations, they do not include damages for cases in which the victim was partially to blame and did not include "excessively high jury awards to victims suing rich plaintiffs" (p. 3). The National Adoption and Foster Care Reporting and Analysis System (Children's Bureau, 2006) does not list the reasons for entry into the foster-care system, so we use the distribution of maltreatment types based on the number of victims reported in 2005. Table 7.6 presents the medical, mental health, and QoL costs for victims of abuse and neglect as well as the distribution of maltreatment types in 2005.

The 1999 DHHS report suggests that, "In 80 percent of substance abuse related cases, the child's entry into foster care was the result of severe neglect" (p. 14). Whether that distribution is the same today, especially in the context of meth, is unclear. So, for our best estimate of the medical, mental health, and QoL costs for those entering the foster-care system, we use a weighted average in which severe neglect accounts for 80 percent of the cost $\left(\$9{,}530.10 = 0.8 \times \left[\$1{,}231.27 + \$10{,}681.36\right]\right)$ and 20 percent comes from a weighted average of the other types of cases $\left(\$17{,}529.65 = 0.2 \times \$87{,}648.26\right)$. This generates a best estimate of $27,059.76 per case.

Table 7.6
Medical, Mental Health, and Quality-of-Life Costs for Victims of Abuse and Neglect

Abuse or Neglect Category	Per-Child Annual Cost ($)[a]		Victims in 2005[b]
	Medical and Mental Health	QoL	
Sexual abuse	8,551.30	127,730.25	83,810
Physical abuse	4,692.61	79,262.07	149,319
Mental abuse	3,626.23	28,516.50	63,497
Severe neglect	1,231.27	10,681.36	582,203

[a] Costs originally reported for 1993 and inflated to 2005 dollars. Based on T. Miller, Fisher, and Cohen (2001) and Aos et al. (2004).

[b] Based on DHHS (2007, p. 41, Table 3-6).

For the lower bound, we use the cost of severe neglect ($11,912.63), and, for the upper bound, we use the weighted average for all maltreatment cases ($37,475.23).

Using these unit cost estimates, we convert into total dollars using the number of foster-care cases from our previous analysis. This yields a best estimate of $501.8 million (see Table 7.7). The lower bound is $110.5 million, and the upper bound is $695.0 million.

Limitations

Meth can negatively influence child well-being in many ways. In this chapter, we have discussed a number of these components, but unfortunately, most of these costs are difficult to measure with the data sets currently available. Our results clearly underestimate the total cost of meth-induced child maltreatment and neglect because we consider costs only of children in the foster-care system (not those who remain with their families) and we consider only three aspects of these costs (government-related, medical, and QoL costs). Moreover, in building our estimate using these limiting factors, we adopt conservative attribution factors based on historical data. Our attribution share was based on a national study using data from 1989. In that year, the percentage of drug-related cases allocated to each drug could be linked to the distribution of treatment admissions by drug to verify their similarity; this allowed us to use the 2005 distribution of drug-treatment cases to create an attribution factor for our calculation. Additional comparisons with detailed information about primary drug of abuse for mothers with children in foster care from two large states in 1997 (California and Illinois) suggest that TEDS generates a reasonably similar point estimate for meth. However, we cannot be certain because more recent data do not exist.

Table 7.7
Costs Attributable to Methamphetamine-Induced Foster-Care Admissions in 2005

Cost Element	Low	Best	High
Children sent to foster care because of meth	9,272	18,545	18,545
Medical, mental health, and QoL costs ($)	11,913	27,060	37,475
Total 2005 foster-care costs ($)	110,457,336	501,827,700	694,973,875

At least one small state reported a very different meth attribution allocation recently. In testimony to the U.S. Congress on the costs of meth for child welfare, a regional administrator for the Montana Department of Public Health and Human Services reported that more than 65 percent of all foster-care placements in Montana are directly attributable to drug use and that, among those, meth is a primary factor 57 percent of the time (Frank, 2006). By comparison (and assuming that this 65 percent includes alcohol), our attribution factor using TEDS for Montana would be between 18 percent and 39 percent, depending on whether alcohol is included. Because we do not have this type of detailed information for all states and we know that Montana had a very serious meth problem in 2005, we rely on our TEDS-based approach to calculate national estimates.

CHAPTER EIGHT

The Societal Cost of Methamphetamine Production

According to information from the DEA, clandestine meth labs cause three main types of harm: (1) physical injury from explosions, fires, chemical burns, and toxic fumes; (2) environmental hazards; and (3) child endangerment. In this chapter, we estimate the cost associated with the first two categories; the third component is considered in Chapter Seven.

In Table 8.1, we present summary findings of our estimates of the cost of production broken down into the component costs considered here. Our best estimate is an annual cost of $61.4 million, with lower- and upper-bound estimates roughly 40 percent lower and 45 percent higher, respectively. These estimates include physical injuries, deaths, and lab-cleanup costs but omit the probably minor costs of personal decontamination, shelter, evacuations, and hazardous waste associated with production-related incidents.

Physical Injury from Lab Mishaps

Numerous health effects are associated with the production of meth, affecting not just those individuals involved in producing the meth but also law-enforcement and other first-responder personnel responsible for raiding and dismantling these laboratories. Meth production is extremely hazardous, with chemical exposure to toxic by-products, including phosphine gas, hydrogen chloride, and ammonia (Lineberry and Bostwick, 2006; Potera, 2005). Meth production is associated with headaches, pulmonary edema, respiratory-tract damage, and death (Potera, 2005). Additionally, meth producers often present to the ED with injuries from explosions and burns from fires (Lineberry and Bostwick, 2006).

Table 8.1
Costs of Methamphetamine Production ($ millions)

Cost Category	Lower Bound	Best Estimate	Upper Bound
Physical injuries and death	9.40	32.22	59.56
Personal decontamination, shelter, and evacuations	NI	NI	NI
Environmental cleanup			
Labs	29.16	29.16	29.16
Additional waste	NI	NI	NI
Total	38.56	61.38	88.72

The Hazardous Substances Emergency Events Surveillance (HSEES) system was established by DHHS' Agency for Toxic Substances and Disease Registry (ATSDR). HSEES collects information about hazardous-substance releases and near-releases. The data allow us to identify meth-related events, including injuries, deaths, decontamination of persons, shelterings, and evacuations.

In 2005, 15 states participated in HSEES. The participating states are fairly representative of the four census regions, as shown in Table 8.2.

To generate national estimates of events and costs from these 15 states, we used two approaches. Both approaches assume that there is a relationship between the levels of production and consumption of meth, where consumption is based on the number of treatment admissions in the state. The first approach was based on the region-specific rate of meth-related hazardous events per primary meth-treatment admission (i.e., ratio of HSEES meth events to TEDS meth admissions). We calculated the weighted average for each region across the HSEES-participating states in that region. We then used the region-specific rate to calculate estimates for nonparticipating states using their counts of meth-treatment admissions. The rates varied across states and regions. A call to the ATSDR confirmed that there is also variation in reporting across states. Some states report all incidents regardless of size, while other states report only those incidents of a minimum size. As a result, we likely have a lower bound on the number of events in those states. The region-specific approach results in a multiplier of 3.59 to generate national estimates from the data for the 15 participating states. A second, simpler approach uses the single weighted average rate across all 15 states in the HSEES and applies that rate to all nonparticipating states to inflate the number of events and injuries to a national total. This results in a multiplier of 2.94. The first approach has the benefit of accounting for the regional nature of meth use and production. However, the second approach is more likely to minimize variation in the nature of reporting across states and in the source of meth (e.g., imported versus produced locally). Given that the multipliers generated using these two approaches are relatively similar, we use the midpoint of these weights as our best estimate.

Given the nature of explosions, fires, and other hazardous events, there is likely to be substantial variation in the number of events over time. To generate lower and upper estimates of events, we must make some assumptions about the nature of these events. We assume that events, deaths, and other injuries are rare and take on the distribution of a Poisson random variable. The Poisson assumes that the variance of a variable is equal to its mean. Bounds are constructed using two standard deviations from the inflated mean. This estimation process can result in noninteger estimates of events (e.g., 0.5 deaths). Because these events can only be

Table 8.2
Four Census Regions

Region	Name	Member States
1	Northeast	New York and New Jersey
2	Midwest	Wisconsin, Iowa, Michigan, Minnesota, and Missouri
3	South	Louisiana, North Carolina, Texas, and Florida
4	West	Oregon, Colorado, Utah, and Washington

nonnegative counts, each estimate is *rounded up* to its nearest integer. For events that we do not observe occurring for meth-related events in our data—for example, injuries treated by a physician—we assume that no events would occur at the national level.

Number of Events and Events with Victims

In 2005, among the 15 participating states, the CDC identified a total of 306 meth-related incidents. Our approach generates a best estimate of 999 events nationally with a lower bound of 936 and upper bound of 1,063 events (see Table 8.3).[1]

Using counts of 43 events with an injury or death, we generate a national estimate of 141 events involving an injury or death with a range of 118 to 165 events. The number of victims per event ranged from 0 to 11. In the 15 states, 82 persons presented with a total of 113 injuries (including those resulting in death). The most common injuries were respiratory distress (36), headache (20), burns (14), and gastrointestinal issues (14). Our methodology generates an estimate of 268 injured or deceased victims nationally, with a range of 236 to 301.

Most of the victims were first responders (51 percent), usually police officers. However, the most severe injuries—those resulting in death or hospital admissions—were concentrated primarily among non–first responders (who could be bystanders or individuals involved in producing meth). In the 15 states, no first responders died, and only three of the 15 observed hospitalizations involved first responders.

The most severe and costly outcome associated with production-related events is death. Both deaths identified in the original data list burns[2] as the primary injury. Our best estimates suggest a total of seven deaths on the scene or at arrival to the hospital nationally, with a range of two to 13 deaths. While it is possible that some of these deaths occurred among meth users, the data do not enable us to identify whether there is overlap with the premature deaths discussed in Chapter Four. No deaths were reported among victims after their arrival at the hospital.

Injured victims were more common than deaths (see Table 8.4). Most of these injured victims were sent to the hospital. Of the 268 estimated victims, we estimate that 167 victims were sent to the hospital; 111 victims were sent to the hospital for treatment but not admitted, 52 were admitted to the hospital, and four were sent to the hospital for observation. Those admitted to the hospital had burns, respiratory injuries, trauma, and gastrointestinal injuries. The estimated range for the number of victims sent to the hospital was 116 to 221. Also, we

Table 8.3
Hazardous-Substance Events Related to Methamphetamine Production

Events and Victims	Actual (15 states)	Lower Estimate	Best Estimate	Upper Estimate
Meth events	306	936	999	1,063
Meth events with victims	43	118	141	165
Meth-event victims	82	236	268	301

[1] The estimate excludes the District of Columbia and Alaska because they did not report treatment-admission data to TEDS in 2005. However, the impact on estimates is likely to be negligible because Alaska and D.C. reported very few admissions for meth. In 2003, the last year in which each reported data, Alaska had only 55 primary meth admissions and D.C. had nine admissions.

[2] The burns may be chemical, thermal, or both.

Table 8.4
Injuries and Deaths Due to Hazardous-Substance Events Related to Methamphetamine Production

Injuries and Deaths	Actual (15 states)	Lower Estimate	Best Estimate[a]	Upper Estimate
Deaths				
At scene or upon hospital arrival	2	2	7	13
After hospital arrival	0	0	0	0
Injuries, by treatment				
First aid	10	22	33	45
Reported	19	48	63	79
Physician	0	0	0	0
Mobile unit	0	0	0	0
Hospital				
Observation	1	0	4	8
Treated but not admitted	34	90	111	133
Admitted, trauma	1	0	4	8
Admitted, burn	8	17	27	38
Admitted, respiratory	5	9	17	26
Admitted, gastrointestinal	1	0	4	8

[a] Aggregating the individual categories yields 270 victims (versus 268 in the total reported in the accompanying text) due to rounding up of individual category estimates.

estimate that an additional 96 victims were either treated with first aid or had an injury reported by responders;[3] the range for these types of injuries was 70 to 124.

Calculating the Costs of Injuries and Deaths

As in our previous estimates, the loss of a life was valued at $4.5 million. Other injuries were valued at substantially lower cost. Victims' injuries were monetized based primarily on the mode of treatment reported. In the case of hospitalizations, however, we also incorporated information about the nature of the injury to determine the cost (see Table 8.5).

First-aid treatment was valued at the labor cost of a two-person EMT team working for an hour. The median hourly wage for EMT workers was taken from the BLS occupational wage survey for May 2005 ($12.54/hour per EMT or $25/hour per EMT team). For reported injuries, we know only that they were reported to police, EMTs, fire-department personnel, or poison-control centers. As a result, we take a conservative approach and also cost these reported incidents at the EMT rate.

We assumed that those victims sent to the hospital for observation or treatment (but not admitted) were treated in an ED. Machlin (2006) estimates $302 for an ED visit with minimal services. The CPI was used to inflate this figure to $332 in 2005 dollars, which we use as

[3] These include injuries experienced within 24 hours of the event and reported by officials (e.g., fire department, emergency medical technician or EMT, police, poison-control center).

Table 8.5
Costs of Injuries and Deaths Due to Hazardous-Substance Events Related to Methamphetamine Production ($)

Injuries and Deaths	Unit Cost	Lower Estimate	Best Estimate	Upper Estimate
Deaths	4,500,000	9,000,000	31,500,000	58,500,000
Injuries, by treatment				
First aid	25	550	825	1,125
Reported	25	1,200	1,575	1,975
Hospital				
Observation	332	0	1,328	2,656
Treated, not admitted	701	63,090	77,811	93,233
Admitted, trauma	12,150	0	48,600	97,200
Admitted, burn	15,275	259,675	412,425	580,450
Admitted, respiratory	8,323	74,907	141,491	216,398
Admitted, gastrointestinal	8,734	0	34,936	69,872
Total		9,399,422	32,218,991	59,562,909

our estimate for those sent to the hospital for observation but not treated. As in Chapter Three, we use $637, inflated to $701 in 2005 dollars, as a cost estimate for an ED visit with a moderate level of services. We use this estimate as the cost of treating an individual at the hospital without an inpatient admission.

The costs of treating the 15 victims admitted to the hospital are substantially higher than treatment in an ED. These individuals suffered burns, trauma, respiratory distress, gastrointestinal issues, eye irritation, and other diagnoses. We relied on average cost information for admissions with these primary diagnoses from the HCUP. For the cases in which individuals suffered multiple injuries, we deferred to the most expensive condition. In the 2005 data, the cost of admissions for which burns were the primary diagnosis averaged $15,275. The cost of a traumatic injury, $12,150, was based on the broad Clinical Classifications Software (CCS) coding for injury but excludes poisonings and burns. Respiratory and gastrointestinal costs were based on their respective costs for the entire CCS category and resulted in costs of $8,323 and $8,734, respectively.

The best estimate for deaths and injuries from meth-related hazardous-substance events is $32.2 million. But the range was somewhat large, with a lower bound at $9.4 million and an upper bound at $59.5 million. Of course, the biggest costs driving these totals are for events causing deaths, and that is where almost all of the variation comes from in our range of estimates. The other injuries result in less than $1 million out of the $32.2 million estimate.

Lab-Cleanup Cost

Meth-production sites present other public hazards. Meth-production sites are one of the more hazardous drug labs to clean up. Meth becomes airborne during production and settles on surfaces at up to 1,000 micrograms per 100 cm^2 (Potera, 2005). Even six months after production ceases, meth levels of 300 micrograms/100 cm^2 have been recorded (Potera, 2005), and vacuuming actually raises airborne meth levels (Potera, 2005). Police officers handle a majority of the cleanup ("Illegal Meth Labs," 2003). Individuals cleaning meth labs experience some short-term effects, including respiratory problems, skin and eye irritation, headaches, nausea, and dizziness, and there are also concerns about suspected carcinogens ("Illegal Meth Labs," 2003). However, improved procedures for law-enforcement personnel have minimized these risks.

According to historical data published in the National Drug Threat Assessment (NDIC, 2006), there were 5,846 total meth-lab seizures in 2005. Of those, 35 were superlab seizures (NDIC, 2006). The DEA is responsible for funding the removal of chemicals, drugs, and the apparatus used to manufacture the drugs on site and reports that, in FY 2004, the average cost per cleanup of hazardous waste was $1,900 (Joint Federal Task Force of the Drug Enforcement Administration, U.S. Environmental Protection Agency, and U.S. Coast Guard, 2005).[4] However, the cost of a superlab cleanup can be substantially higher, with one DEA report suggesting that it can cost up to $150,000 to clean up the hazardous materials in a larger superlab (Scott and Dedel, 2006). In addition to labs, the National Clandestine Laboratory Register reports information on dump-site and chemical and glassware seizures that the DEA has also been involved in cleaning up (and these costs get averaged into the average cost per cleanup). Thus, the total number of sites cleaned up by the DEA is the sum of superlabs, small labs, and these additional dump-site and chemical and glassware seizures. Assuming an average cost per cleanup of small lab, dump site, or seizure of $1,900 and an average cost of $150,000 per cleanup of a superlab, Table 8.6 shows that the total cost of environmental cleanup was just over $29 million in 2005. Given that the number of meth-lab incidents is known and we have no data from which one can determine the variation in price around its mean, we take these cleanup costs as our low, high, and best estimates of the costs.

Table 8.6
Costs of Cleaning Up Methamphetamine Labs

Cost Element	Number[a]	Average Cost per Incident ($)[b]	Total Cost Estimate ($ million)
Superlabs	35	150,000	5.25
Small labs	5,811[b]	1,900	11.04
Dump sites and chemical and glassware seizures	6,773	1,900	18.87
Total cost to clean up labs			29.16

[a] NDIC (2006) used for identifying number of each type of lab. In the case of small labs, we subtract the number of superlabs from the total number of labs reported in 2005 (5,846).

[b] Average cost per superlab cleanup from Hunt, Kuck, and Truitt (2005); average cost of small-lab cleanup from Joint Federal Task Force of the Drug Enforcement Administration, U.S. Environmental Protection Agency, and U.S. Coast Guard (2005).

[4] This cost does not include the cost of remediating residual contamination at these sites, which the DEA is not legally responsible to pay (Joint Federal Task Force of the Drug Enforcement Administration, U.S. Environmental Protection Agency, and U.S. Coast Guard, 2005).

Other Costs Associated with Production: Decontamination, Evacuation, Sheltering, and Hazardous Waste

In addition to the known costs associated with lab and dump-site cleanup, the DEA reports that each pound of manufactured meth produces about 5–6 pounds of hazardous waste (Joint Federal Task Force of the Drug Enforcement Administration, U.S. Environmental Protection Agency, and U.S. Coast Guard, 2005).[5] This waste is commonly buried or burned near the site or dumped along roads or into streams and rivers. Because we cannot reasonably estimate the amount of production per lab, and hence the waste that would be associated with each lab's production, we do not attempt to estimate the social cost of this pollution. Instead, we point out that this is another aspect of the social cost that is missing from our overall estimate. The magnitude of these costs is difficult to quantify, as information related to the amount of meth produced during the life of a lab, the method of disposal, and the proximity of the waste to natural resources or populated areas would all affect the magnitude of these costs.

In addition to the cost of hazardous waste, lab explosions can require decontamination of affected individuals, evacuation of sites, and in-place sheltering of nearby residents. It is difficult to cost out these events, and the costs themselves are likely to be very low. However, we can provide estimates on the prevalence of these events (see Table 8.7).

Victims who suffered the injuries described in the preceding section may require decontamination as part of their care, but these costs are likely to be contained in the costs of that care. In this section, we focus instead on understanding the prevalence of decontamination among uninjured persons. The data for the 15 HSEES states document 100 decontaminations of uninjured persons with defined location of decontamination.[6] Approximately half of those decontaminated were first responders, and the other half were members of the general public. Our best estimate indicates that, on a national level, 328 uninjured persons were

Table 8.7
Other Potential Sources of Costs Due to Hazardous-Substance Events Related to Methamphetamine Production

Evacuations, Sheltering, and Decontaminations	Actual (15 states)	Lower Estimate	Best Estimate	Upper Estimate
Decontaminations				
Uninjured decontaminated at scene	91	264	298	333
Uninjured decontaminated at medical facility	9	20	30	41
Evacuations				
Evacuations ordered	27	71	89	108
People evacuated	166	496	542	589
In-place sheltering	13	30	43	57

5 It is unclear whether available estimates to clean up lab sites include waste disposal, but there will likely be additional waste disposal for labs that were not discovered.

6 The location of decontamination was not defined for one person.

decontaminated as a result of their exposure. The lower and upper bounds on decontaminations were 284 and 374, respectively.

The majority of these individuals (298) were decontaminated on site. Because decontamination may involve only water costs, these events would likely not be highly valued. However, the remaining 30 individuals were decontaminated at a medical facility. For these events, it is possible to assume that they were nontrauma ED visits and value such cases at our previously used estimate of $332 (in 2005 dollars). But including these costs would only increase our estimate by $9,969. Moreover, it is likely an overestimate to price them the same as a noncomplex ED visit.

We also estimate that 89 evacuations were ordered, affecting a total of 542 persons, and 43 in-place shelterings. There is not much evidence on the costs of evacuations. A potential cost may be overnight stays outside of the home, such as paying for lodging. The HSEES does contain information on the length of the evacuations, but we cannot determine whether the evacuees incurred any lodging or associated costs.

As noted earlier, it would be difficult to price these elements, because there is little information about costs. Also, these elements are unlikely to substantially increase the economic costs, because these comprise very minor costs compared to the deaths and injuries associated with meth production.

CHAPTER NINE

Consideration of Costs Not Included

As noted throughout this monograph, there are a number of cost components that we are unable to consider or include in our overall estimate due to data and resource limitations. Some of these cost components are likely to be relatively small, so their exclusion does not substantially influence the overall estimate. Other cost components, however, have the potential to be quite large and could significantly influence the magnitude of the totals (or the relative burden of particular cost areas). In this chapter, we provide a brief description of various components that have been mentioned throughout this monograph as areas we could not include, and, where it is possible, we provide very preliminary evidence regarding the probable magnitude of these costs. Our goal in doing so is not to revise our estimate but to provide useful information to the reader and policymakers regarding areas in need of further research or better data. By identifying cost areas that are likely to be significant, we hope to encourage new research in these areas. We briefly consider the following categories:

- treatment
  - the cost of treatment received in the general medical setting
- health
  - cost of care received outside of inpatient settings (e.g., doctor visits)
  - other health care costs for conditions caused by meth use
  - dental costs
- productivity
  - health care and workers' compensation costs
  - other productivity-related losses
- crime and criminal justice
  - incarceration for misdemeanor possession
  - violent crime
  - identity theft
- child maltreatment and foster care
  - other child-endangerment costs
- meth production
  - personal decontamination and shelter
  - additional hazardous waste.

It is important to note that there is missing cost information in each of the main areas we examine in this monograph. To the extent that particular omitted costs are believed to be large, that could have important implications regarding the relative magnitude of costs in a given overall category (e.g., health care versus criminal justice setting), which might then change one's perspective on where limited resources should be focused in addressing the problem.

Treatment

In this monograph, we consider the costs of treatment received only in public and nonprofit facilities, hospitals, and federally funded facilities. While there is the obvious omission of care received in privately funded treatment facilities, we anticipate these costs to be relatively small based on information on total substance abuse expenditure for the nation (Mark, Coffey, et al., 2005). However, meth users may also seek treatment in nontraditional treatment settings, such as a doctor's office or health clinic. The question is to what extent omitting care received from these alternative health providers would bias our current estimates of the costs.

We investigate this question by examining information regarding drug treatment available in the 2005 NSDUH (NSDUH, 2006). The 2005 NSDUH inquires not only whether individuals received alcohol and drug treatment but also where. The question was asked only of people who reported drug or alcohol treatment in the past year. If we subset among meth-dependent users, we find that approximately 6.8 percent reported receiving drug treatment in a physician's office. Given that the weighted population is 243,173 meth-dependent users, that translates into 16,536 meth-dependent individuals indicating that they received drug treatment in a physician's office. The NSDUH does not provide information on the number of visits these individuals had with their physicians for drug treatment nor on their costs.

Although cost information is not directly available in the NSDUH, one could construct a cost estimate based on the relative value unit (RVU) valuation of an outpatient visit. The RVUs measure the resource intensity of the visit with respect to work, practice expense, and insurance costs associated with delivery of care. A moderately complex outpatient visit for a new patient (procedure code 99214) can result in 2.18 RVUs with routine follow-up visits resulting in 1.39 RVUs (99213) (CMS, 2008). Translated into dollars, the value of each visit is $82.62 and $52.68, respectively.

If we assume a brief intervention of three visits for drug dependence (not even a full course of treatment, but a plausible amount administered by a physician before referral to a specialist), then we get a lower-bound estimate of $3.1 million for all users receiving such treatment. A higher bound would assume that all meth-dependent users continue their treatment with monthly visits for the entire year. Even under this assumption, costs total only $10.9 million. Both calculations comprise only a very small share of the treatment costs described in Chapter Two. Thus, we do not consider this particular missing cost to be a major omitted component of our overall estimate.

Health

Chapter Three discusses and monetizes a number of health concerns that are likely caused by meth use. There are three additional areas in which meth may contribute to costs but that we could not include in our overall estimate. These areas are the cost of health care received outside the inpatient setting, the total cost (versus incremental cost) of conditions caused by meth, and dental costs.

Cost of Health Care Received Outside the Inpatient Setting

Meth users may seek services from providers outside the hospital setting for conditions that result from their meth use (e.g., skin infections). A potential resource is their primary-care physician or other outpatient specialist. The NSDUH does not provide information on the number of outpatient or physician visits individuals make for physical health problems. Other data sets that do inquire about physician and outpatient care visits do not include information on meth use or dependence. Thus, we have no available data source on which to base an estimate of outpatient care utilization associated with meth.

Because we were curious about the extent to which this omission might be influencing our results, we decided to price out a couple of hypothetical scenarios to see what impact this cost category could have on our total estimate. For example, if we were to assume that every meth-dependent user sees a physician once a month for a meth-induced condition, then we can price out the cost of a meth-dependent patient seeing a physician once in the year for a diagnostic visit and then 11 times that year for a follow-up. A moderately complex outpatient visit to diagnose an existing patient (code 99214) results in an RVU of 2.18 (CMS, 2008), and follow-up routine visits result in 1.39 RVUs (code 99213). Translated into dollars, the value of each initial visit is $82.62 with follow-up visits valued at $52.68. So, for the example we just gave, the cost would be $662 per patient per year. If every patient had only one meth-induced condition requiring physician care, this would translate into a total cost of $208.1 million ($662 × 314,273 meth-dependent users) per year. Adding this to our current best estimate of the cost of meth-induced health care utilization would substantially increase our estimate of health care costs but would not substantially change the relative importance of health care costs to other cost categories considered in this monograph. Drug treatment, death, intangible health burden, crime, and child endangerment would all remain larger cost drivers of our total estimated cost.

Furthermore, the assumption that all meth users would see their physician monthly due to a meth-related illness is probably an overestimate. Some may not see a physician due to lack of health insurance and financial resources, lack of a meth-induced condition, or other reasons. It may be more intuitive to assume that only a minority of users see a primary-care physician but that they do so regularly. Therefore, if we instead assume that one in every five of the 314,273 meth-dependent users sees his or her primary-care physician monthly throughout the year for conditions specifically due to meth use, the total costs would be only $41.6 million. Thus, in general, we do not anticipate this omitted cost to be a significant driver in terms of the overall economic burden of meth.

Other Health Care Costs for Conditions Caused by Methamphetamine Use

In Chapter Three, we also estimate the cost of inpatient hospitalizations. For diagnoses that are clearly caused by meth, we include the total cost of the hospitalization. For other hospitalizations with a mention of meth, we include only the incremental costs because it is not clear that meth caused the hospitalization. This is likely an overly conservative assumption because some of the hospitalizations in this second group may be caused by meth and consequently, the total costs (rather than incremental costs) should be included. For example, some of the hospitalizations for cardiac arrhythmia may be caused directly by meth use, while others are simply exacerbated or co-occurring. Similarly, we cannot distinguish whether a meth-dependent HIV patient contracted HIV as a result of meth-induced risky sexual behavior or whether both diagnoses are the result of preexisting risk-taking behavior.

More research to disentangle causality is necessary. It is not possible, with the data available to us for this project, to determine the percentage of meth-related events in which the total cost should be attributed to meth, because we observe each patient only at a point in time.[1] In this case, we also cannot draw the necessary information from the literature. We would need estimates of the share of each component that is due to meth use: cardiovascular, cerebrovascular, dental, fetal, injury, liver or kidney, lung, nutritional, sexually transmitted, skin, and mental health. Determining these shares is important, as the estimated cost per case of particular diseases can be substantial. For example, current estimates of the average cost per case of HIV/AIDS are $910,800 in 2002 dollars (Hutchinson et al., 2006).[2] Thus, even a relatively small number of meth-induced HIV/AIDS cases can have a rather substantial effect on the estimated burden of the disease.

The causal relationship between meth and these health concerns is a potentially fruitful area for further research and one deserving of attention, given the potential to generate substantial costs.

Dental Costs

As discussed in Chapter Three, meth abuse is associated with severe dental problems commonly called *meth mouth*. The mechanism is unclear, but the condition may be due to meth-induced hyposalivation, the acidity of meth, or meth-related behaviors, such as craving sugary sweets, excessive chewing, and neglecting oral hygiene. We do not have access to data on dental problems associated with meth use in the general population. However, we do have detailed data on the incarcerated population. The BJS collected data on health and drug use from inmates in state and federal prisons.

Using these data, we examined whether the incidence of dental problems was greater among inmates who reported meth use and heavy meth use than it was among other inmates. Among state inmates, we found that the incidence of dental problems was 1.7 percentage points higher for meth users but 0.2 percentage points lower for heavy meth users. The corresponding numbers for the federal inmates were 8.1 and 8.2 percentage points higher for meth users and heavy meth users, respectively. There is no information on the cost of services provided to these inmates, but we do know that approximately 82 percent of these inmates received care for their dental problems.

We can apply these differentials to the 314,273 meth-dependent users to generate evidence on the potential magnitude of dental costs. Even with the most generous assumptions, this component does not contribute greatly to our estimate. If we apply the largest percentage difference observed among federal inmates (i.e., 8.2 percent), only 25,770 individuals would have meth-induced dental problems. Another generous assumption would say that all meth-induced dental problems were treated by dentists. A more reasonable assumption would likely be that the incidence of meth-induced dental problems is the average between the state and federal surveys—for example, 4.1 percent—and that only half of meth-dependent users have access to care. These more intuitive assumptions would yield an incidence of 6,443 cases.

We do not have any information on the cost of treating meth mouth and other dental issues caused by meth. But based on the incidence just described, if we assume a cost of $1,000

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1 Some patients may be readmitted in our data set, but the data do not identify unique patients.

2 This average-cost-per-case estimate includes lost productivity due to hospitalization or absenteeism caused by HIV/AIDS and thus does not reflect merely the medical cost of treating the disease.

per visit and two visits per year, it would yield estimates of only $12.9 million to $51.5 million for our two scenarios.

While these calculations suggest that dental costs are small in terms of the overall burden, more research in this area could isolate the true costs more accurately. For example, regression analyses (rather than sample means) could be used to isolate the difference in incidence of dental problems between meth users and nonusers. Information on the actual procedures received by patients receiving care for meth mouth could also be quantified and given unit cost estimates so that a more accurate assessment of the average cost of treating meth mouth could be applied. As there are not many resources available that speak to both dental problems and meth use, new work examining these issues in those with dental insurance from employers may be a fruitful avenue for further research.

Productivity

Health Care and Workers' Compensation Costs

As stated earlier in this monograph, Chapter Five omits estimates of the cost to employers of insuring and providing benefits to meth users. Employer-sponsored insurance plays a significant role in health coverage for U.S. workers. Among private-sector employers, approximately 88 percent were offered insurance in 2002, and 81 percent of those eligible employees enrolled (Stanton, 2004, Table 1). The premiums, paid by employers and employees, are based, in part, on the health costs of the employee population. To the extent that meth users have unusually high costs, they may raise the premiums. Substance abuse and dependence do not, in themselves, constitute catastrophic cost. However, it is possible that some meth-related behaviors, such as risky sexual behavior, can lead to catastrophic diagnoses or events, such as HIV or severe motor-vehicle crashes. Such costs are difficult to quantify but would be a function of meth use among the employed population and the likelihood that meth use results in a catastrophic event.

Meth use may also influence employer costs through workplace safety. In 2005, there were 5,734 workplace fatalities and 109,127 nonfatal workplace injuries (BLS, 2006, 2008a). But there is little information on how many of these are due to meth use or even general substance use. For example, operating motor vehicles or other machinery under the influence or during withdrawal may increase the likelihood of accidents. If work-related accidents increase, then employers may also incur increased cost for workers' compensation and insurance. Some of the accidents may show up in our calculations of ED visits and deaths—as long as the victim is the meth user. To the extent that co-workers or the general public incur the harms, they will also likely not be included in our estimates. The increased premium does not appear in our calculations.

At this point, we have no basis on which we can project a probable magnitude of these costs. We do know from the 2005 NSDUH that 58 percent of meth users report being employed in the past month, but it is unclear to what extent this translates into higher costs for employers, because we have limited information regarding potential increases in the prevalence of health conditions or accidents. Future work in this area would be useful to better understand the impact of meth use on the workplace and to determine whether this is indeed an area of high costs.

Other Productivity-Related Losses

There are other issues associated with meth use that are not explicitly included in our productivity estimates. These issues may impose costs to society but are difficult to quantify.

In Chapter Five, we included the costs of lost wages due to unemployment. If meth users drop out of the labor market, there are potential state and federal tax revenue losses associated with the reduced employment. The amount of these losses depends on the extent to which meth use reduces the total tax base and whether employers simply hire someone else instead. The loss of meth users from the labor force may also reduce the pool of potential hires and so can have the secondary effect of tightening the labor market, which may increase wages. However, selection is an issue here, so the size of this effect likely depends on the quality and type of worker.

Chapter Four also included an estimate of the costs associated with absenteeism. But meth may also affect the productivity of users when they show up for work. On the one hand, meth use does increase the users' energy levels. But it is unclear whether that energy will be used in a productive or disruptive manner in the workplace. Moreover, it is likely that the longer-term consequences of use, such as withdrawal, will decrease productivity. The quality of the work produced while under the influence of meth or during withdrawal may also be negatively affected, furthering the impact of use on employers.

In our chapter on crime, we calculated the extent to which meth increases crime and then calculated the costs associated with those events. A secondary productivity-related effect, not included in that estimate, is the extent to which increased crime reduces the ability of affected areas to attract businesses or other investments.

Crime and Criminal Justice

Incarceration for Misdemeanor Possession

Chapter Six assumes that those arrested for meth possession and other drug-related misdemeanor offenses are sentenced to probation if convicted. As a result, we do not incorporate any incarceration costs before, during, or after adjudication for those initially arrested for possession. We are unable to incorporate these costs because data tracking misdemeanor offenses and infractions through adjudication are difficult to obtain. We are not aware of any states that make these misdemeanor or infraction data readily available, and this information is not collected at the national level.

However, we do know that, among those sentenced to jail for drug possession, the mean and median time served is six and four months, respectively (BJS, 2004). At nearly $60 per day of jail, these costs are likely nonnegligible. We also know that some individuals arrested for drug possession spend time in jail before a disposition is made, some of whom are sentenced to time served and probation.

While these costs may be large, we point out that other costs of possession are already included in the estimates. First, we include the costs associated with those arrested for drug sales who eventually plea-bargain to a typically lesser drug offense, such as possession. Second, in some cases, possession charges may be dropped or individuals may be referred to treatment. We include the criminal justice referrals to treatment in the treatment costs discussed in Chapter Two.

Still, this omission suggests that we are underestimating the costs of drug offenses. Administrative data documenting the disposition of misdemeanor drug arrests and related infractions would be useful in understanding the full social cost of prohibition policies and drug consumption in general. However, assuming limited resources, this is not an area to which we would recommend allocating substantial research dollars, considering the probable magnitude of other omitted cost categories.

Violent Crime

Our low and best estimates of crime caused by meth assume that meth has no effect on violent crime. Neither the limited scientific literature nor the analyses included in Appendix C supports a causal relationship. However, lack of evidence does not necessarily mean that there is no causal relationship. It is possible that we are simply unable to identify the relationship for other reasons (e.g., events may be rare, instruments for determining causality may be relatively weak).

Our high estimate included offenses committed by regular meth users in order to obtain drugs as well as those committed by individuals who reported being under the influence of meth and (possibly) other substances at the time of the offense. While this does not directly estimate the costs associated with violence in the meth market, it likely includes some of these systemic crime costs (especially since there was home production by user-sellers in 2005). Further work with data sets such as the FBI's National Incident-Based Reporting System may shed light on the amount of violence associated with meth selling and trafficking as well as meth-induced violent crime, which should be explored, given the substantial social costs attributed to violent crimes in general. If the association between meth and violent crime is causal to even a small degree, it is possible that these omitted costs could be substantial.

Identity Theft

In Chapter Six, we estimate the costs associated with property and violent crime that can be attributed to meth. The focus in that analysis is the UCR's index crimes. But there has also been concern that meth leads to other illegal activities not included in the seven UCR index crimes, such as identity theft.

Evidence for the link to identity theft is growing on the front lines of law-enforcement agencies. The Department of Justice released an intelligence bulletin in 2007 referencing law-enforcement reports of meth-related identity theft. In addition to these specific reports, the National Association of Counties surveyed sheriffs in 2006, 31 percent of whom reported meth-related identity theft in their counties, a 4-percentage point increase from the previous year (Kyle and Hansell, 2005). However, while these reports give us reason to believe that sheriffs believe that the problem exists, they do not give us any indication of the extent of the problem. Additionally, these reports do not provide evidence of causality. Consequently, meth's impact on the incidence of identity theft remains unknown. While there is a growing perception that meth use is related to identity theft, there is currently little evidence to support or refute these claims. As a result, estimates of the impact of meth-related identity theft have been omitted from the main cost estimates.

However, we did obtain data from the Federal Trade Commission on the number of identity thefts reported in each state on a monthly basis. We then regressed the prevalence of identity theft on proxies for meth use in the state using data on admissions from the NIS hospital data and TEDS treatment-admission data. The specification included state-fixed effects so that the relationship between identity theft and meth was based on changes within states. The preferred model does not identify a significant relationship between meth and identity theft, but the results were sensitive to the specification of the model.[3] Additional research seems warranted to determine whether there is a relationship and, if so, what the associated costs are.

Other Crime Issues

Finally, our estimates of the costs of crime do not consider the effect of meth use on every possible type of offense (e.g., vandalism) or community corrections violation. Nor do we consider the possible long-term costs associated with meth-related convictions, such as the denial of some welfare benefits, denial of student aid, and removal from public housing (GAO, 2005). Further, our methodology relied on our ability to identify the link between meth use and specific crime types. As a result, the estimates do not include the costs associated with crimes committed by meth producers who do not use meth but who commit crimes in order to obtain the materials necessary to make meth.

Child Maltreatment and Foster Care

Chapter Seven addressed only some of the issues involved in child endangerment. Ultimately, we would like to identify the children who have been abused or neglected because of meth use or production and follow them over time. This would allow us to track the negative effects on the children as well the government costs associated with possible investigations and foster care. For lack of better information, our analysis focuses only on those children who entered the foster-care system.

Clearly, more information and research are needed. Conducting another national survey (like the 1993 *Study of Child Maltreatment in Alcohol Abusing Families* [Westat and James Bell Associates, 1993]) and requiring states to report drug-specific information about parental use to the ACF would go a long way toward improving our estimates of the number of children who are affected by parental involvement with meth.

With respect to foster care, the fundamental question is whether the child would have been removed from the home absent the meth. If a child were already neglected or abused pre-meth and it is indeed the meth that led him or her to be removed from the home (i.e., generated the attention of authorities), we must also consider that the child's welfare may actually increase in the long run when removed from the care of a meth-using parent. This is indeed an empirical question, but with new research suggesting that children whose mothers enter prison are less likely to experience grade retention (Cho, 2009), it should not be ignored in future cost analyses (especially those that include measures of child QoL). For example, if the children move in with other relatives, this could improve their QoL as well as impose important costs on the new caretakers.

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[3] We estimated the models in log-log, log-linear, and linear specifications (see Appendix C). The preferred model was based on the results of a Box Cox specification test (see Greene, 2003, for more on this).

Methamphetamine Production

Decontamination, Evacuation, and Sheltering

In Chapter Eight, we provide some preliminary estimates of the number of people probably affected by a hazardous event caused by meth (e.g., lab fire or lab explosion). While some of the costs were easy to quantify and are included in the chapter, we noted several aspects that could be more difficult, as costs could vary considerably (e.g., the cost of decontaminating the 298 people on site is likely to differ from the cost of decontaminating the 30 people who were sent to a medical facility). Possible unit cost estimates were offered for most of these components, but none suggested that the omission of these costs would greatly influence the overall cost estimate provided, and, given the relative uncertainty of the unit cost estimates, we opted to leave them out. If future work discovers that the unit costs involved in particular aspects of decontamination, evacuation, or sheltering are substantial, then it might be fruitful to revisit these costs.

Hazardous Waste

A potentially substantial omission from our previous estimate of the cost of meth production is the omission of hazardous waste that comes in the overall production of meth in the United States (regardless of whether a hazardous event occurs). In addition to the costs associated with lab and dump-site cleanup that are known, the DEA reports that each pound of manufactured meth produces about 5–6 pounds of hazardous waste (Joint Federal Task Force of the Drug Enforcement Administration, U.S. Environmental Protection Agency, and U.S. Coast Guard, 2005).[4] This waste is commonly buried or burned near the site or dumped along roads or into streams and rivers. The economic valuation of this hazardous waste is an extremely difficult thing to do, as the full social burden fundamentally depends not only on the cost of cleaning it up but also on the number of people potentially affected. Clearly, if the waste leaks into a public reservoir that is used for drinking water or near an area with a high density of housing, the social burden would be substantially greater than if the waste was located in a remote area.

An additional difficulty comes with trying to determine the amount of meth that is produced in any given lab (small or large), which is necessary to know the extent to which hazardous waste is produced from the production. A simple thought exercise could begin with information on the total amount of meth seized in the United States. According to the *National Methamphetamine Threat Assessment 2008* (NDIC, 2007b), just over 4,772 kg of meth was seized inside the United States. Some of this may have been produced outside of the United States and brought in, in which case the toxic waste associated with production would not have been generated in the United States. Nonetheless, this represents only the amount seized by the U.S. government, which clearly underestimates the total amount produced for that year. We currently have no useful way of inferring the total size of the market based on the amount seized. If we presume, just for the purposes of illustration, that the amount seized in the United States is about one-tenth of what is produced in the United States, then that would suggest that the total amount of hazardous waste generated from meth production would be on the order of 526,000 pounds. The impact on our total estimate could be fairly large even if the unit cost

[4] It is unclear whether available estimates to clean up lab sites include waste disposal, but there will likely be additional waste disposal for labs that were not discovered.

per cleanup is relatively small. However, given the possibility of leakage into drinking systems or other public venues, the actual cost per cleanup could be quite substantial as well. This is an area in which more research is needed to better understand the components that make up these costs—not just the unit cost estimates but the actual magnitude of production. Right now, insufficient information exists on which to generate a meaningful estimate, but one can presume that the estimate is not zero.

Summary

In this chapter, we briefly reviewed the evidence on cost components that were not included in our overall estimate. We found that many of these components comprised only a small share of the economic cost of meth abuse, such as treatment received in the nonspecialty sector and dental costs. However, we also identify several areas in which the costs could be large and consequently additional research could be useful, such as crime, child endangerment, meth-induced health problems (e.g., HIV/AIDS and heart problems), and possibly employer costs. Future research is necessary to explore the relationships between meth use and each of these outcomes before reasonable cost estimates can be constructed. In some cases, such as that of crime and HIV/AIDS, the unit social cost estimates are fairly large, so even small causal associations can create substantial unit costs. The omission of the costs from the main estimate provided in this monograph is not intended to indicate that these costs are negligible—only that the costs cannot be reasonably quantified at this point, given limitations of the data or the science.

CHAPTER TEN

Conclusion

This study represents the first rigorous attempt to calculate the cost that meth use imposes on individuals and society at the national level. The goal of this research is to generate cost estimates for the primary components, identify areas in which more research is needed for estimating total costs in the future, and analyze which quantifiable components represent the greatest share of the costs. In this chapter, we briefly summarize our findings and provide some context for evaluating the estimates within the broader substance abuse literature. While this study provides information that is useful for policymakers, we emphasize that there are many areas in which further research is warranted.

Our best estimate of the cost of meth in the United States in 2005 is $23.4 billion (see Table 10.1). By far, the biggest component of our cost estimate to date is the intangible cost of addiction ($12.6 billion). Most previous studies examining the economic burden of other substances in the United States fail to include a measure of the intangible burden of addiction, which makes it difficult for us to make direct comparisons of our estimate to other efforts. However, if we take out just this one piece, our estimates are consistent with other studies in terms of the major cost drivers of the total estimate. As in other studies, the losses associated with premature death ($4 billion) and criminal justice costs ($4.2 billion) comprise a substantial portion of the estimate. Lost productivity due to absenteeism, incarceration, unemployment, and other employer costs comprises an additional $687 million. Unlike previous studies, ours also includes the costs associated with child endangerment. Although our estimates include

Table 10.1
Social Costs of Methamphetamine in the United States in 2005 ($ millions)

Cost	Lower Bound	Best Estimate	Upper Bound
Drug treatment	299.4	545.5	1,070.9
Health care	116.3	351.3	611.2
Intangibles/premature death	12,513.7	16,624.9	28,548.6
Productivity	379.4	687.0	1,054.9
Crime and criminal justice	2,578.0	4,209.8	15,740.9
Child endangerment	311.9	904.6	1,165.7
Production/environment	38.6	61.4	88.7
Total	16,237.3	23,384.4	48,280.9

NOTE: Due to rounding, numbers may not sum precisely.

only lost QoL and foster-care costs, this component contributes $905 million to our estimate. Smaller contributions are made by drug treatment ($545 million), health ($351 million), and production ($61 million).

This best estimate translates into $26,872 for each person who used meth in the past year or $74,408 for each meth-dependent user.[1] The per capita cost, like our overall estimate, is sensitive to the inclusion of intangible costs, however. If we ignore intangibles, the costs per past year and meth-dependent user are appreciably smaller at $12,395 and $34,322, respectively.

To provide some perspective on this estimate, we can compare our findings regarding overall costs to estimates of general drug abuse constructed by Harwood, Fountain, and Livermore (1998) and updated by the ONDCP (2004b). Although there are some differences in the methodologies and included costs, it is interesting to see what fraction of the total illicit drug cost estimate meth might represent. The ONDCP (2004b) estimates that the total economic burden of illicit drug use in 2002 dollars is $180.9 billion. When converted to 2005 dollars using the CPI, the total cost is $196.4 billion.[2] If we exclude the intangible cost of addiction from our estimate (to be more consistent with methodology employed by Harwood, Fountain, and Livermore), our estimate for the cost of meth comprises 5.5 percent of the total costs of drug abuse. While this may seem like a small share, it represents a 50 percent higher burden than would be suggested by simple prevalence rates. Annual prevalence data from the NSDUH shows that meth users represent only 3.7 percent of all illicit drug users (NSDUH, 2006). Thus, meth imposes a disproportion share of costs relative to some other drugs. And if we instead use our upper-bound estimate (still excluding intangibles) to calculate meth's share, bearing in mind the significant number of omitted cost categories from our meth estimate, there is reason to believe that the burden of meth may be approximately twice its share of consumption.[3]

Comparisons to the costs for other specific substances are also useful, but there are few estimates available. We do find that our estimate of the cost of meth is in the same range as that for heroin. The economic cost of heroin abuse is estimated at $27.3 billion when inflated to 2005 dollars (Mark, Woody, et al., 2001). When calculated per addicted user, Mark and colleagues' estimate averages $45,433 per heroin addict. Our estimate of cost per addicted user, excluding intangible costs, which are not reflected in Mark et al.'s estimate, is $33,606 per meth-dependent user. Thus, the cost per meth-addicted user is at least 75 percent the cost per heroin addict, and that is excluding numerous crime and productivity costs that remain unaccounted for in our meth estimate.

A final point to draw from Table 10.1 is the substantial uncertainty in some estimates. It is important to understand the assumptions, uncertainty, and limitations underlying each estimate and its range. While the $23.4 billion represents our best estimate for the total cost of the included categories, the estimate contains substantial uncertainty such that our lower bound on the cost is $16.2 billion and our upper bound is $48.3 billion. The uncertainty is concentrated in certain areas, such as intangibles, premature mortality, and crime. These are some of the areas in which future research could prove useful in identifying the costs more accurately.

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1 Based on NSDUH estimates of past-year use in 2005 and based on adjusted NSDUH (2006) measures for dependence (see Chapter Five).

2 Using the CPI for all urban consumers in 2005 (195.3) and 2002 (179.9). See BLS (2008b).

3 If we do a similar comparison using our upper-end estimate of the total cost of meth abuse and subtract the intangible cost of addiction, we find that meth accounts for 7.2 percent of the total cost of illicit drug use.

More research could also shed light on cost components that are not included in our estimate. We considered these costs briefly in Chapter Nine and, for the most part, do not feel that these components would contribute greatly to the costs of meth. The exceptions are child endangerment and crime, for which costs may be large, and other health conditions caused by meth, for which we do not have sufficient information to determine whether costs are large.

Finally, these estimates are entirely based on information for 2005—the most recent year for which we had access to the necessary data sources for each component. To the extent that meth use has changed since that time, our estimates would not reflect those changes.

External Versus Internal Costs

The decision to use meth is an individual one, but the decision to use also imposes costs on society. Table 10.2 designates the major cost components discussed in this monograph based on who bears the burden in general. Internal costs are borne by the individual, while external costs are borne by nonusers, including the government, employers, family members, and other members of society. This distinction between internal and external costs can be a key factor for assisting policymakers with decisions regarding the need to intervene in these markets and whether their efforts should more aggressively target prevention or treatment. The fact that the bulk of the costs (intangible health burden and premature mortality) are borne largely by the individual would cause some economists to argue that there is little need for

Table 10.2
Internal and External Components of the Cost of Drug Use in the United States

Major Cost Component	Internal Costs	External Costs
Treatment	Out of pocket (e.g., copayments and deductibles)	Paid by insurance or the government
Health care	Out of pocket (e.g., copayments)	Paid by insurance or the government
Intangibles and premature death	Pain and suffering, reduced QoL Premature death	Lost tax revenue associated with forgone earnings
Productivity	Lost after-tax earnings	Lost tax revenue associated with unemployment Employer costs of absenteeism Increased workers' compensation premiums Drug testing
Crime	Private legal fees, fines, and forfeitures	Enforcing drug prohibition (e.g., jail and prison costs, court costs) Cost of other crimes (e.g., incarceration) Pain and suffering of crime victims Monetary costs to victims (e.g., lost property)
Child-endangerment costs	Lost productivity Other consequences of child maltreatment (e.g., court costs)	Costs imposed on the foster-care system Lost QoL
Production	Fatal and nonfatal injuries among users and producers	Fatal and nonfatal injuries among nonusers Environmental cleanup First-responder costs

government intervention, as these are costs that should be rationally considered in the decision to use the substance. However, many believe that once meth is tried, the decision to continue using is no longer made by a rational decisionmaker. In that second case, the government could and should intervene to assist users. On the other hand, to the extent that meth use imposes costs on the drug-treatment, health care, and criminal justice systems, there are grounds for the government to consider interventions that could reduce these costs. However, the nature of the interventions and how targeted they should be is best considered in a careful cost-effectiveness study rather than a general COI study, such as this one.

Table 10.2 is a simplification, of course, as some costs have effects on those who do not directly bear the costs. For example, the premature death of a meth user is an internal cost but may impose pain and suffering on family. But looking across categories, one can think about the extent to which nonusers bear the brunt of specific costs. For example, federal and state governments pay for the vast majority of drug treatment and incur the cost of health care for those who are publicly insured or uninsured. The government also forgoes tax revenue on lost productivity. For the crime component, the government incurs the costs of enforcing drug prohibition and of incarcerating inmates for drug and other crimes. The government also incurs the cost of providing for children who have been removed from their parents' homes due to meth. Finally, the government is responsible for responding to meth explosions and fires and cleaning up the pollution resulting from meth production.

Employers lose as well because they incur the cost of employee absenteeism on production, drug testing to screen prospective and current employees, and higher premiums for health and workers' compensation insurance.

Finally, individuals who do not use meth also bear the burden of meth use. The victims of meth-related behaviors may suffer financial harm, such as property theft, or intangible costs, such as the pain and suffering of the victims of meth-induced crime and child maltreatment.

If we use the categorization in Table 10.2 as a general framework, it would suggest that the bulk of our estimated costs are borne by the individual, not others in society. Intangible costs and premature mortality make up more than two-thirds of our total cost estimate. That is not to say that the costs to nonusers are small. Indeed, crime costs are almost entirely borne by the public, as are treatment costs, child endangerment, and the costs associated with meth production. Thus, meth users do place a significant burden on society. And it is precisely this burden that is likely to be underestimated in our totals, as many of the biggest costs currently omitted from our estimate (violent crime, identity theft, employer costs, and health and dental) would be borne by nonusers.

To Conclude

Our cost estimates provide the first evidence of the scope of the meth problem nationally. We find that meth does impose a significant burden on individuals and society. While we believe that our estimate captures the majority of meth's costs, we acknowledge that we could not include all potential costs of meth. There are some components that data and resource limitations did not allow us to address. For these elements, we made an attempt to provide some preliminary evidence of the scope of the costs in Chapter Nine. Future research is needed in order to better understand meth's relationship to these cost components, however.

These estimates provide useful guidance for policymakers in understanding the scope and source of costs associated with meth. Clearly, meth use places a burden on our treatment and health care systems, but the greater burden is in terms of the intangible health burden of addiction, lost productivity, premature mortality, and crime.

APPENDIX A

Supporting Information for Estimating the Cost of Methamphetamine-Related Health Care: Inpatient Days

The NIS data provide both the costs associated with inpatient stays and the number of days associated with those stays. In this appendix, we provide the estimated increase in the LOS associated with the use of meth. These estimates do not constitute additional costs but rather provide an alternative indicator of the costs of inpatient stays due to meth discussed in Chapter Three. We used the same methodology as in Chapter Three to identify the number of days associated with meth-induced stays and the number of incremental days for meth-involved stays. We estimate that meth-induced stays contributed between 19,910.5 and 23,693.5 inpatient days, with our best estimate at 19,910.5 (Table A.1). The number of incremental days due to meth-involved stays is estimated at 3,793.9 days, with a significant range of 2,325 to 10,085.6 days (Table A.2).

Table A.1
Inpatient Days for Methamphetamine-Induced Hospital Stays for Which 100 Percent of Costs Were Attributed to Methamphetamine in 2005

Condition	Lower	Best Estimate	Upper
Fetal dependence	292	292	312
Neuropathy	5	5	5
Substance-induced psychosis	8,895	8,895	10,623
Skin, bacterial infection	135	135	135
Skin, other infection	9,464	9,464	10,856
Skin, ulcer	550	550	670
Skin, other inflammation	75.5	75.5	75.5
Injury, mental health or drug screen	60	60	453
Injury, poison by psychostimulant drug	434	434	564
Total	19,910.5	19,910.5	23,693.5

SOURCE: NIS (2005).

Table A.2
Incremental Inpatient Days for Methamphetamine-Involved Hospital Stays for Which Methamphetamine Use Contributed to Costs in 2005

Condition	Lower	Best Estimate	Upper
Cardiovascular	1,471.94	2,070.73	2,704.12
Cerebrovascular	684.10	1,482.22	2,409.28
Dental	0	0	0
Fetal	0	0	0
Injury	114.47	361.42	4,250.43
Liver or kidney	–938.60	–498.89	–17.83
Lung	0	0	0
Nutrition	0	0	0
STDs	54.47	378.42	739.59
Skin[a]			
Mental health	0	0	0
Total	2,324.98	3,793.9	10,085.59

SOURCE: NIS (2005).

[a] Skin costs are already accounted for in the meth-induced costs (see Table 3.1 in Chapter Three).

APPENDIX B

Additional Calculations to Support Productivity-Loss Estimates

Self-Reported Methamphetamine Use in the Past Year: Evidence from the NSDUH

At the heart of many of the calculations that follow is a reliance on self-reported information related to meth use in the past year as reported in a large, nationally representative household survey, the NSDUH. Thus, it is important to begin with a good understanding of what those responses look like in the data, both weighted and unweighted. In Table B.1, we report the information on self-reported meth, alcohol, marijuana, and cocaine use from the NSDUH so that it is possible to compare use rates of meth to those of other substances.

As can be seen in Table B.1, meth use is not nearly as common as use of any of the other substances shown for the household population in general. However, annual use rates vary substantially regionally, as can be seen from evidence from the states.

Table B.1
Self-Reported Prevalence of Substance Use, by Substance and How Recently It Occurred, Entire 2005 NSDUH Sample

	Prevalence of Use (%)			
NSDUH (2005) *n* = 55,905	**Meth**	**Alcohol**	**Marijuana**	**Cocaine**
Unweighted				
Use in the past month	0.34	44.96	9.64	1.28
Use in the past year but not the past month	0.53	16.50	7.30	2.16
Use in lifetime but not past year	3.05	11.26	22.41	8.26
Never used	96.09	27.29	60.66	88.30
Weighted				
Use in the past month	0.22	51.67	5.99	0.96
Use in the past year but not the past month	0.32	14.96	4.47	1.26
Use in lifetime but not past year	3.60	16.36	28.57	11.44
Never used	95.87	17.00	59.97	86.33

Assessing the Impact of Methamphetamine Use in the Past Year on the Probability of Being Unemployed

As stated in the main text, we begin with an examination of the likelihood of being unemployed among individuals between the ages of 21 and 50. By restricting our sample to individuals within this age range, we hope to reduce the impact of individuals who drop in and out of the labor force for reasons other than their substance use behavior (i.e., schooling decisions and retirement). In the 2005 NSDUH, respondents are asked whether, in the past 12 months, there was ever a period during which they did not have at least one job or business. Respondents who reported an unemployment spell during the past year and had not previously stated that they were a full-time student or out of the labor force were then asked how many weeks in the past year they were without a job. These two questions provide us with information for our main assessment of the impact of meth use on employment.

The literature suggests that substance use and unemployment may have a reciprocal relationship. Higher drug use may lead to the probability of being unemployed, by increasing the chances of an accident, a positive drug test, missing too much work, or poor performance on the job. However, it is also true that prolonged spells of unemployment may discourage individuals to the point that they self-medicate by using illicit substances. Because of the potential for such reverse causality, we tested the appropriateness of the bivariate probit model, which attempts to control for the possible feedback mechanisms just suggested by explicitly modeling the unobserved correlation in the error terms across the two specific outcomes (unemployment and meth use). Empirical tests of the existence of its correlation and its impact on coefficient estimates are indicated by a statistically significant value of rho (the correlation parameter that is estimated in the model).

In Table B.2, we show the coefficient estimates of the effects of meth use on unemployment using the bivariate probit model. As mentioned in the main text, all the models include as additional controls the individual's gender, race or ethnicity, educational attainment, age bracket, marital status, general health status, number of children in the household under the age of 18, number of prior jobs, and population density. To test the robustness of findings to alternative specifications that include potentially endogenous variables, we first estimate the model using only the additional controls just mentioned. Then, in a second specification, we include as additional controls the use of other substances, to make sure that the estimated effect of meth is not really due to the use of some other substance that drives the result. In the third specification of the model, we also include family income (as a series of dichotomous indicators) and whether the individual is currently enrolled in school (even though the sample includes only those between the ages of 21 and 50) to examine whether these additional variables, which could also be highly correlated with the error term and meth use, reduce the significance of the meth effect.

The instruments used for identification of the causal association between meth use and unemployment status include indicators of religious attachment (number of times in the month one attended religious services), whether the respondent has been offered drugs in the past 30 days, and the age of first use of marijuana, a substance commonly believed to be a gateway drug to other illicit substances, including meth. All of these instruments were assessed in terms of their validity, exogeneity, and exclusion criteria using linear probability models estimated using ivreg2 in Stata 8.2. The F-statistic tests the power of the identifying instruments to determine whether they are jointly significant and have explanatory power on the first stage

Table B.2
Coefficient Estimates of the Effect of Methamphetamine Use on the Probability of Unemployment, Using Bivariate Probit Estimation

Bivariate Probit Results from Alternative Models	Outcome: Probability of Being Unemployed	Outcome: Probability of Being Unemployed	Outcome: Probability of Being Unemployed
Coefficient on meth	1.325***	1.045***	1.405***
Alcohol and other illicit drugs included?	No	Yes	Yes
Family income and school enrollment included?	No	No	Yes
Rho	−0.391***	−0.310***	−0.397**
Instruments	Religious attendance, drug offers, age of first marijuana use	Religious attendance, drug offers, age of first marijuana use	Religious attendance, drug offers, age of first marijuana use
F (6, 33)	9.61***	11.28***	13.97***
Hansen J statistic	3.11 (NS)	3.49 (NS)	1.22 (NS)

*** Indicates statistical significance at the 1-percent level (two-tailed test).

** Indicates statistical significance at the 5-percent level (two-tailed test).

NS indicates no statistical significance.

of the regression on their own. A value of 10 is usually deemed necessary to demonstrate that the instruments are strong enough and will not introduce additional bias, although some have argued that an F-test of 8 is all that is needed. The Hansen J statistic is an overidentification test that determines whether the instruments (in this case, religiosity, drug offers, and age of first marijuana use) satisfy the orthogonality conditions. The test assesses whether the instruments directly affect the dependent variable (e.g., unemployment) other than through the potentially endogenous variable (meth use) by testing whether the instruments are correlated with the error term. The null hypothesis is that they are not correlated with the error term, so the goal of the Hansen J statistic is to not reject the null hypothesis (i.e., have a statistically insignificant test statistic that will not allow rejection of the null hypothesis).

As can be seen from the results presented in Table B.2, we find that meth has a positive and statistically significant effect on the probability of being unemployed. The magnitude of the effect gets a little bit smaller as other substance use is introduced into the model (second column) but remains statistically significant. Interestingly, with the inclusion of school enrollment status and family income as additional controls, the effect of meth use on unemployment gets even larger. In all cases, the estimated correlation between the error terms is found to be large and statistically significant, showing that single-equation estimation of this relationship could lead to biased estimates. It is the difference in predicted probabilities generated from the last model (column 3) and the 95-percent confidence interval surrounding this estimate that are used to generate our estimated cost of unemployment in Table 4.3 in Chapter Four.

Impact of Meth Use on Absenteeism

As noted in the main body of the monograph, the 2005 NSDUH asks respondents about missed workdays through two specific questions:

- How many days in the past month did you miss work because of injury or illness ("sick days")?
- How many days in the past month did you miss work because you just did not feel like going to work ("blah days")?

We evaluated the impact of self-reported meth use in the past year on each of these measures using two alternative types of IV techniques. Table B.3 shows the population-weighted average responses for both of these questions and suggests that meth users may indeed experience more missed days of work. It shows that there is a statistically significant difference in the mean number of sick days reported, with meth users reporting more sick days on average than non–meth users. We find a similar result for reported blah days, but the 95-percent confidence intervals overlap, so this difference in average response is not statistically significant. The results are suggestive, however, and warrant further investigation in a manner that can control for other factors that might drive some of these differences.

The first approach we employed is a standard two-stage least squares (2SLS), where the probability of meth use in the past year is estimated as a linear probability model using ivreg2 in Stata 8.2. Estimating the model this way makes it possible for us to evaluate standard tests to assess the quality of the instruments used to identify true causal associations instead of mere correlation. In cases in which the instruments were found to be valid and consistent, we also estimated the model using Stata's treatreg command, which enables us to use the probit model for estimating the probability of being a meth user in the past year in the first stage. We view the treatreg as a more appropriate model for estimating the effects on missed days of work because of the dichotomous nature of meth use (see Table B.4). However, the treatreg model could generate statistically significant results that are biased because of weak instruments (which can be identified only via the ivreg2 command). So, both methods contain information that is relevant for interpreting the results.

Table B.3
Mean Number of Sick Days and Blah Days, by Methamphetamine Use in the Past Year

Variable (Subpop)	Mean Estimate	Lower Bound of 95% Confidence Interval	Upper Bound of 95% Confidence Interval
Sick days**			
Non–meth user	0.67	0.61	0.73
Meth user	1.71	0.91	2.50
Blah days			
Non–meth user	0.23	0.21	0.26
Meth user	0.43	0.22	0.64

** Statistically significant differences between meth users and non–meth users at the 5% level.

Table B.4
Estimation of Workdays Missed in the Past Month Because of Injury or Illness, Ages 21 to 50

	Outcome: Number of Sick Days in the Past Month					
	2SLS Results			Treatreg Results		
Estimate Element	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Coefficient on meth	3.88 (NS)	3.62*	3.58*	5.01***	2.95***	2.92***
Alcohol and other illicit drugs included?	No	Yes	Yes	No	Yes	Yes
Family income and school enrollment included?	No	No	Yes	No	No	Yes
Lambda (hazard)				–1.83***	–1.11***	–1.11***
Instruments	Drug offers, age of first marijuana use	Drug offers, age of first marijuana use	Drug offers, age of first marijuana use	Drug offers, age of first marijuana use	Drug offers, age of first marijuana use	Drug offers, age of first marijuana use
F (4, 35)	8.15***	8.54***	8.69***			
Hansen J statistic	4.29 (NS)	4.78 (NS)	4.65 (NS)			

*** Indicates statistical significance at the 1-percent level (two-tailed test).

* Indicates statistical significance at the 10-percent level (two-tailed test).

NS indicates no statistical significance.

As in the case of the unemployment models, all regressions include as additional controls the individual's gender, race or ethnicity, educational attainment, age bracket, marital status, general health status, number of children in the household under the age of 18, number of prior jobs, and population density.

As shown in Table B.4, once again we find that the instruments we use for estimation of causal effects appear to be working well. The instruments pass the specification tests, suggesting that they have reasonably good power and are indeed orthogonal to our main dependent variable (sick days). Meth use is generally associated with more missed days of work using both methods of estimation. However, the results from the 2SLS models are statistically significant only at the 10-percent level, which some would seriously question in terms of reliability. Because the results are not statistically robust across both the 2SLS and treatreg specifications, we are cautious interpreting the results in our main tables presented in Table 5.5 in Chapter Five.

Next, we consider the effect of meth use on the number of missed days of work because of feeling blah. The results for this variable, shown in Table B.5, are a bit different from those shown in the other measure of missed workdays. The instruments again meet the basic requirements in that they pass the overidentification test, but the statistical power of the instruments is a bit weaker and may therefore lead to some bias in estimated coefficients. For that reason, we rely on the smaller but still statistically significant results from the treatreg regression as our main measure of the effects of meth use on days missed because of feeling blah. Our

Table B.5
Estimation of the Number of Days of Missed Work Due to Feeling Blah, Ages 21 to 50

Estimate Element	2SLS Results			Treatreg Results		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Coefficient on meth	9.22***	7.44**	7.36**	2.96***	1.58***	1.42***
Alcohol and other illicit drugs included?	No	Yes	Yes	No	Yes	Yes
Family income and school enrollment included?	No	No	Yes	No	No	Yes
Lambda (hazard)				–1.05***	–0.56**	–0.50***
IV included?	Yes	Yes	Yes	Yes	Yes	Yes
Instruments	Drug offers, religiosity	Drug offers, religiosity	Drug offers, religiosity	Drug offers, religiosity	Drug offers, religiosity	Drug offers, religiosity
F (3, 39)	6.95***	7.16***	6.89***			
Hansen J statistic	2.15 (NS)	4.78 (NS)	3.38 (NS)			

*** Indicates statistical significance at the 1-percent level (two-tailed test).

** Indicates statistical significance at the 5-percent level (two-tailed test).

NS indicates no statistical significance.

calculations in Table 5.5 in Chapter Five are based on the 95-percent confidence interval surrounding the coefficient estimate from the last specification, which includes substance use as well as income and schooling status.

Alternative Calculation of Productivity Losses

In Chapter Five, we provided an in-depth analysis of mortality, unemployment, and days of work missed to calculate the productivity losses associated with meth use. Productivity losses (excluding premature death) totaled $687.0 million, according to our best estimate. In this section, we provide a less rigorous but potentially interesting alternative assessment of these costs based on findings from a recent study funded by the Wal-Mart Foundation. That study, which used data from a small sample of employees in a single county, determined that each meth-using employee costs his or her employer $47,500 per year in lost productivity, absenteeism, higher health care costs, and higher workers' compensation costs (CBER, 2004). Due to the very small sample of employees (n = 2,934) and lack of geographic variation, the generalization of these results is highly questionable. Moreover, there are several limitations of the study, including assumptions (such as the correlation between theft and use) that are not supported in the scientific literature. However, it is interesting to compare the productivity losses implied using this as an estimate of the average productivity loss per meth worker. According to data from Quest Diagnostics (2006), 0.28 percent of workers who were assessed tested positive for meth in 2005. Given that more than 7.3 million tests were conducted in 2005, this suggests that there were at least 20,440 meth-using employees in 2005. Applying an average cost of $47,500 per year, this suggests that, in 2005, meth-using employees cost their employers at least $970.9 million in lost productivity, absenteeism, higher health care costs, and higher workers' compensation costs.

This estimate is in the ballpark of our estimates of lost productivity not associated with mortality but is nearly 1.5 times larger than our best estimate of $687.0 million (excluding mortality). Differences are expected because this estimate includes more information related to employers cost of hiring meth users, including higher health care and workers' compensation costs, but it is interesting to see that these omissions from our calculation might approach $280 million.

APPENDIX C

Additional Information to Support the Cost of Methamphetamine-Related Crime

The Issue of Causality

As noted in Chapter Five, there is limited evidence on the relationship between meth and crime, particularly with respect to whether meth *causes* property or violent crime. In this appendix, we provide evidence from regression analyses examining whether meth use increases any of the index crimes.[1] The regression results do suggest a relationship between meth and certain property crimes, but no relationship with violent crime.

We use data from the FBI UCR on the prevalence of each index crime: murder or manslaughter, forcible rape, assault, robbery, burglary, larceny, and motor-vehicle theft. These data are available monthly for each of the 50 states. Ideally, we would want to regress these outcomes on the prevalence of meth use. However, data on the prevalence of meth use are available annually only at the state level. We can, however, determine the monthly share of hospital admissions for each state that have a mention of amphetamine on the record and use that measure to proxy for the prevalence of meth use. This same measure has been used to proxy for meth use in previous studies (e.g., Dobkin and Nicosia, forthcoming).

We estimate three specifications for each offense category. In addition to the share of hospitalizations with a mention of meth, the first specification includes the shares of hospitalizations with a mention of opioids, cocaine, cannabis, and alcohol. Year-fixed effects are also included to control for trends, while month-fixed effects address seasonality. The second specification includes state-fixed effects. State-fixed effects are important because they address any time-invariant unobservable differences across states. In effect, a state-fixed effects regression identifies the relationship between meth and crime using within-state changes in these measures. The third specification builds on the state-fixed effects model by adding state-specific time trends. This third specification represents our preferred model. All regressions are estimated for the period from January 2003 to December 2006.

Table C.1 summarizes our findings. The share of hospitalizations with a mention of amphetamine is statistically significant for murder and manslaughter, assault, rape, and robbery only in the first and most basic specification. However, once we control for state-fixed effects, the significance disappears. The third (preferred) specification with state-specific time trends likewise fails to identify any significant relationship.

However, the results for the property-crime categories suggest a potentially important relationship. Motor-vehicle thefts, burglaries, and larceny show a statistically significant and

[1] Carlos Dobkin was a significant contributor to the work that is included in this appendix, and we gratefully recognize his contribution.

Table C.1
Methamphetamine and Crime

	Murder			Manslaughter		
Crime	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Percent amphetamine	9.72	–0.31	0.09	–0.48	–0.35	–0.44
	[2.04]***	[1.18]	[1.23]	[0.25]*	[0.42]	[0.45]
Percent opioid	–5.70	–0.70	–1.00	–0.02	0.18	0.28
	[1.15]***	[0.88]	[1.04]	[0.13]	[0.18]	[0.21]
Percent cocaine	22.09	1.73	4.20	–0.36	–0.09	–0.45
	[1.46]***	[1.88]	[1.72]**	[0.27]	[0.26]	[0.27]
Percent cannabis	–1.38	2.73	0.10	0.17	0.76	1.10
	[2.94]	[2.14]	[1.70]	[0.38]	[0.58]	[0.59]*
Percent alcohol	–5.53	–1.06	–1.37	0.03	–0.20	–0.16
	[0.74]***	[0.56]*	[0.60]**	[0.09]	[0.12]	[0.13]
Constant	0.37	0.35	0.36	0.01	0.02	0.02
	[0.03]***	[0.02]***	[0.02]***	[0.00]***	[0.00]***	[0.00]***
Month- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State-fixed effects	No	Yes	Yes	No	Yes	Yes
State-specific trends	No	No	Yes	No	No	Yes
R-squared	0.16	0.07	0.10	0.02	0.01	0.04
Observations	1,740	1,740	1,740	1,740	1,740	1,740
		Rape			**Robbery**	
Percent amphetamine	61.16	–0.34	2.61	415.44	48.76	59.34
	[9.19]***	[7.50]	[6.09]	[41.80]***	[45.88]	[41.18]
Percent opioid	–40.02	13.59	11.52	–2.75	0.64	–25.68
	[5.75]***	[8.75]	[7.90]	[22.38]	[11.38]	[25.39]
Percent cocaine	–9.21	–13.95	–9.65	584.27	–25.63	–15.25
	[6.83]	[10.77]	[10.74]	[26.14]***	[23.98]	[15.51]
Percent cannabis	26.14	6.68	12.24	–251.26	18.84	–6.65
	[14.32]*	[10.76]	[10.67]	[67.46]***	[35.28]	[25.31]
Percent alcohol	–2.93	–7.37	–5.52	–126.33	4.17	12.68
	[3.41]	[6.45]	[4.57]	[18.75]***	[15.88]	[14.18]
Constant	2.07	2.06	1.96	8.45	8.54	7.72
	[0.11]***	[0.18]***	[0.10]***	[0.59]***	[0.30]***	[0.30]***
Month- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State-fixed effects	No	Yes	Yes	No	Yes	Yes

Table C.1—Continued

Crime	Rape (cont'd.) (1)	(2)	(3)	Robbery (cont'd.) (1)	(2)	(3)
State-specific trends	No	No	Yes	No	No	Yes
R-squared	0.20	0.23	0.33	0.25	0.36	0.47
Observations	1,740	1,740	1,740	1,740	1,740	1,740
		Assault			**Burglary**	
Percent amphetamine	1,645.85	–77.23	81.15	2,824.36	196.05	211.22
	[260.48]***	[222.22]	[145.27]	[184.09]***	[220.75]	[79.31]**
Percent opioid	–1,611.78	71.21	85.31	–1,097.18	51.30	107.45
	[266.81]***	[110.43]	[90.84]	[122.97]***	[58.56]	[63.86]
Percent cocaine	2,546.43	–319.88	–276.65	1,624.65	29.70	–119.93
	[344.71]***	[132.23]**	[146.41]*	[167.36]***	[105.20]	[77.00]
Percent cannabis	–741.37	344.56	99.37	29.66	251.90	33.48
	[553.95]	[195.74]*	[207.89]	[258.58]	[170.31]	[130.43]
Percent alcohol	–1,038.29	–32.33	47.70	–501.24	–89.10	–10.28
	[140.32]***	[64.97]	[68.58]	[67.56]***	[36.21]**	[20.85]
Constant	108.33	81.08	73.56	55.91	52.22	51.98
	[5.09]***	[1.96]***	[2.38]***	[2.50]***	[0.92]***	[0.81]***
Month- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State-fixed effects	No	Yes	Yes	No	Yes	Yes
State-specific trends	No	No	Yes	No	No	Yes
R-squared	0.12	0.54	0.62	0.26	0.46	0.63
Observations	1,740	1,740	1,740	1,740	1,740	1,740
		Larceny			**Motor-Vehicle Theft**	
Percent amphetamine	10,291.02	406.36	1,099.00	4,156.32	436.64	317.32
	[503.30]***	[839.88]	[303.52]***	[202.84]***	[91.39]***	[66.83]***
Percent opioid	–1,948.40	138.27	218.31	94.90	183.56	96.79
	[302.77]***	[204.15]	[160.31]	[71.24]	[89.72]**	[37.55]**
Percent cocaine	2,819.23	281.58	–299.06	1,021.33	–202.61	–72.82
	[384.35]***	[278.04]	[149.94]*	[96.09]***	[122.78]	[54.36]
Percent cannabis	1,904.36	964.81	290.83	–1,210.30	71.28	223.54
	[701.96]***	[597.90]	[288.03]	[249.30]***	[146.00]	[112.93]*
Percent alcohol	–1,720.18	–272.83	–43.88	–184.45	–42.80	–49.35
	[178.81]***	[126.64]**	[77.43]	[57.08]***	[44.26]	[20.16]**

Table C.1—Continued

	Larceny (cont'd.)			Motor-Vehicle Theft (cont'd.)		
Crime	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Constant	176.57	165.80	183.16	23.31	30.23	32.68
	[6.80]***	[3.54]***	[2.44]***	[1.83]***	[0.84]***	[0.70]***
Month- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State-fixed effects	No	Yes	Yes	No	Yes	Yes
State-specific trends	No	No	Yes	No	No	Yes
R–squared	0.37	0.51	0.70	0.40	0.24	0.46
Observations	1,740	1,740	1,740	1,740	1,740	1,740

SOURCE: Deb, Manning, and Norton (2006).

NOTE: Robust standard errors in brackets.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level. All regressions include month- and year-fixed effects.

positive relationship with meth in the first specification. An increase in the share of hospitalizations with a mention of amphetamine increases property crimes. The effects persist in the fully specified models with state-fixed effects and state-specific time trends.

In Chapter Six, we found that meth-using inmates do report committing income-generating property crime as a result of their drug use, but violent crimes are less common. These regressions are consistent with those findings. Because the regressions do not identify a statistically significant relationship with violent crime, our lower-bound estimate for these costs in Chapter Six is 0. These regressions, however, do support the relationship with burglary, larceny, and motor-vehicle theft, so the lower bounds on those cost estimates are positive.

Identity Theft

In Chapter Nine, we briefly discussed the potential relationship between meth and identity theft. Our conclusion was that we did not have sufficient evidence to support a cost estimate at this time but that additional research would be useful.

Our analysis focused on estimating whether reports of identity thefts to the Federal Trade Commission are related to meth prevalence. The data are state-specific totals for each month from 2000 to 2006. We estimated these counts on the prevalence of meth and other substances (e.g., cocaine, heroin, marijuana) (see Table C.2). Prevalence was measured at the state-month level using two sources. The first was treatment admissions from TEDS. The second source was hospital admissions from the NIS.[2] The specifications also include state-fixed effects to address time-invariant differences across states, year-fixed effects to address trends, and month-fixed effects to address seasonality.

[2] The NIS identifies amphetamines rather than methamphetamines. The NIS data contain only the subsample of states that participate in the HCUP.

Table C.2
Relationship Between Identity Theft and Methamphetamine Use

	ID Theft Versus TEDS			ID Theft Versus NIS		
Measure	**Level**	**Log-Linear**	**Log-Log**	**Level**	**Log-Linear**	**Log-Log**
Meth/amphetamine	0.85***	0.00	0.01	5.69***	0.00	0.01
Admission for other drugs	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Box Cox theta		0.1187***			0.1368***	
LVHAT coefficient		1.59***			1.56***	

NOTE: *** Significant at the 0.01% level.

The models that estimated the levels of identity-theft reports on the level of admissions do find a significant relationship with meth (or amphetamines) as well as a relationship with other drugs. However, log-linear and log-log models do not support a significant relationship. Moreover, tests suggest that the regressions estimating the relationship in levels are not appropriate. We then estimated a generalized linear model with link(log) and family(gamma). Our specification is based on the methodology suggested by Deb, Manning, and Norton (2006). As a result, we do not currently have sufficient evidence to support a relationship on which to base a cost estimate. Alternative specifications with robust and clustered standard errors and adding time-varying characteristics, specifically the state unemployment rate, did not qualitatively change the results.

APPENDIX D

Deriving Methamphetamine Attribution Factors from the Inmate Surveys

The SISCF and SIFCF are together known as the SISFCF. The data were collected through personal interviews conducted between October 2003 and May 2004. The SIFCF was comprised of 3,686 prisoners from 39 federally owned and operated prisons. The SISCF included 14,499 inmates from 287 facilities. These respondents were weighted to be nationally representative using variable v2927 in the data set. The SILJ was conducted in 2002 and comprised of responses from 6,982 inmates in 460 jails. These responses are weighted to be nationally representative using variable v2291 in the data set.

We started by creating variables for the index-crime categories: murder and manslaughter, forcible rape, assault, robbery, burglary, motor-vehicle theft, and larceny. Inmates may be held for multiple offenses; however, we used only one offense for each inmate, the controlling offense as embedded in variable v2596 in the SISFCF and in v2239 in the SILJ. The offense codes used for these variables were listed in Appendix A in the SISFCF, and in "Other Study-Related Materials" in the SILJ. The offense codes used for each of the defined crimes are listed in Table D.1.

Using these definitions, the percentage of the population that was held for each of these crimes was determined for the weighted population. Combined with the number of prisoners in each population, we generated the number of inmates for each controlling offense, as listed in Table D.2.

Next, we generated variables for meth use. The data sets had multiple variables that coded reported use in several ways. We first limited our focus to current users; meth use in the month before arrest is coded in variables v2075 and v2076 for the SISFCF and variables v1715 and

Table D.1
Offense Codes Used for Each of the Defined Crimes

Offense Variable	Controlling Offense Code
Murder and manslaughter	010, 011, and 012 (murder); 015, 016, 030, 031, and 032 (manslaughter)
Forcible rape	050, 051, and 052
Assault	120, 121, and 122
Robbery	090, 091, 092, 100, 101, and 102
Burglary	190, 191, and 192
Motor-vehicle theft	210, 211, and 212
Larceny	230, 231, 232, 240, 241, 242, 250, 251, and 252

Table D.2
Number of Inmates for Each Controlling Offense

Controlling Offense	Number of Inmates in Population			
	Jail	State Prison	Federal Prison	Total
Murder and manslaughter	3,298	166,180	5,057	174,534
Forcible rape	2,348	44,950	350	47,648
Assault	25,909	95,349	2,345	123,602
Robbery	6,860	157,636	15,048	179,543
Burglary	13,825	102,284	787	116,896
Motor-vehicle theft	2,322	15,231	210	17,763
Larceny	18,495	48,294	805	67,594
Previously on parole	24,247	232,057	21,679	277,983
Previously on probation	107,566	299,049	25,038	431,654

v1716 for the SILJ. Respondents were considered regular current meth users if they used once a week or more. This included those who responded "at least once a week," "almost daily," "daily," or "other" and then specified the other number of days as between 4 and 31. We similarly coded regular use of any drug besides meth. The definitions for the drug categories used can be found in Table D.3.

Using these variables for regular drug use by drug type, we created a new indicator variable for regular users of meth who were not regular users of any other drug. We then used respondent reports that they committed the crime specifically to obtain drugs or money for drugs (coded as v2126 in SISFCF and v1765 in SILJ) or were on meth at the time (coded as v2129 in SISFCF and v1769 in SILJ). Additionally, we created a variable to identify use of any drug other than meth at the time of the crime (coded as v2127, v2128, and v2130 through v2140 in SISFCF, coded as v1767, v1768, and v1770 through v1780 in SILJ) and another to identify whether they had been drinking any alcohol at the time of the offense (v1987 in SISFCF, v2383 in SILJ). Using these new variables, we conservatively defined an offense as meth-induced if the inmate met the following criteria:

- not a regular user of other illicit drugs
- not under the influence of other illicit drugs at time of offense
- not under the influence of alcohol at time of offense
- (regular meth user *and* committed crime in order to obtain drugs or money for drugs) *or* (under the influence of only meth at time of offense).

This presents a conservative estimate of regular meth use, as it excludes multidrug meth users who may have had even one beer or one joint but also does not overestimate the impact of meth use in cases in which current drug use contributed more to the offender's state of mind at the time of the offense than did their meth dependence or abuse.

Our best and low estimates are drawn from respondents who committed offenses that we defined as meth-induced. Our best estimate was the mean percentage of the population that reported either of these conditions; our low estimate was the lower bound of the 95-percent

Table D.3
Definitions for the Drug Categories

Drug type	Code in SISFCF	Code in SILJ
Methamphetamine	v2075=2, 3, 4 or v2075=5 & 31 ≥ v2076 ≥ 4	V1715=2, 3, 4 or v1715=5 & 31 ≥ v1716 ≥ 4
Heroin	v2067=2, 3, 4 or v2067=5 & 31 ≥ v2068 ≥ 4	V1707=2, 3, 4 or v1707=5 & 31 ≥ v1708 ≥ 4
Opiates	v2071=2, 3, 4 or v2071=5 & 31 ≥ v2072 ≥ 4	V1711=2, 3, 4 or v1711=5 & 31 ≥ v1712 ≥ 4
Other amphetamines	v2079=2, 3, 4 or v2079=5 & 31 ≥ v2080 ≥ 4	V1719=2, 3, 4 or v1719=5 & 31 ≥ v1720 ≥ 4
Methaqualone	v2083=2, 3, 4 or v2083=5 & 31 ≥ v2084 ≥ 4	V1723=2, 3, 4 or v1723=5 & 31 ≥ v1724 ≥ 4
Barbiturates	v2087=2, 3, 4 or v2087=5 & 31 ≥ v2088 ≥ 4	V1727=2, 3, 4 or v1727=5 & 31 ≥ v1728 ≥ 4
Tranquilizers	v2091=2, 3, 4 or v2091=5 & 31 ≥ v2092 ≥ 4	V1731=2, 3, 4 or v1731=5 & 31 ≥ v1732 ≥ 4
Crack	v2095=2, 3, 4 or v2095=5 & 31 ≥ v2096 ≥ 4	V1735=2, 3, 4 or v1735=5 & 31 ≥ v1736 ≥ 4
Cocaine	v2099=2, 3, 4 or v2099=5 & 31 ≥ v2100 ≥ 4	V1739=2, 3, 4 or v1739=5 & 31 ≥ 1740 ≥ 4
Phencyclidine (PCP)	v2103=2, 3, 4 or v2103=5 & 31 ≥ v2104 ≥ 4	V1743=2, 3, 4 or v1743=5 & 31 ≥ v1744 ≥ 4
Ecstasy	v2107=2, 3, 4 or v2107=5 & 31 ≥ v2108 ≥ 4	V1747=2, 3, 4 or v1747=5 & 31 ≥ v1748 ≥ 4
Lysergic acid diethylamide (LSD)	v2111=2, 3, 4 or v2111=5 & 31 ≥ v2112 ≥ 4	V1751=2, 3, 4 or v1751=5 & 31 ≥ v1752 ≥ 4
Marijuana or hashish	v2115=2, 3, 4 or v2115=5 & 31 ≥ v2116 ≥ 4	V1755=2, 3, 4 or v1755=5 & 31 ≥ v1756 ≥ 4
Other drugs	v2119=2, 3, 4 or v2119=5 & 31 ≥ v2120 ≥ 4	V1759=2, 3, 4 or v1759=5 & 31 ≥ v1760 ≥ 4
Inhalants	v2123=2, 3, 4 or v2123=5 & 31 ≥ v2124 ≥ 4	V1763=2, 3, 4 or v1763=5 & 31 ≥ v1764 ≥ 4

confidence interval for the variable. These confidence intervals were based on a normal distribution of the data rather than a distribution bounded between 0 and 1, so the estimated lower bounds were set to 0 when the estimate due to use returned a negative value.

Our high estimates included a proportional attribution for meth. As before, we calculated the percentage of individuals committing crime for meth or on meth at the time, but instead of excluding meth users who used other drugs or were drinking at the time of the crime, we included these users proportionally based on the share of those individuals' total drug use that was due to meth. For example, a regular meth user who used cocaine and marijuana as well would be given a meth use value of one-third; an offender who was on meth at the time of the crime and had also been drinking would be given a meth offense value of 0.5. These estimates do not distinguish between drugs based on their likelihood to increase criminality but weight each drug equally for this purpose. These assumptions may overestimate the impact of meth in multiple-drug users, for which reason we apply these estimates only to the high estimate. Additionally, to set the upper bound, we took the upper bound of the 95-percent confidence interval for the estimate for each crime.

We applied these estimates by determining the weighted percentage of inmates in federal prison, state prison, and jail inmates separately. We excluded from our sample those inmates who were in the correctional facility but were not there to serve time for a sentence (v0083 ≠ 1 in SISFCF, v92 ≠ 8 in SILJ), as well as those who gave uncertain responses for their controlling offense (997, 998, 999), drug use (v2601 = 9 in SISFCF and v2386 = 7, 8, or 9 or v2387 = 7, 8, or 9 in SILJ), alcohol use (v2600 = 9 in SISFCF and v2383 = 9 in SILJ), or meth use at the time of the crime (v2142 = 2, 7, or 8 in SISFCF and v1782 = 2, 7, or 8 in SILJ). From the remaining population, we determined the percentage of the population that fit the definition of an offender whose offense was attributable to meth for each of the crimes.

We then took these weighted means for each institution type and estimated a weighted average for each crime across all institution types combined. This was done by taking the weighted average for each crime in each institution, multiplying this by the number of inmates for each crime in each institution, as discussed above. This provided us with best, low, and high estimates of inmates nationally for each crime. We then compared the fraction of inmates under each scenario for each crime with the total number of inmates generally for each crime to derive a percentage of each crime that was attributable to meth.

Finally, we applied these percentages of inmates of each crime type attributable to meth to data on the number of each crime type reported in 2005. The estimates for each type of crime committed in 2005 were drawn from the UCR. The UCR estimates were prepared by the National Archive of Criminal Justice Data's online tool on September 15, 2008.

Applying these estimates of the prisoner population to the criminal population makes the assumption that the distribution of meth-attributed crimes is similar in the correctional system to that in crimes committed, an assumption that may or may not be accurate. First, it is unclear whether arrest rates for crimes committed for reasons attributable to meth are the same as arrest rates for crimes unattributable to meth. Similarly, it is unclear whether conviction rates for meth-attributed crimes are the same as for non–meth-attributed crimes. Also important is the length of the sentence—if meth-attributed crimes result in longer sentences, they will be overrepresented in the prison population as compared to their representation in the crime rates, a classic stock-and-flow distinction. As the commission of a crime is an intentionally opaque act, we cannot match criminal action in the population to criminal characteristics in the correctional setting with any certainty. For this reason, we present a conservative estimate, with wider bounds to encompass our higher degree of uncertainty in the projection.

In addition to attributing a number of crimes committed to meth-related reasons, we also developed estimates of the number of inmates who were in jail or prison due to having their parole or probation rescinded for meth-related reasons.

First, we classified the status of the inmate at the time of his or her arrest. Parole was coded as v0084 = 1 in the SISFCF and v2313 = 1 in the SILJ. Probation was coded as v0084 = 2 in the SISFCF and v2314 in the SILJ. Then we classified the reported reason that the parole or probation was revoked; reasons for revocation of parole were listed in v0152–v0164 and reasons for revocation of probation were listed in v0268–v0280 in the SISFCF, while reasons for revocation of parole and probation were listed together in v151–v163 in the SILJ. This allowed us to determine the number of prisoners on probation or parole in each institutional setting, using the survey weights discussed earlier.

We applied two levels of estimates for the contribution of meth to the revocation of probation or parole, the lower being those reasons that were clearly drug related and a second estimate that included reasons less directly related to drug use. The first category of clearly drug-related reasons for revocation included failing a drug test (v0153 for parole and v0269 for probation in SISFCF; v152 in SILJ), drug possession (v0154, v0270, v153), failing to take drug test (v0155, v0271, v154), and failing to report for treatment (v0156, v0272, v155). Our second category expanded to include possibly drug-related reasons for failure to report to counseling (v0157, v0273, v156) and failure to report to officer (v0158, v0274, v157). We did not consider an arrest or sentencing for a new crime as revocation of parole but rather considered that to be its own controlling offense. This approach excluded arrests for possession that were listed as arrests and included those cases of possession when listed as a reason for revocation of parole. This allowed us to determine the number of inmates who had their parole or probation revoked for both levels of drug-related reasons, using the survey weights discussed earlier.

For these definitions of drug-related reasons for revocation of parole or probation, we added our definitions of use in a similar fashion to our approach to offenses. For our low estimate, we applied these two categories to meth use as defined strictly as regular use of meth and no regular use of any other drug. Again, this is a conservative estimate, as it does not ascribe any use of meth in conjunction with any other drug to meth. For our high estimate, we applied the same proportional attribution as before, based on the share of those individuals' total drugs used that were meth. Our best estimate in this case was determined as the average of these two estimates. This allowed us to determine the number of inmates who had their parole or probation revoked for both levels of drug-related reasons under low, best, and high estimates, using the survey weights discussed earlier. As before, we combined the federal and state prison and local jail estimates using a weighted average to get estimates of the national proportion of parolees and of probationers whose parole or probation was revoked for reasons attributed to meth. Similar caveats apply to this estimate as were noted in the estimate of crimes committed, specifically with regard to the assumed similarity of the flow of individuals having their parole or probation revoked to the stock of inmates who had their parole or probation revoked. These estimates of the number of parolees and probationers whose parole or probation was revoked were combined with our estimates for the average sentence length and the average confinement costs to obtain a range of costs for parole and probation attributable to meth.

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