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OCCASIONAL PAPER

Reducing Drug Trafficking Revenues and Violence in Mexico

Would Legalizing Marijuana in California Help?

Appendixes

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RAND INTERNATIONAL PROGRAMS and
DRUG POLICY RESEARCH CENTER

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Appendix A: A New Estimate of the Weight of a Marijuana Joint

Estimates of Mexican DTOs' revenues from exporting marijuana to the United States are grounded in estimates of total U.S. marijuana consumption, and some of those consumption estimates, in turn, use the weight of a marijuana joint as a parameter. Strangely, that is a parameter that cannot easily be looked up. There are various estimates in the literature, but none is entirely satisfactory. In the course of the project, we developed an additional approach, which is described here.

The ADAM program asks arrestees detailed information about the price they paid for marijuana at their last transaction. We estimate the grams per joint based on information from 1,613 arrestees in the 2000–2003 ADAM survey who reported purchasing either 1 g of marijuana or one joint of marijuana at the time of their last purchase. We do not focus on other quantities because we would like to minimize complications that could arise from possible differences in quantity discounts in ADAM jurisdictions. Table A.1 presents the descriptive statistics about price for these two types of purchases.

Table A.1: Nominal Price That Arrestees Paid for One Joint or One Gram, Arrestee Drug Abuse Monitoring Program, 2000–2003

Price Point	1 Joint (n = 527) ($)	1 g (n = 1,086) ($)
Mean	8.00	16.74
Median	5.00	20.00
25th percentile	5.00	10.00
75th percentile	10.00	20.00
90th percentile	10.00	20.00

NOTE: Outliers were not removed before calculating these summary statistics.

Using these data, we constructed a statistical model[1] that first estimated the average price per gram for each location from the gram data, adjusting for a year trend. Since some

[1] Greg Ridgeway performed these statistical analyses. Here is a more technical description of the methods employed: Each reported price for a gram of marijuana was modeled as coming from a $N(\beta_j\alpha_k, \sigma^2)$, where β_j is the average price per gram in location j and α_k is a coefficient to adjust for price changes in year k. The location was treated as a random so that $\beta_j \sim N(\beta_0, \tau^2)$. A nonparametric distribution for β_j produced nearly identical results. For identifiability, α_{2000} was set equal to 1.0 so that, for future years, the values of α_k represent yearly changes in price relative to 2000. The weight of joint i, w_i, was modeled as coming from $N(\mu, \sigma_w^2)$. The observed price paid for the joint was modeled as $N(\beta_j\alpha_k w_i, \sigma^2 w_i^2)$, the same distribution used for the price per gram but rescaled by w_i. All hyperparameters were given standard uninformative priors. The prior for τ was Uniform(0,10), the upper bound of which is well above plausible values for τ. We reported the posterior mean and posterior 95-percent interval for μ.

locations had very few observations, we used a random effect to stabilize the estimates and shrink the price-per-gram estimates from each location toward one another. Our model described each of the joint weights as coming from a common distribution with a shared mean and variance. Then we modeled the price for each joint as the unobserved joint weight times the price per gram for that location multiplied by the year effect plus noise. We simultaneously computed Bayes estimators of all of the model parameters: each location's price per gram, the year trend, the weights of each of the joints, and their common mean and variance. This generates an estimate of 0.46 g/joint with a 95-percent confidence interval of (0.43, 0.50). To address outliers, we dropped those observations with price values greater than the 99th percentile separately for one joint and 1 g, joints reportedly costing more than $20 and grams reportedly costing more than $50. Note that most of these outliers were on the order of $100–$500, far beyond reasonable values and almost certainly errors in reporting or recording.

There are two minor biases in this analysis. Both will lower the estimate price per gram of a joint and, so, tend to overestimate the weight of a joint. First, the average "1 g" purchase on the street weighs slightly less than 1.0 g; drug dealers tend to err on the light side when preparing sales. Second, the price per gram for a gram purchase is estimated at a (marginally) higher "market level" than is the price per gram for a single joint. Price as a function of weight is often modeled as a power function with an exponent in the vicinity of 0.8. In such circumstances, the price per gram will tend to be lower for the larger quantity (e.g., with an exponent of 0.8, doubling the quantity would lead to a price per gram that is 13 percent lower).

Appendix B: Delta-9-Tetrahydrocannabinol (THC) Content of Sinsemilla and Mexican Commercial-Grade Marijuana

Mexican marijuana and the marijuana that would most likely be produced in California after legalization are quite different. Mexican marijuana is predominantly lower-potency "commercial grade," whereas indoor California production is and would be primarily higher-potency sinsemilla.

We know or can estimate the price per gram of each type of marijuana, but the prices cannot be compared side by side. We need an estimate of how many grams of Mexican marijuana are equivalent to 1 g of sinsemilla, in the sense that consumers would be indifferent between buying that number of grams of Mexican marijuana or 1 g of legally produced sinsemilla. Many factors could enter into this. For example, there might be some preference for legally produced product—even that which is then diverted into illegal distribution—out of a belief that it is produced with better quality-control standards or is less likely to have pesticides on it. However, potency is perhaps the key dimension on which the two types of marijuana differ.

While there is growing interest about the effects of other cannibinoids (e.g., cannabidiol, or CBD) and aesthetics (e.g., visibility of trichomes, color, smell) that can influence consumer behavior, THC is the primary psychoactive ingredient[2] and, arguably, is the single best proxy for understanding the quality of marijuana being consumed.

The THC level of marijuana can vary dramatically depending on a number of factors, including the strain of marijuana, the sex of the plant, fertilization status, the growing environment, the resources devoted to maintaining the crop, and grower expertise. Marijuana consumed in the United States is typically classified into four or five groups (BC bud, domestic sinsemilla, domestic commercial, Mexican commercial, ditchweed), and there can be important variation in THC levels within these groups. For the purposes of this exercise, we focus on how THC levels vary between sinsemilla and the marijuana imported from Mexico (which is typically commercial grade). We do this by combining information from a number of different sources.

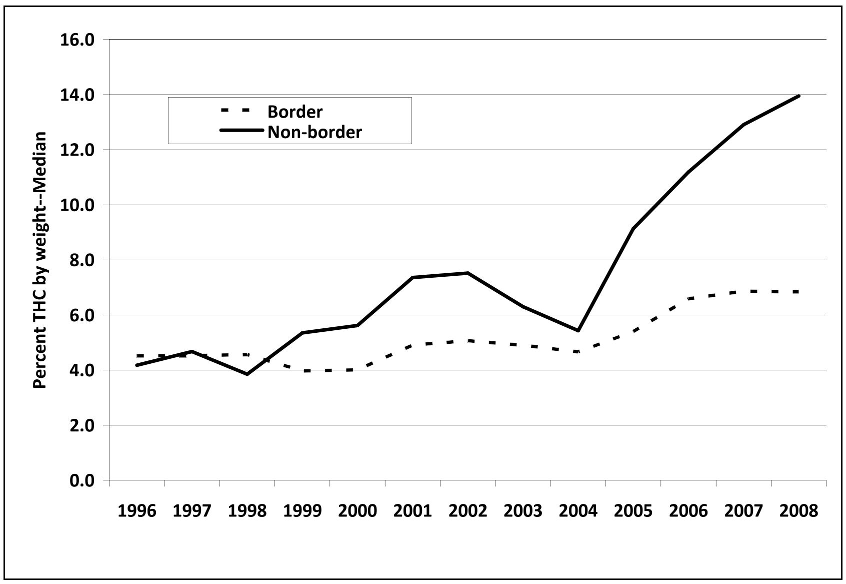
First, RAND obtained potency information for more than 5,000 marijuana seizures that occurred in California between 1996 and 2008.[3] These data include date and location of seizure, THC, CBD, and cannabinol (CBN) levels; however, we do not have information

[2] Robin Room, Benedikt Fischer, Wayne Hall, Simon Lenton, and Peter Reuter, *Cannabis Policy: Moving Beyond Stalemate*, Oxford: 2010. Note that all references not included in this appendix as full footnotes can be found in the main report's list of references.

[3] James R. Burgdorf, Beau Kilmer, and Rosalie Liccardo Pacula, *Heterogeneity in the Composition of Marijuana Seized in California*, Santa Monica, Calif.: RAND Corporation, under review.

about the type or amount of marijuana that was seized. If we examine seizures made at the border, we find that, in 2008, the median THC value was 7 percent, close to double what it was in 1996 (Figure B.1). While, in 1996, the median THC level for seizures made north of the border was the same as at the border (4 percent), the former increased dramatically over this period, possibly because of an increase in seizures of indoor facilities growing high-potency sinsemilla. In 2008 data, we see that the median THC level for this group was 14 percent, twice the amount observed for seizures made at the California-Mexico border.

Figure B.1: Median Tetrahydrocannabinol Levels Are 50 Percent Lower in Marijuana Seizures Made at the Mexico-California Border Than in Other Seizures in California



Source: Burgdorf, Kilmer, and Pacula (in review).
Note: Border seizures include those that took place at a border crossing or town: San Ysidro, Otay Mesa, Tecate, Calexico, and Andrade.

Second, to the extent that one believes that much of the commercial-grade marijuana consumed in the United States comes from Mexico, we can also examine national potency data published by the National Institute on Drug Abuse's (NIDA's) Potency Monitoring Project (PMP) at the University of Mississippi (Table B.1). It appears that, from 1985 to 1992, DEA reported the same values for sinsemilla as University of Mississippi. While there are slight differences later, these sources should probably not be considered independent.

Table B.1: Comparing Tetrahydrocannabinol Levels for Commercial Versus Sinsemilla Samples

Year	University of Mississippi			DEA, 19 Cities		
	Commercial[a]	Sinsemilla	Ratio	Marijuana	Sinsemilla	Ratio
1985	2.83	7.28	2.572438	3.70	7.28	1.967568
1986	2.37	8.43	3.556962	3.34	8.44	2.526946
1987	2.96	7.93	2.679054	3.46	7.97	2.303468
1988	3.18	7.62	2.396226	3.82	7.62	1.994764
1989	3.04	6.95	2.286184	3.46	6.95	2.008671
1990	3.24	10.10	3.117284	3.61	10.10	2.797784
1991	3.09	10.53	3.407767	3.26	10.53	3.230061
1992	3.08	8.57	2.782468	3.84	8.57	2.231771
1993	3.38	5.77	1.707101	4.18	5.45	1.303828
1994	3.5	7.49	2.14	4.06	7.29	1.795567
1995	3.73	7.51	2.013405	3.97	7.51	1.891688
1996	3.87	9.23	2.385013	4.01	8.92	2.224439
1997	4.25	11.62	2.734118	4.92	11.61	2.359756
1998	4.22	12.33	2.921801	4.21	12.33	2.928741
1999	4.28	13.38	3.126168	4.19	13.38	3.193317
2000	4.68	12.80	2.735043	4.68	12.82	2.739316
2001	5.02	9.55	1.90239	4.72	9.03	1.913136
2002	5.11	11.36	2.223092			
2003	4.97	11.59	2.331992			
2004	5.38	11.87	2.20632			
2005	5.25	11.62	2.213333			
2006	5.58	11.17	2.001792			
2007	6.01	10.98	1.826955			
2008[b]	9.32	11.70	1.255365			

[a] Defined as *not* sinsemilla, ditchweed, or Thai sticks.
[b] Incomplete data from first 3 months of 2008.

The University of Mississippi ratio of sinsemilla potency to commercial potency is close to 2.4:1 for the entire period (unweighted by number of seizures), although the ratio appears to have declined every year from 2003 to 2008. The THC level for commercial grade jumped 50 percent from 2007 to 2008, but the 2008 data cover only the first three months of that year. The data for 2006 and 2007, the two most-recent full years, suggest a ratio close to 2.

NDIC reports are a third source. Reports from 2001 and 2002 suggest that Mexican-marijuana THC potency was 2–6 percent.[4] Figures cited for California-produced marijuana

[4] E.g., "Marijuana produced in California and in Mexico is available in every part of the state. High quality marijuana from Canada (BC Bud) is also available in some areas of the state. California-produced marijuana is preferred by abusers because of its ready availability and high THC, (tetrahydrocannabinol) content. *California-produced marijuana usually contains 10 percent to 20 percent THC, while Mexico-produced marijuana contains 2 percent to 5 percent*. Canada-produced marijuana typically has 28 percent to 30 percent THC content" (NDIC, 2002a; emphasis added; see also NDIC, 2001b). "Marijuana is readily available throughout the Central District. *The Los Angeles HIDTA reports that the THC content for Mexican marijuana ranges between 4 and 6 percent, while domestic marijuana's THC content reaches levels as high as 26 percent*. The DEA Los Angeles Field Division reports that marijuana of Canadian origin, with a potency of up to 28 percent, is readily available in Los Angeles" (NDIC, 2001a; emphasis added).

were 10–20 percent, with one report noting that THC levels could reach as high as 26 percent. We do not give this information source as much weight as the others because it nearly ten years old.

A fourth source of information comes from the marijuana advertised for two large Bay Area dispensaries.[5] On September 5, 2010, we collected price and potency data from an online menu produced by a medical-marijuana dispensary known as the San Francisco Patient and Resource Center (SPARC). Similar information was also obtained for Harborside Health Center dispensary on September 3, 2010, via Twitter. Of course, this is just a convenience sample, but it might create a more credible upper bound than law enforcement reports of potency getting as high as 25–30 percent. We think that those are fairly extreme values for Californian sinsemilla and should not factor in our ranges based on our findings here. The prices and THC levels are given in Table B.2.

Table B.2: Marijuana Price and Potency at Two Bay Area Dispensaries, September 2010

Location	Name	Price ($/oz)	THC	CBD
Harborside	Orange Velvet	325	12.50	
	J-27	295	13.99	
	Purple Snow	295	12.60	
	Pure Kush		17.34	
	Skywalker OG		15.76	
	Headband		15.50	
	Blackberry Bubba		14.83	
	XJ-13		14.80	
	Blue Dream		14.40	
	Champagne		14.00	
	Master Kush		13.01	
	Mean		14.43	
	Median		14.40	
SPARC	OG Kush	340	15.50	0.215
	Blackberry Kush	340	13.50	0.165
	Purple Kush	340	12.00	0.210
	Bubba Kush	340	10.00	0.160
	Blue Dream	285	15.00	0.230
	J-27	285	13.50	0.260
	Hindu Skunk	285	13.50	0.240
	Green Dragon	285	12.50	0.330
	Odyssey	240	13.50	0.260
	Mean		13.20	
	Median		13.50	

NOTE: While there is no date on the price quotes from SPARC, the values differ from what was published on SPARC's website on August 31, 2010, suggesting that they had been recently updated. For Harborside, we excluded a strain that was produced specifically to have a high level of CBD and low level of THC (Soma A+: 7.3% THC, 4.9% CBD).

[5] Most of this is believed to be sinsemilla.

Table B.3 summarizes the data from these four sources. We do not think that it is controversial to assume that the THC level for Mexican marijuana is 4–6 percent and for sinsemilla is 10–18 percent. For the purposes of this report, what matters is the sinsemilla–to–Mexican-commercial-grade THC ratio. Comparing the three (low, midpoint, and high) estimates for each type of marijuana generates nine possible potency ratios (Table B.4). In the analysis in the body of the report, we use the ratios from the middle row: 2.0, 2.8, and 3.6 to 1.

Table B.3: Summary of Tetrahydrocannabinol Estimates

Source	THC
Mexican	
Seizures at Mexico-California border in 2008 (likely includes some sinsemilla)	Median: 7%
NDIC (2001–2002)	2–5%; 4–6%
University of Mississippi commercial grade 2007 (not all Mexican; could include midgrade domestic)	6%
Reasonable range	4–6%
Midpoint	5%
California sinsemilla	
California seizures north of the Mexico border in 2008	Median: 14%
University of Mississippi sinsemilla 2007 (not just Calif.)	11%
NDIC (2001–2002)	10–20%, up to 26%
SPARC	Range: 10–15.5%; median: 13.5%
Harborside	Range: 12.5–17.3%; median: 14.4%
Reasonable range	10–18%
Midpoint	14%

Table B.4: Plausible Ratios of Sinsemilla–to–Commercial-Grade Potency

		Sinsemilla Potency		
		10%	**14%**	**18%**
Commercial-grade potency	**4%**	2.5	3.5	4.5
	5%	2.0	2.8	3.6
	6%	1.67	2.33	3.0

Appendix C: Marijuana Price Data

Using the National Survey on Drug Use and Health to Estimate the Share of Marijuana Purchases That Are Sinsemilla Versus Commercial Grade

The data sets used to estimate national consumption do not ask about the type of marijuana directly, but two do ask about price paid (ADAM and NSDUH). Since sinsemilla prices are typically two to three times higher than commercial-grade prices, per-unit prices for a given weight can serve as a proxy for the type of marijuana. For any given cutoff price that lies between the typical prices for commercial grade and sinsemilla, one could guess that most purchases below that price were for commercial-grade marijuana, and most with higher prices were sinsemilla.

Such an exercise is not precise. There are not just two distinct types of marijuana or two marijuana prices; rather, there is a continuum. So we will vary the assumed cutoff price as a sensitivity analysis. Likewise, there are complications because the distribution of prices paid for the last purchase may differ from the distribution of prices paid for consumption overall. Nevertheless, the overall finding comes through rather forcefully. Marijuana, as expensive as figures typically cited for sinsemilla, accounts for a rather modest share of all self-reported purchases.

This section describes the calculations using data from the household survey (NSDUH). The next section describes the parallel calculations using ADAM.

Note that not all commercial-grade marijuana comes from Mexico. Here we are trying to segment only between lower- and higher-priced marijuana, not between Mexican and non-Mexican marijuana. The Mexican- versus non-Mexican split is addressed in the body of the report.

NSDUH asks respondents about the most recent marijuana purchase, including price and quantity, but allows them to describe the amount in various ways, as joints or loose and, if loose, in pounds, ounces, or grams. Those answering in grams first pick one of three coarse categories (1–5, 5–10, or over 10 g), but those responding "more than 10 grams" are then asked to specify the amount. Hence, most responses for weight and all responses for amount paid are categorical, so only a range is specified.

For example, a portion of the ounce-purchase data from the 2008 survey showing the sample-weighted numbers of respondents can be seen in Table C.1. (There are many more price categories, and we use all of them; the table shows just a subset.)

Table C.1: Sample of Ounce-Purchase Data

	AMOUNT PAID FOR MARIJUANA BOUGHT LAST TIME		
	Less than $5.00	$5.00 to $10.99	$11.00 to $20.99
AMT OF MARIJUANA BOUGHT LAST TIME - OUNCES			
1: At least 1/8, but less than 1/4 of an ounce	27,099	82,127	114,615
2: At least 1/4 but less than 1/3 of an ounce	0	24,011	79,155
3: At least 1/3 but less than 1/2 of an ounce	0	15,420	29,762
4: At least 1/2 but less than 1 ounce	6,304	27,588	25,811
5: At least 1 but less than 5 ounces	6,792	17,925	42,532
6: At least 5 but less than 10 ounces	0	7,627	0
7: At least 10 but less than 16 ounces	2,079	885	8,765

NOTE: Cell entries indicate weighted number of 2008 NSDUH respondents falling in that cell.

The ranges complicate efforts to determine whether these respondents paid less or more than any particular cutoff price. Consider those who paid $150–$200 for 0.5–1 oz. If they paid $150 for one ounce ($150 per ounce), that is clearly commercial-grade marijuana, not sinsemilla. But if they paid $200 for 0.5 ounce ($400 per ounce), that could well be U.S.- or Canadian-produced sinsemilla.

We dealt with this by definitively assigning a set of respondents to commercial grade or sinsemilla only if the most-conservative ratios formed from the end points of the ranges were below or above the cutoff (e.g., we definitively concluded that the purchase was commercial grade only if the *upper* end of the price range divided by the *lower* end of the amount range was still below the cutoff). Midpoints were used only to divide those that could not be classified definitively into "probably commercial grade" or "probably sinsemilla."

The problem of ranges is particularly severe for respondents who described their most recent purchase as being 1–5 g. The factor-of-five uncertainty introduced by the coarseness of this category means that most of those respondents could not be definitively categorized.

In contrast, we can be reasonably decisive about three other groups of respondents: (1) those reporting their purchase as >10 g (because they were asked in a follow-up question to state the number of grams exactly), (2) those reporting their purchase as 5–10 g, and (3) those reporting their purchase in ounces. Table C.2 shows that these three groups accounted for the majority of past-year days of marijuana use reported in the 2008 NSDUH (among those who reported making a purchase).

Table C.2: Marijuana Purchases in 2008 National Survey on Drug Use and Health

Way Respondent Described Last Purchase	Proportion of Past-Year Days of Use (%)	Included in Analysis?
Bought joints	1	No
Refused to answer	1	No
Bought loose	98	
Described loose purchase in		
Pounds	3	No
Ounces	30	Yes
Grams, >10 g	8	Yes
5–10 g	22	Yes
1–5 g	36	Yes, but results indefinite
NOTE: Cell entries indicate weighted number of respondents falling in that cell.		

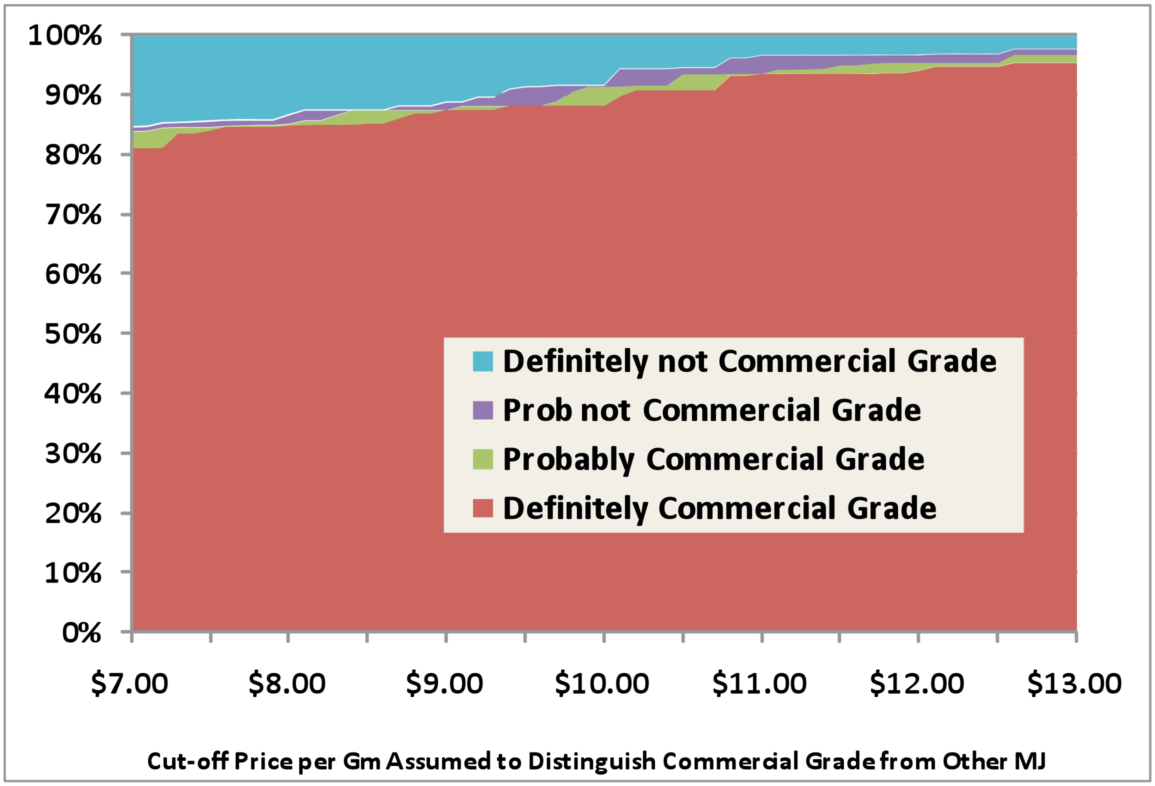
The respondents who described their last purchase in grams and reported it as >10 g are easy to deal with because they were asked, in a follow-on question, to state exactly how much they bought. We created three prices by dividing the category lower limit, midpoint, and upper limit by the amount bought. These three ratios then defined four categories in terms of assigning the purchase to "commercial-grade" or "sinsemilla" sources, by the following rule:

If (lower limit of price category) / amount > cutoff, then
conclude that marijuana was not commercial grade.
Else, if (upper limit of price) / amount < cutoff, then
conclude that marijuana was commercial grade.
Else, if (midpoint of price range) / amount < cutoff, then
conclude that marijuana was probably commercial grade.
Else, (lower limit) / amount < cutoff < midpoint / amount, so
conclude that marijuana was probably not commercial grade.

Ten dollars per gram might be a reasonable lower bound on the price of sinsemilla. Using that cutoff, 88 percent of respondents' purchases were definitely commercial grade versus only 9 percent that were definitely sinsemilla. All of the 3 percent that could not be definitively classified fell into the "probably bought commercial grade" category.

Figure C.1 shows how these proportions change if we vary the cutoff, considering values anywhere within the range of \$7–\$13 per gram, not just \$10 per gram. Naturally, the higher the cutoff, the greater the proportion of respondents' purchases that are classified as being commercial grade. Even with a conservative threshold of \$7 per gram of sinsemilla, 83 percent of those purchases had prices that were definitely below that cutoff.

Figure C.1: Proportion of Marijuana Purchases Described in Grams and More Than 10 Grams, with Price That Suggests That the Purchase Was of Commercial-Grade Marijuana



We repeated this exercise for the respondents whose most recent purchase was described in ounces. An added complication is that these respondents' answers were categorical for amount as well as price, so we modified the classification algorithm as follows:

If (lower limit of price category) / (maximum amount) > cutoff, then

conclude that marijuana was not commercial grade.

Else, if (upper limit of price) / (minimum amount) < cutoff, then

conclude that marijuana was commercial grade.

Else, if (midpoint of price range) / (midpoint amount) < cutoff, then

conclude that marijuana was probably commercial grade.

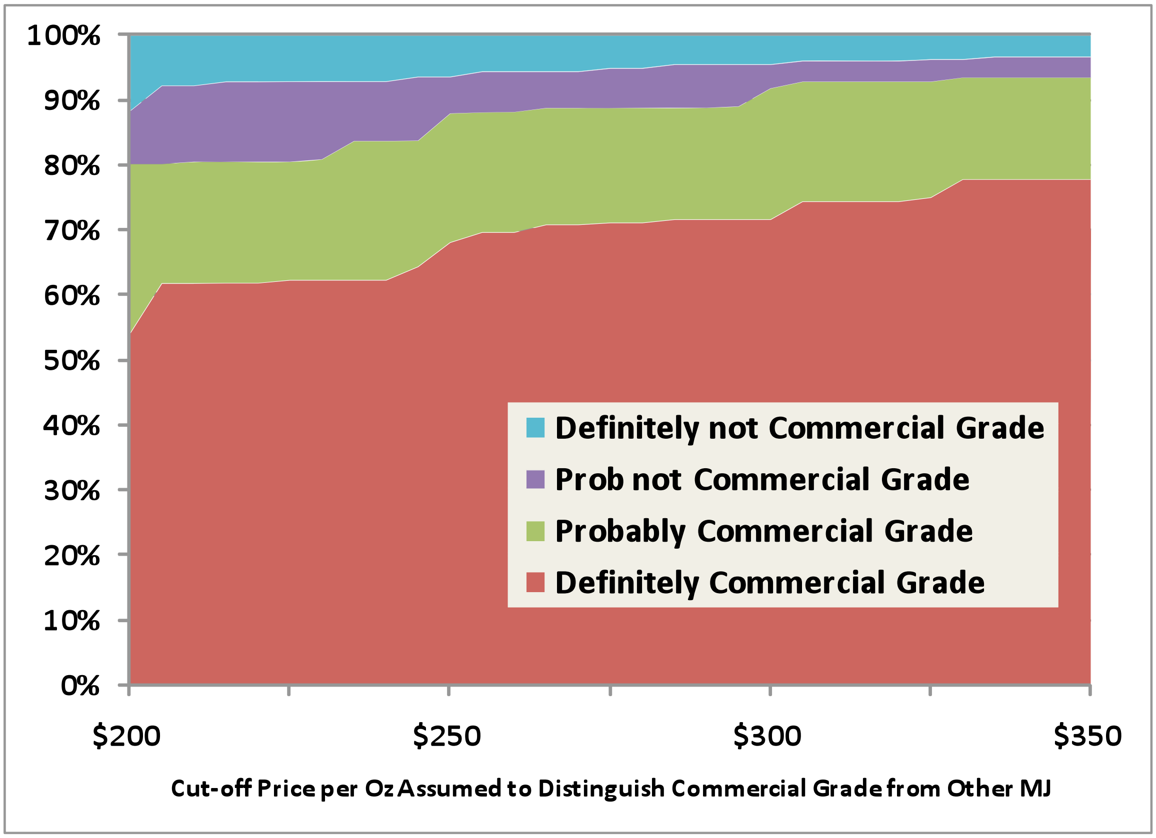
Else, (lower limit) / (maximum amount) < cutoff < midpoint / mid-amount, so $250 per ounce might be a reasonable lower bound on the price of sinsemilla.

Using that cutoff, 70 percent of respondents' purchases were definitely commercial grade versus only 7 percent that were definitely sinsemilla. Of those that could not be definitively classified, three-quarters (18 percent versus 6 percent) probably bought commercial grade.

Figure C.2 shows how these proportions change if we vary the cutoff, considering values anywhere within the range of $200–$350 per ounce, not just $250 per ounce. Naturally, the higher the cutoff, the greater the proportion of respondents' purchases that

are classified as being commercial grade. Even with a conservative threshold of $200 per ounce of sinsemilla, 80 percent of those ounce purchases were either definitely or probably of a lower grade of marijuana.

Figure C.2: Proportion of Marijuana Purchases Described in Ounces for Which Price Suggests That the Purchase Was of Commercial-Grade Marijuana



We used the same classification rule for those who reported purchasing 5–10 or 1–5 g because amount purchased and amount paid were both given as ranges. At a $10-per-gram cutoff, 87 percent of those buying 5–10 g definitely or probably paid less than the cutoff (66 percent and 21 percent, respectively). The proportion fell to only 72 percent for those buying 1–5 g, with just 6 percent definitely paying less than the cutoff. The reason, besides the coarseness of the category, could be that the price per gram is higher when purchasing in smaller quantities. Figures C.3 and C.4 are the analogues to Figures C.1 and C.2 for these groups.

Figure C.3: Proportion of 5- to 10-Gram Marijuana Purchases for Which Price Suggests That the Purchase Was of Commercial-Grade Marijuana

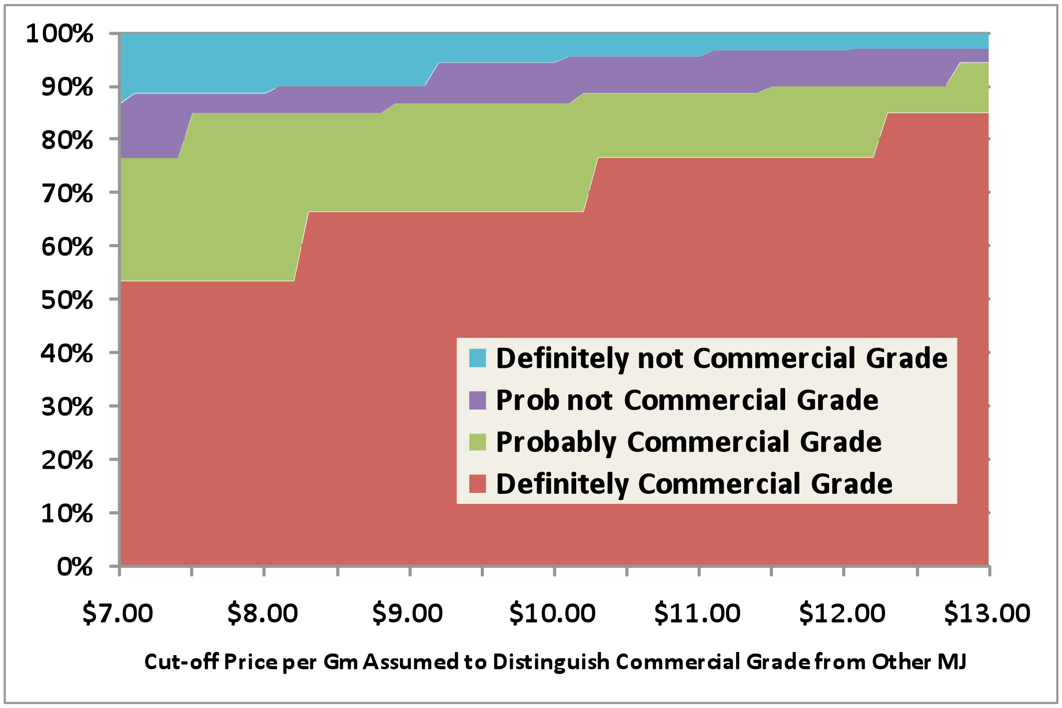
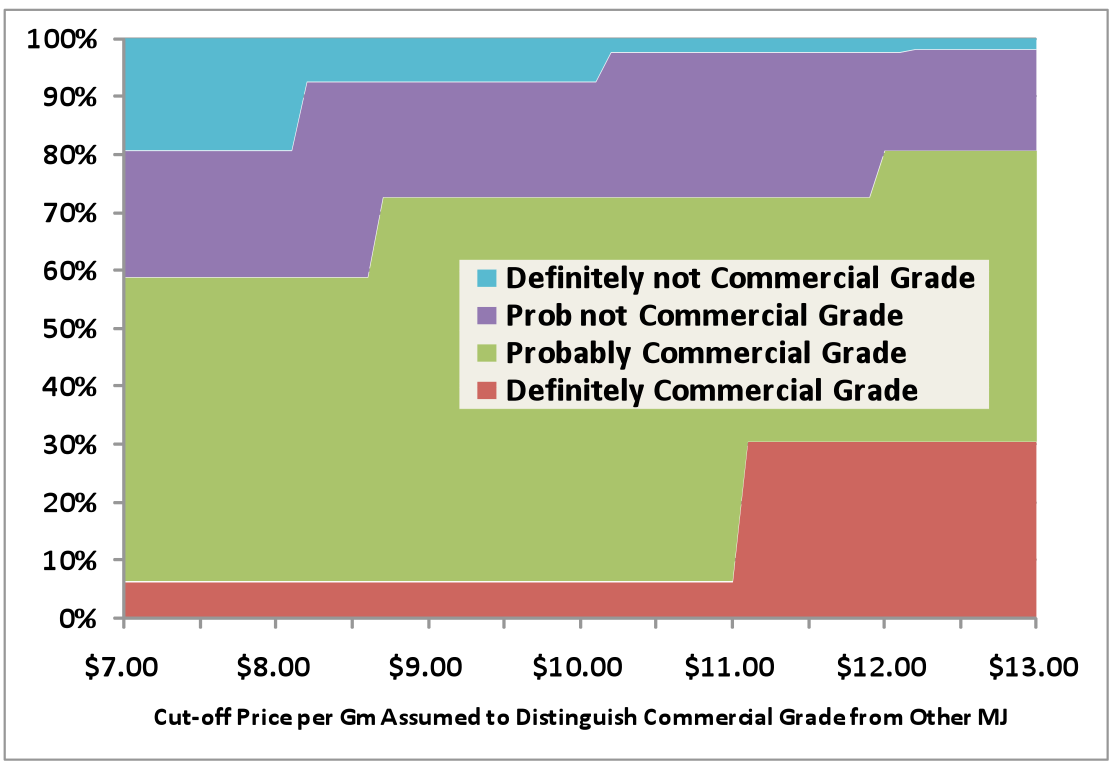


Figure C.4: Proportion of 1- to 5-Gram Marijuana Purchases for Which Price Suggests That the Purchase Was of Commercial-Grade Marijuana



Proportion of Arrestee Drug Abuse Monitoring Data Purchases That Are as Expensive as Sinsemilla

Self-report information from the ADAM program also suggests that the vast majority of those purchases are not sinsemilla. ADAM is not a nationally representative survey, but, from 2000 to 2003, the survey covered approximately 40 large urban areas and was redesigned to capture something close to a representative sample for male arrestees (females were sampled by convenience). It was also in 2000 that detailed questions were included about marijuana purchases. There were 1,977 arrestees who reported purchasing 1 oz during their last purchase, and the vast majority of these purchases were for less than $200 (the 75th percentile was $100). Table C.3 also presents data from the 2007–2008 waves (a much smaller sample; data are not available for 2004–2006). The nominal price for all arrestees increases from $95 to $134, which cannot be fully explained by changes in the cost of living (which increased only 25 percent from 2000 to 2008); however, we still see that the 75th percentile suggests that most of what is being purchased is most likely commercial grade.

Table C.3: Self-Reported Amount Arrestees Paid for 1 oz Marijuana, Various Years

Arrestee Set	n	Mean ($)	Standard Error ($)	Median ($)	25th percentile ($)	75th percentile ($)	Percentile for $200
ADAM, 2000–2003							
Arrestees, all	1,977	95.3	1.8	60	50	100	87
Arrestees, not Calif.	1,797	92.7	1.7	60	50	100	88
Arrestees, Calif.	180	121.4[a]	8.8	60	50	200	74
ADAM, 2007–2008							
Arrestees, all	138	140.7	12.9	85	50	150	77

SOURCE: Analysis of ADAM data.
NOTE: Nominal prices reported. Only seven of the 138 observations for 2007–2008 were from California. Outliers were addressed using a 90% Winsorization.
[a] The difference between the mean prices paid inside and outside California is statistically significant at the 5% level.

Table C.3 also separates the purchase for arrestees inside and outside of California. For the 2000–2003 cohort, arrestees in California paid $121.40 for an ounce, while those outside of California paid $92.70 ($p < 0.001$). This relationship is consistent with what was observed in the 2007–2008 cohort, but the small sample size for the period precludes definitive inferences. This is consistent with our prior belief that Californians are, on average, more likely to purchase sinsemilla than consumers in other states.

Wholesale Prices Near the Southwestern U.S. Border

There are limited data on prices paid for marijuana by importers per se, but we examined four sources of information about wholesale marijuana prices in the Southwest border states. It is important to focus on prices near the Mexican border because prices increase noticeably with distance from Mexico. That price gradient has previously been estimated to be $450 per pound per thousand miles (Bond and Caulkins, 2010). Indeed,

one HIDTA report noted a substantial price difference between areas in the United States along the border ($200) and areas north of highway checkpoints that are just north of those border communities ($250–$400).[6]

Likewise, the focus is on wholesale prices, and not retail or ounce prices, because there are substantial markups as prices move down the distribution chain, and those markups could vary by location.

This section describes the four data sources and concludes that prices are between $200 and $500 per pound, with a best guess being $400.

The first source is the NDIC (undated) Drug Market Analysis reports. NDIC publishes analyses for approximately 32 regions (depending on the year), including but not limited to HIDTA zones. The reports include varying amounts of price data.

Scanning them uncovered 63 quotes of wholesale prices of Mexican marijuana in the United States. Average prices vary significantly with distance from Mexico (Bond and Caulkins, 2010), ranging from $375 per pound (equivalent to $23.50 per ounce) in New Mexico to $1,725 per pound ($108 per ounce) in Minnesota.

For cities near the U.S.-Mexican border, NDIC data suggest a range of $300–$500 and an average of $400 per pound (Table C.4).

Table C.4: National Drug Intelligence Center Market Analysis Prices for 1 lb Mexican Marijuana in Locations Near the Southwest Border

State	City/Area	Year	Low ($)	High ($)	Midpoint ($)
Calif.	Southern	2001	300	600	450
			300	400	350
		2002	250	400	325
N.M.	Albuquerque	2002	400	400	400
	Las Cruces	2002	350	350	350
Texas	Dallas	2002	450	700	575
	El Paso	2002	250	500	375
	Houston	2002	300	600	450
		2008	280	500	390
		2009	180	600	390

The second source is the *Narcotic News* website. *Narcotic News* is not a standard source in the academic literature, but we have used it previously (Bond and Caulkins, 2010), and its data are concordant with other, more-familiar sources and display sensible variation with distance from source. Hence, because it offers stronger coverage than do other sources, we use it to estimate wholesale prices around the country and for prices near the border.

Narcotic News appears to be a private undertaking that, in its own words,

> is designed to appeal to Law Enforcement personnel and all others who have a desire to read about the latest news in cocaine, marijuana, heroin, methamphetamine, etc. In addition we will post news articles relating to large cash seizures and hidden compartments that are used to conceal dangerous drugs. The goal of this site is to bring awareness to the worldwide drug problem.

[6] "For example, 1 pound of marijuana purchased in Mexico for $40 to $50 typically increases in value to $200 per pound when smuggled across the border and further increases to $250 to $400 per pound north of the checkpoints" (NDIC, 2007c).

The *Narcotic News* website does not describe its methods of data collection or authentication. The data appear to be intended to reflect voluntary self-report by law enforcement agencies. The site invites, "If you are involved in law enforcement and would like to submit the going prices for your area, please email us at info@narcoticnews.com."

The site lists wholesale price ranges for a pound of marijuana, organized by state and city. Prices are usually given as ranges, of which we took the midpoint. Some are supplemented by parenthetical descriptions (such as "High Grade"); no date information is given.

We separated those reported to be sinsemilla or high grade (n = 22) from the others, assumed to be commercial grade (n = 126). Table C.5 lists the price ranges for commercial-grade marijuana in 11 southwestern U.S. border cities from 2010. The midpoints ran from $250 and $500, and the average of the midpoints was $397 per pound.

Table C.5: *Narcotic News* Prices for 1 lb Commercial-Grade Marijuana in Cities Near the Southwestern U.S. Border

State	City/Area	Low ($)	High ($)	Midpoint ($)
California	Fresno	400	600	500
	Los Angeles	300	450	375
	San Diego	250	450	350
	San Francisco	375	500	438
N.M.	Albuquerque	400	600	500
	Las Cruces	300	450	375
Texas	Dallas	350	600	475
	El Paso	200	300	250
	Houston	350	475	413
	Laredo	250	325	288
	San Antonio	350	450	400

The third source was marijuana purchases in the DEA STRIDE database. There were 82 marijuana purchases of roughly 1–9 kg between 2005 and April 2009, but most were from interior states. Ignoring the one observation labeled "THC" (rather than the usual "Cannabis (all plt ma)[7]") and two observations with implausible prices per pound ($4 and $21 per pound), the median price among the remaining 13 border-state observations is $322 per pound (with an interquartile range [IQR] from $234 to $327). Omitting two more observations with rather low prices ($59 and $63 per pound) would raise the average to $324 per pound (IQR $286–$334). It is not clear whether observations of around $60 per pound are true observations with low prices or whether they represent coding errors.

Finally, the fourth source was ADAM. It has a very large data set of 14,782 marijuana price quotes from 2000–2003 provided by arrestees interviewed in central booking facilities. We extracted the prices reported for 343 instances in which the

[7] That is, "all plant material."

amount of marijuana purchased was described in pounds in ten cities in the Southwest. The medians by city ranged from $100 to $600, with an average of $430 per pound.

Table C.6: Arrestee Drug Abuse Monitoring Prices for 1 lb Mexican (commercial) Marijuana in Locations Near the Southwestern U.S. Border

State	City	Observations	1st Quartile ($)	Median ($)	3rd Quartile ($)
Calif.	San Diego	33	350	480	600
	Los Angeles	4	289	430	575
Ariz.	Phoenix	94	353	515	743
	Tucson	53	293	400	520
N.M.	Albuquerque	51	320	450	600
	Rio Arriba	2	525	600	575
Texas	Dallas	52	400	463	550
	Houston	17	350	440	600
	Laredo	12	87	100	184
	San Antonio	29	250	425	560

Table C.7 summarizes this information. Considering all four sets of information, we judge that a reasonable range for the wholesale price of Mexican marijuana in border states might be $200–$500 per pound, with $400 per pound being perhaps the best point estimate.

Table C.7: Estimates of Wholesale Marijuana Prices Along the Southwestern U.S. Border from Four Sources

Source	Year	Grade	Point Estimate ($/lb)	Range ($/lb)
NDIC	Mostly 2001–2002	Mexican	400	300–500
Narcotic News	2010	Commercial grade	397	250–500
STRIDE	2005–2008	Not specified	323	234–334
ADAM	2000–2003	Not specified	430	100–600

There is a fifth source of marijuana price information that is sometimes used: *High Times*, a "fanzine" that has been published monthly since 1975. In each issue, contributors to the "Trans High Market Quotations" (THMQ) section write in with descriptions and prices of marijuana in their part of the country. We do not rely on those data directly here both because the prices are quoted at the ounce level, and so are below wholesale, and because our previous analysis (Bond and Caulkins, 2010) suggests that they are inferior to these other sources in the sense of not reflecting systematic variation across location that accords with either the other data sets or prior expectation.

Nevertheless, we computed average prices for southwestern U.S. border states and other states by year from 1996 to 2005 for schwag (n = 490), mids (n = 244), and sinsemilla (n = 1,422) using data provided by Mireille Jacobson. As expected, sinsemilla prices are similar in both sets of states, and there are relatively few mids price quotes in southwestern border states, but schwag prices are systematically lower along the border

than inland. Average ounce prices for schwag in the four border states in the two most recent years were $54 and $58, respectively.

Based on DEA data from 19 cities, the ratio of commercial-grade pound-to-ounce prices averaged 7.8 in the four most recent years for which such data were available (1998–2001). That suggests that the *High Times* ounce prices would be consistent with prices of $420–$450 per pound, which is in line with the estimates in Table C.6.

Export Prices

Data on marijuana prices in Mexico are scarce, but a number of sources put this figure at or very close to $80 per kilogram.[8] An August 2010 document from Mexico's attorney general and Centro Nacional de Planeación, Análisis e Infamación para el Combate a la Delincuencia de México (CENAPI) includes a price of $80 per kilogram based on the statements of individuals arrested either transporting or selling drugs.[9] The 2008 WDR (UNODC, 2008) puts the price at $80, and the 2007 WDR[10] puts it at $79. One HIDTA report from 2007 on outlying markets in the Houston area gives a price range of $40–$50 per pound in Mexico (about $88–$110 per kilogram).

Table C.8: Sources for Mexican-Marijuana Export Prices

Source	Estimate in Kilograms ($/kg)	Estimate in Pounds ($/lb)
CENAPI and Procuradura General de la República (2010)	80	~36.30
2008 WDR (UNODC, 2008)	80	~36.30
2007 WDR (UNODC, 2007)	79	~35.83
HIDTA (NDIC, 2007c)	~88–110	40–50

We accept the $80-per-kilogram figure for present purposes not so much because we have confidence that it is highly accurate or precise, but mostly because the conclusions are not particularly sensitive to this parameter. An import price of $400 per pound corresponds to roughly $880 per kilogram. So, if the export price were really only $40 per kilogram or were actually as high as $120 per kilogram, such $40-per-kilogram swings in the export price would affect the price markup available to smugglers by only $40 / ($880 – $80) = 5%, which is modest compared to the many other uncertainties in this analysis.

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[8] The extract of STRIDE we had available for this analysis did not include any marijuana purchase observations from Mexico.

[9] Centro Nacional de Planeación Análisis e Información para el Combate a la Delincuencia and Procuradura General de la República, *Esfuerzo nacional. 1 de diciembre de 2006 al 19 de agosto de 2010*, 2010.

[10] United Nations Office on Drugs and Crime, Office for Drug Control and Crime Prevention, International Drug Control Programme, *World Drug Report*, c. 2007.

Geography-Specific Information About Marijuana Prices

To estimate current DTO revenues from exporting marijuana to the United States, we were interested in marijuana prices near the border. However, to understand where and whether marijuana diverted from legal production in California might outcompete Mexican marijuana, we need wholesale prices for Mexican marijuana throughout the United States.

For this, we relied on two principal sources, which have already been described: the *Narcotic News* website and NDIC market analysis results.

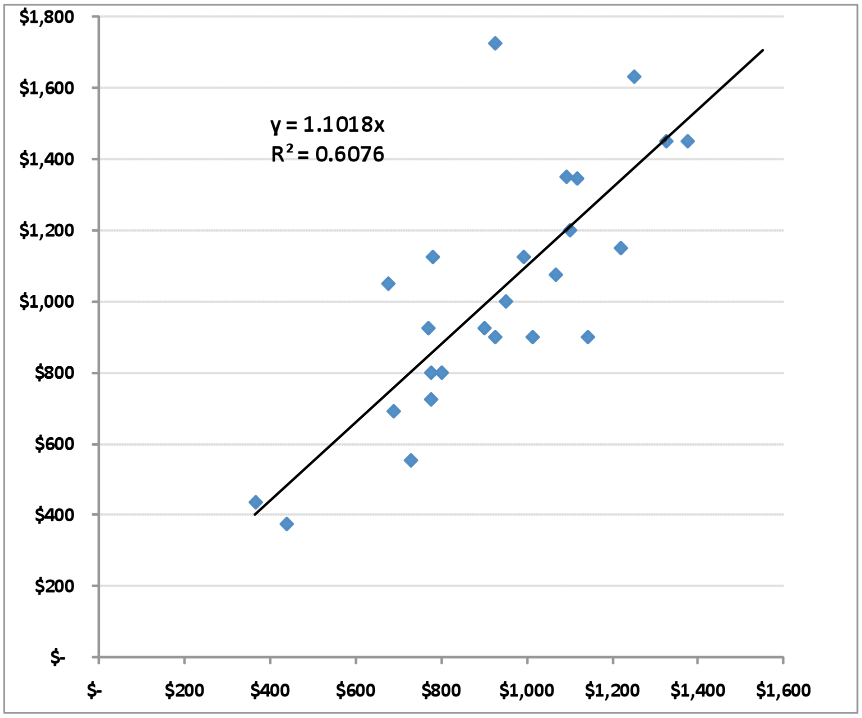
The most recent (2009) collection of NDIC reports included wholesale (pound) prices for Mexican marijuana in only four states, so we combined data from past-year reports as well, taking midpoints of ranges and averaging across years. This yielded prices for 25 states.

We suspect that the resulting average for Minnesota ($1,725 per pound) is too high; it is influenced by a 2001 price report of $2,500–$3,000 per pound of Mexican marijuana, which is far higher than for other states at the time or the next year's report for Minnesota. Since no formal retraction or correction was mentioned, we retain it in the analysis but note how that one point affects certain results.

The only source of wholesale marijuana prices we found that had data for (almost) every state was the *Narcotic News* website.

The site lists wholesale price ranges for a pound of marijuana, organized by state and city. Prices are usually given as ranges, of which we took the midpoint. We separated observations reported to be sinsemilla or high grade (n = 22) from the others, assumed to be commercial grade (n = 126). The average by state of the commercial-grade prices is highly correlated with the NDIC Mexican-marijuana prices, as is illustrated by Figures C.5 and C.6. Figure C.5 is a scatter plot directly comparing prices from the two sources but not showing their spatial distribution. Figure C.6 plots both sets of prices on a map.

Figure C.5: Wholesale Price of Mexican Marijuana Reported by National Drug Intelligence Center Versus Price of Commercial-Grade Marijuana Reported by *Narcotic News*



NOTE: Dollars per pound. The outlying state is Minnesota.

Figure C.6: Price ($/pound) of Mexican and Commercial-Grade Marijuana

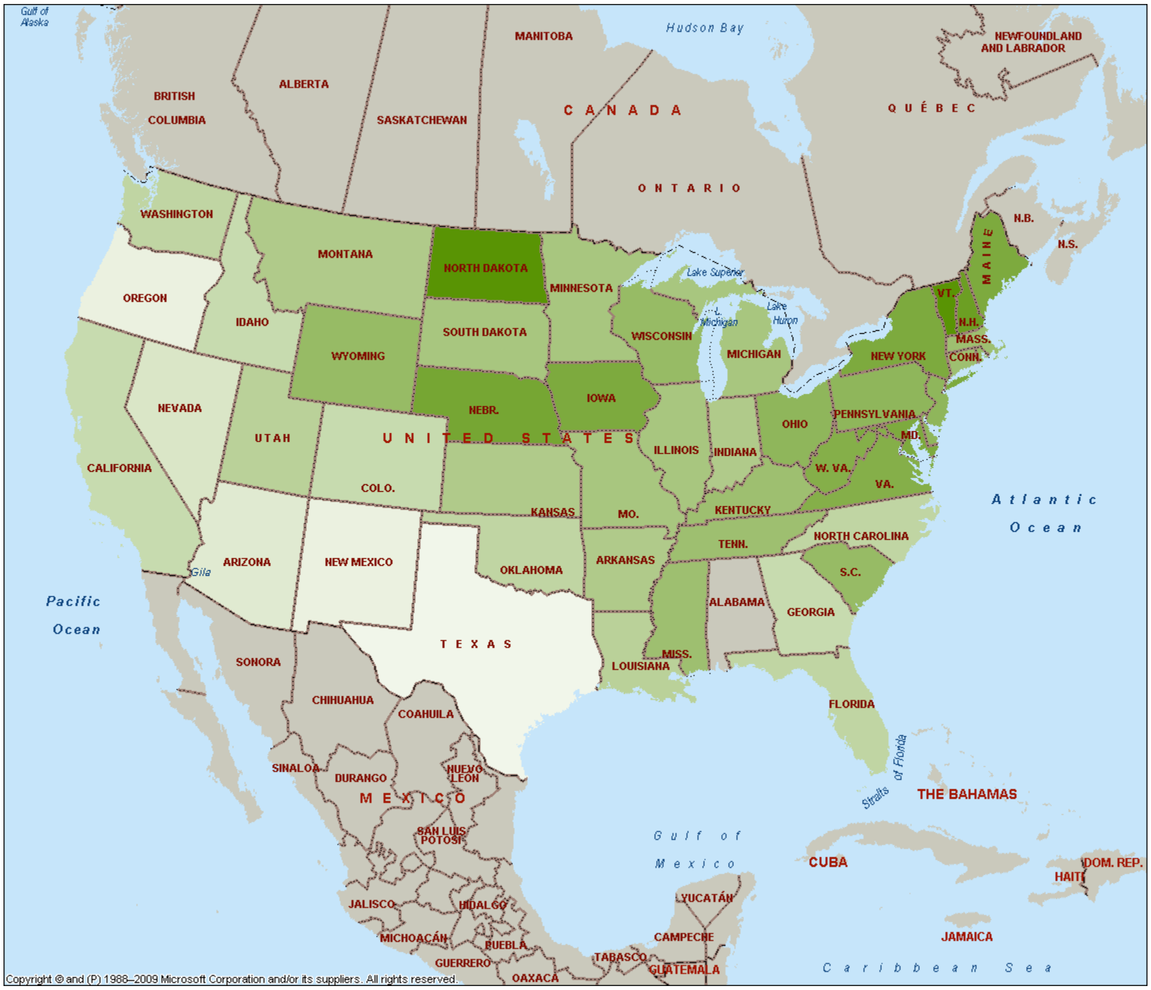
NOTE: Correlation when both sources of prices are present is 0.78. Light bars in 25 states represent Mexican marijuana as reported by NDIC market analyses. Darker bars in 47 states plus the District of Columbia represent commercial-grade marijuana as reported in *Narcotic News*.

The two data sets' prices are highly correlated. The correlation across the 25 states with prices from both sources is 0.78, and that correlation increases to 0.862 if one removes the data point for Minnesota. The correlation does not appear to be from simply copying the same source material; only one of the states had exactly the same price (Utah, $600–$1,000 per pound).

We are thus faced with a choice. We can use data specifically labeled as pertaining to Mexican marijuana that are from a familiar source (NDIC) but available for only 25 states, or we can use a highly correlated series that is available for 49 states but that does not explicitly differentiate between Mexican or commercial grade and whose methodology is not described. Ultimately, the choice does not matter greatly, because the two sets of prices are so similar, but we opt for the *Narcotic News* data to avoid having to interpolate for states for which NDIC has no data.

Figure C.7 plots the *Narcotic News* wholesale marijuana prices on a map of the lower 48 states. The map shows a clear pattern with higher prices (darker shading) as one moves farther away from Mexico.

Figure C.7: Higher Wholesale Prices of Commercial-Grade Marijuana



NOTE: No price available for Alabama. Darker shading indicates higher wholesale prices of commercial-grade marijuana, as reported by *Narcotic News*.

Appendix D: Exploratory Analysis of Mexican Drug-Trafficking Organizations' Revenues from Other Drugs Exported to the United States

Our method for estimating Mexican DTOs' revenues from exporting cocaine, heroin, and methamphetamine to the United States involves the following steps. Start with total retail spending on the drug. Multiply by the ratio of import to retail price, after adjusting for purity. (Retail prices are quoted per pure gram, whereas wholesale prices are typically quoted in raw, not purity-adjusted, form.) Then multiply by Mexican exports' share of the market for that drug, where, in the case of heroin, we track separately Mexican heroin and Colombian heroin transshipped through Mexico. The next four sections assemble information on each of these parameters, as well as export prices. The export prices are not used here. They were judged as being of insufficient quality to support estimates of net export revenue for these drugs, but the information is retained to provide a foundation for further work along those lines.

Total Spending on Cocaine, Heroin, and Methamphetamine in the United States: Judgmental Updates of Abt's Demand-Side Estimates for the Year 2000

Abt has produced a series of studies for ONDCP estimating the total value of the retail drug market in the United States. These studies are far from perfect, but they are sensible and documented and have become something of an "industry standard" reference. Unfortunately, the latest study is rather dated, providing estimates through only 2000 (Abt Associates, 2001). The results suggest a retail market value of approximately $65 billion, as indicated in Table D.1, reproduced from the Abt report.

Table D.1: Total U.S. Expenditures on Illicit Drugs and Total Amount of Cocaine and Heroin Consumed, 1988–2000

	Total U.S. Expenditures on Illicit Drugs, 1988-2000 ($ in billions, 2000 dollar equivalents)												
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cocaine	107	88.4	69.9	57.1	49.9	45	42.8	40	39.2	34.7	34.9	35.6	35.3
Heroin	26.1	24.3	22.5	20.3	17.2	13.8	13.2	13.2	12.8	11.4	11.1	10.1	10
Meth	5.8	5.8	5.7	3.7	4.8	5.1	7.6	9.2	10.1	9.3	8	5.8	5.4
Marijuana	12.1	11	15	14	14.6	12	12.2	10.2	9.5	10.5	10.8	10.6	10.5
Other Drugs	3.3	2.8	2.2	2.3	1.5	1.5	2.6	2.7	2.7	2.5	2.3	2.6	2.4
Total	154	132	115	97	88	78	78	75	74	68	67	65	64

	Total Amount of Cocaine and Heroin Consumed, 1988-2000 (in metric tons)												
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cocaine	660	576	447	355	346	331	323	321	301	275	267	271	259
Heroin	14.6	16.6	13.6	12.5	11.7	11.2	10.8	12	12.8	11.8	14.5	14.3	13.3

SOURCE: Abt Associates (2001, pp. 3–4).

We anticipate that these estimates will be updated, and, when updated numbers become available, they can be plugged into our overall analysis described in the body of this report. For now, we cobble together an extrapolation based on available trend data.

Abt's methodology distinguishes between "chronic" and "occasional" users and estimates the numbers and spending rates of each. In the most recent year, chronic cocaine and heroin users were assumed to spend just over $200 per week on their drug of choice, based on data from the Drug Use Forecasting (DUF) surveys of arrestees. Occasional cocaine users were assumed to spend $35 per week, based on data from the 1993 household survey. For occasional heroin users, $50 per week was assumed without much basis and also without much consequence, as the Abt study estimated that there were not many such users.[11]

The estimates of amounts consumed are essentially just amounts spent divided by the retail price ($152 and $839 per pure gram for cocaine and heroin, respectively, in 2000), after the amounts spent in dollars (from Figure D.1) are inflated to account for drugs obtained via in-kind rather than cash payments (i.e., bartering). Abt assumed that, in the more recent years, cocaine and heroin users received 11 percent of their drugs in exchange for noncash payments.

Abt was frank about the limitations of the parallel calculations for methamphetamine because of weaknesses in the underlying data. It estimated that there were 670,000 chronic methamphetamine users, based on TEDS data, assumed the same $200 per week in spending for chronic users, and then bumped up the product by 33 percent to account in a rough way for occasional methamphetamine users' spending. The resulting amount estimate was 20 MT. On the other hand, DASC (2002)—while also acknowledging the very weak evidence base—estimated that the amount of uncut methamphetamine available for consumption in the United States in calendar year (CY) 2001 was 106.5 to 144.1 MT.

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[11] We do not discuss the Abt marijuana estimates because we believe that our quantity estimates, based on more-recent data, are stronger.

Abt's demand-side estimate of quantities consumed for these three drugs are derived by first estimating what users spend on drugs and then dividing by the retail price. So, effectively, the demand-side estimate of export revenues is just user expenditures multiplied by the ratio of import over retail prices. Note that this approach is different from the one taken in the body of this report for marijuana. Data on marijuana consumption are stronger, and marijuana consumption is less concentrated among the minority of "hard-core" users, so we—and others—typically estimate marijuana consumption directly, not indirectly by dividing marijuana expenditures by prices.

We are aware of a few subsequent estimates of cocaine, heroin, and methamphetamine market size. Caulkins et al., using data through 2000, attempted to project how cocaine demand would evolve if the historically observed epidemic dynamics continued.[12] They projected that cocaine demand would fall by about 10 percent between 2000 and 2010.

Paoli, Greenfield, and Reuter (2009) estimated a variety of amounts related to the world heroin market, concluding that U.S. consumption in 2002 was about 17.2 MT. Likewise, DASC (2002, p. 47) notes that the intelligence-based Global Heroin Threat Assessment[13] put the U.S. heroin market in 2001 at 18 MT. These should not be understood as suggesting that there was a 70- to 80-percent increase in consumption since Abt's estimate of 10 MT in 2000, but rather that Abt's amount estimate may have been too low even in 2000. Abt's amount estimate could be too low either because its spending estimate was too low (which is of greatest concern to us here) or because its price estimate was too high. (Recall that Abt estimates amount as a result of dividing spending by price.)

UNODC (2010) reports that 196 MT of pure cocaine were consumed in North America in 2008 (U.S. 165 MT; Mexico 17; California 14). Using a raw price per gram of $108 and an average retail purity of 56 percent, it estimates a purity-adjusted price of $192 per pure gram. Multiplying this by the 196 figure generates a market estimate of $38 billion, of which the U.S. figure is about $32 billion.

Kilmer and Pacula (2009) provide a more recent estimate for methamphetamine, but it is difficult to compare because it comes from near the peak of U.S. methamphetamine use (2005) and pertains only to the U.S. household population. They reviewed the scant literature and chose 0.4 raw grams as the best estimate for the average amount consumed on a use-day and 0.25 and 0.7 g as lower and upper bounds, respectively.[14] They then merged this with information about prevalence and days consumed from the household survey for two types of users: past month, and past year but not past month. After adjusting for underreporting, their best estimate for consumption by those in the household survey's sampling frame was 33 pure MT (with lower and upper bounds of 12 MT and 84 MT, respectively), with corresponding spending of $3.5 billion.

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[12] Jonathan P. Caulkins, Doris A. Behrens, Claudia Knoll, Gernot Tragler, and Doris Zuba, "Markov Chain Modeling of Initiation and Demand: The Case of the US Cocaine Epidemic," *Health Care Management Science*, Vol. 7, No. 4, 2004, pp. 319–329.

[13] Central Intelligence Agency, Drug Enforcement Administration, and Defense Intelligence Agency, *Global Heroin Threat to the United States*, Washington, D.C., July 2000.

[14] The studies reviewed did not specify raw or pure grams, but, based on the context (e.g., user surveys), we believe that they were reporting in raw grams.

The next section augments that analysis with an estimate for users who are in treatment. The resulting point estimate is 45 pure MT, suggesting that total spending might be roughly $\$3.5 \times 42 / 33 = \$4.5$ billion, which is consistent with the Abt estimate.

Extrapolating Based on Published Estimates

The Abt figures are a decade old, so we need to adjust for drug-use trends over the past decade. The general understanding is that cocaine consumption has been ebbing slowly for the past decade as its dependent users age (Pollack et al., 2010). In contrast, methamphetamine use increased substantially as the drug spread further east, but then fell quite sharply since 2004/2005. Heroin data are the weakest, but very roughly the aging of the original heroin epidemic cohort (who initiated in the late 1960s and early 1970s) seems to have been offset by a second surge in initiation that occurred in the mid-1990s.[15]

No single data series fully captures these trends. Some of the familiar series, including the household survey and the Drug Abuse Warning Network (DAWN) Emergency Department series, have been redesigned in the interim, complicating direct comparisons. Furthermore, the household survey is a weak source of information about *amounts* of hard drugs consumed or amounts spent on them (as opposed to prevalence), and the number of emergency department mentions per dependent user can vary substantially as those users age and become less healthy generally.

Although the estimates are not terribly informative, we note that, from 2002 (first year after the survey redesign) through 2008, household survey estimates of past-month and past-year cocaine use fell by 9 percent, respectively. The household survey cannot reliably estimate current heroin use, and, in 2007, changes were made that make it difficult to compare methamphetamine rates before and after that year. But even just looking at the 2007 and 2008 data, we observe that there was a large and statistically significant drop in past-month (37 percent; $p < 0.05$) and past-year methamphetamine use (41 percent; $p < 0.01$).

Likewise, emergency department mentions since the 2004 DAWN redesign have fallen by roughly 50 percent for methamphetamine, ebbed slightly for heroin, and were stable for cocaine except for a blip up in 2006–2007 (ONDCP, 2010a, Table 33).

Drug arrests from the FBI's Uniform Crime Reports are measured more consistently but with less resolution in the sense that cocaine and heroin violations are reported as one combined figure (which fell by about 10 percent between 2000 and 2008), and methamphetamine arrests are combined with enough other drugs as to obscure the trends.

The population-weighted proportion of arrestees testing positive in the eight cities for which ADAM collected data in both 2000 and 2008 also fell (ONDCP, 2010a, Table 88), by 35 percent for cocaine, 46 percent for opiates, and 12 percent for methamphetamine. The decline for cocaine was fairly consistent across all eight cities. The decline for heroin was almost entirely due to roughly 50-percent declines in Chicago and

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[15] Harold Pollack, Peter Reuter, and Eric Sevigny, "If Drug Treatment Works So Well, Why Are So Many Drug Users in Prison?" in P. J. Cook, J. Ludwig, and J. McCrary, eds., *Making Crime Control Pay: Cost-Effective Alternatives to Incarceration*, Cambridge, Mass.: National Bureau of Economic Research, forthcoming.

New York City—which, together, accounted for 69 percent of the 41 million people in the eight metropolitan statistical areas (MSAs). Those two large cities more than offset increases in most other cities that were not small in percentage terms but applied to much lower bases; the decline when weighting cities equally was only 26 percent. The decline for methamphetamine was driven by Portland, Oregon—because Chicago and New York City had such low rates of methamphetamine use in either 2000 or 2008.

There is consistent time-series data on high school students' self-reports, but those students account for a negligible share of hard-drug consumption. According to both the Monitoring the Future and Youth Risk Behavior Surveillance System survey, high school seniors' past-month prevalence of cocaine use had been fairly stable since 2000, but use in earlier grades has fallen by one-fifth to one-third. Monitoring the Future records nearly a 50-percent decline in past-month use of amphetamines by high school seniors, and household survey data on initiation likewise record a substantial decline in nonmedical use of methamphetamines between 2004 and 2008 (ONDCP, 2010a, Table 8).

The best data are probably TEDS data on treatment admissions, but "best" in this case does not imply good. TEDS has problems with programs leaving and entering its panel, and the number receiving treatment reflects investments in treatment capacity as much as it does need for treatment; in particular, expanded treatment capacity might mask some declines in use. However, trends in the number of people admitted to treatment who identified these drugs as a primary, secondary, or tertiary drug of abuse are consistent with expert opinion based on a broader set of indicators (see Figure D.1).[16]

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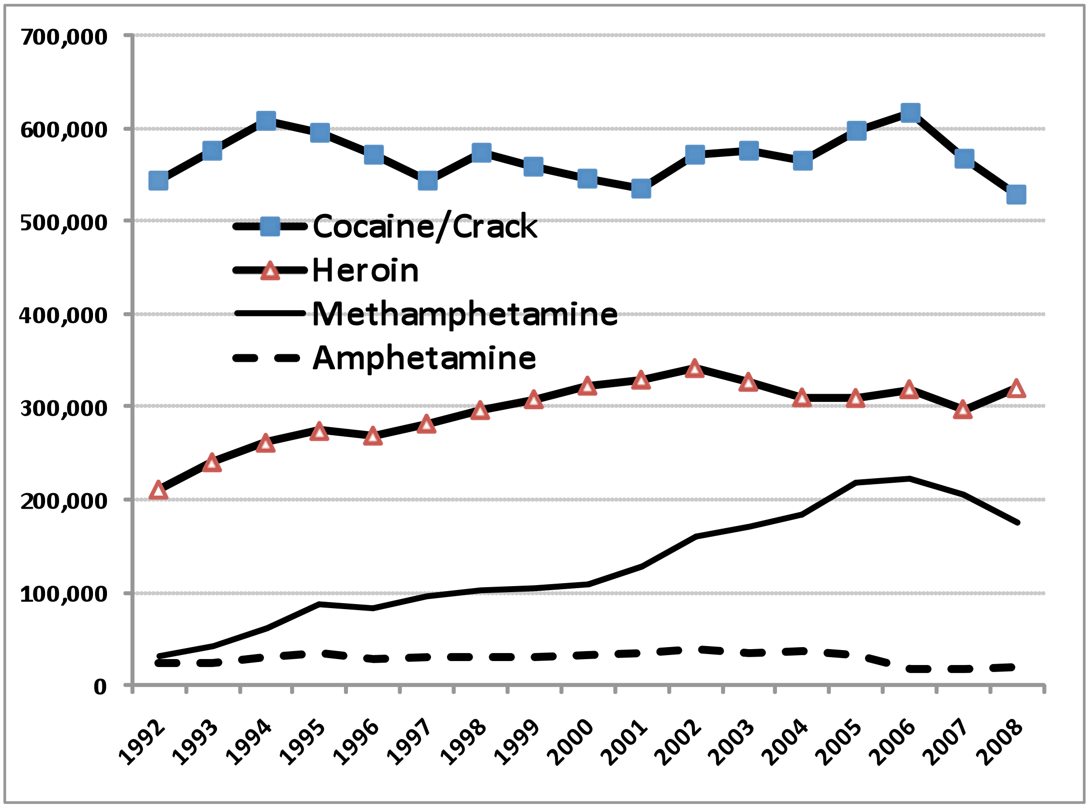
[16] See, e.g., Carlos Dobkin and Nancy Nicosia, "The War on Drugs: Methamphetamine, Public Health, and Crime," *American Economic Review*, Vol. 99, No. 1, March 2009, pp. 324–349.

Figure D.1: Trends in the Number of People Admitted to Treatment for Whom a Drug Was Reported at the Time of Admission



SOURCE: TEDS.

Cocaine and heroin mentions fell slightly between 2000 and 2008; however, there was a lot of fluctuation in the cocaine/crack figures (which increased from 550,000 in 2000 to 625,000 in 2006 and then dropped closer to 525,000 in 2008). Methamphetamine mentions rose by 60 percent, but there was a 40-percent decline in amphetamine, so the total number of mentions of either type of stimulant rose by about 40 percent. That is, some of the expansion in methamphetamine consumption may have come from taking market share away from standard amphetamines.

For methamphetamine, it is possible to augment RAND's estimate (Kilmer and Pacula, 2009) based on NSDUH consumption by estimating the amount of methamphetamine consumed by the treatment populations in 2005. We use round numbers to make it clear that this subexercise is not intended to generate precise estimates. The 2005 TEDS identifies 220,000 admissions involving methamphetamine, 150,000 as the primary drug. There are a number of concerns associated with TEDS. First, since individuals can be admitted to treatment multiple times over a year, this figure overestimates the number of individuals covered by TEDS. Second, TEDS generally covers only those facilities receiving public funds. Third, for our purposes, there is the difficulty of measuring consumption for those in treatment settings, since participants generally use less during treatment and might also use less upon leaving treatment. And finally, for the purposes of this exercise, we need to account for the fact that individuals in TEDS may also show up in the NSDUH data.

With those caveats in mind, we use the raw TEDS count for any meth-involved episode and make an NSDUH adjustment at the end. For amount consumed, Cho and Melega report that chronic users typically use between 0.7 and 1 g per day,[17] and Simon et al. found that those in treatment reported using 0.5 to 1 g during a typical day before entering.[18] Semple, Patterson, and Grant found that a population who injected methamphetamine used, on average, 7.8 g over 12 use-days in the previous 30 days (which works out to 0.65 g per use-day).[19] Using this estimate of 12 use-days per month and 0.7 g per use-day, the TEDS population would add 22 raw MT to the total. We then multiply this by 70 percent[20] to convert to pure grams (15 MT).

As noted above, we need to account for the potential overlap of individuals covered by NSDUH and TEDS. Nineteen percent of past-year methamphetamine users in NSDUH reported participating in some sort of treatment in the previous year.[21] Thus, we add the 15 MT from TEDS to the NSDUH-based 33 MT × (1 – 0.19) to generate a conservative estimate of 42 MT of pure methamphetamine consumed in 2005 by those covered by these data systems.[22]

Of course, there are others not covered by either sample, and the challenge will be to figure out the best way to estimate their consumption. Interestingly, if one keeps the same assumptions and only updates the prevalence and treatment figures from the 2008 NSDUH and TEDS, respectively, the total pure amount consumed would be less than 30 pure MT.[23] This supports the earlier assertion that methamphetamine market estimates can vary dramatically depending on which year is analyzed and, more specifically, that methamphetamine consumption has fallen sharply since 2005.

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[17] Arthur K. Cho and William P. Melega, "Patterns of Methamphetamine Abuse and Their Consequences," *Journal of Addictive Diseases*, Vol. 21, No. 1, December 2001, pp. 21–34.

[18] Sara L. Simon, Kimberly Richardson, Jennifer Dacey, Susan Glynn, Catherine P. Domier, Richard A. Rawson, and Walter Ling, "A Comparison of Patterns of Methamphetamine and Cocaine Use," *Journal of Addictive Diseases*, Vol. 21, No. 1, December 2001, pp. 35–44.

[19] S. J. Semple, T. L. Patterson, and I. Grant, "A Comparison of Injection and Non-Injection Methamphetamine-Using HIV Positive Men Who Have Sex with Men," *Drug and Alcohol Dependence*, Vol. 76, No. 2, November 11, 2004, pp. 203–212.

[20] Kilmer and Pacula (2009) assumed that methamphetamine purity at the retail level was near 70 percent in 2005, and new data suggest that this figure may be too low. The 70-percent figure is based on a DEA analysis of STRIDE and was published as ONDCP's 2007 "Fact Sheet: Methamphetamine Market Disruptions." We could not find this publication online in September 2010, but we did locate other publications showing similar charts. From the DEA, 2005 Q2: 71 percent pure; Q3: 71 percent, and Q4: 62; average: 68 percent ("All Methamphetamine Purchase Prices: Domestic STRIDE Data, April 2005–September 2008," undated). Figure 22 from the 2008 *National Drug Control Strategy*, Q2: 71 percent; Q3: 71 percent; Q4: 63 percent; average: 68 percent (ONDCP, c. 2008). Using a peer-reviewed methodology that is publicly available, Arthur Fries, Robert W. Anthony, Andrew Cseko Jr., Carl C. Gaither, and Eric Schulman (*The Price and Purity of Illicit Drugs: 1981–2007*, Alexandria, Va.: Institute for Defense Analyses, P-4309, October 2008) report that the purity of methamphetamine at the retail level in 2005 was 86 percent. For consistency, we use the 70-percent figure for this exploratory analysis but note that using the larger figure would reduce the share of gross drug revenues from export that are attributable to marijuana (by increasing the share attributable to methamphetamine).

[21] This reduction overestimates the duplication, since the treatment variable includes self-help and other treatment modalities that are not included in TEDS; thus, it generates a more conservative estimate of the market. The equivalent value for 2008 is 13 percent, and the fact these figures are in the double digits suggests that they deserve closer attention in future analyses of the methamphetamine market.

[22] Since most of the meth consumed by past-month users and most of those entering treatment are past-month users, we simply multiplied the total quantity consumed by 81 percent.

[23] NSDUH estimates before and after 2007 are not supposed to be compared, as changes were made in 2007 to increase detection of methamphetamine. This suggests that the real decrease was even greater.

Table D.2 consolidates these various snippets of information and offers some guesses as to what might be plausible ranges of current market values for these three drugs.

Table D.2: Variety of Estimates About How Cocaine/Crack, Heroin, and Methamphetamine Use Have Changed in the Past Decade

Estimate	Cocaine/Crack	Heroin	Methamphetamine
Previous market-size estimates ($ billions)			
Abt (2001) for 2000	35.3	10.0	5.4
Paoli, Greenfield, and Reuter (2009) for 2002		~70% higher	
Kilmer and Pacula (2009) for 2005			3.5 billion (household population only) augmented here to 4.5 billion
UNODC (2010)	32		
Trend information (%)			
TEDS treatment admissions (2008 vs. 2000)	–3	–1	38
NIS heroin poisonings (2000–2006)		9, but not statistically significant	
Caulkins et al. (2004) extrapolation to 2010	–10		
UCR arrests (2008 vs. 2000)	–10	–10	
Arrestees' urine tests	–35	–26 to –46	–12
General employer urine test (QUEST: 2004–2008)	–43		–66
Household survey past-year use	–9 (2002–2008)	n.a.	(Lots of caveats)
Youth use	0 to –33, depending on grade	n.a.	–20 to –50
Change in price per pure gram (2000–2007) (%)	–33	–20	–13
Guess of current market size ($ billion)			
Point estimate	30	10	5
Range used for sensitivity analysis	25–35	7–15	3–8
NOTE: NIS = Nationwide Inpatient Sample. UCR = Uniform Crime Report.			

Retail Prices of Heroin, Cocaine/Crack, and Methamphetamine

Retail cocaine (both powder and crack), heroin, and methamphetamine prices are now routinely estimated using methods developed at RAND[24] and implemented most recently for ONDCP by Fries et al. (2008) using data on undercover drug purchases from DEA's STRIDE database.

Fries et al. report prices quarterly through the fourth quarter of 2007. Sometimes, with STRIDE, the most-recent time periods show spurious price shifts because DEA releases data only from closed cases. To avoid that problem and to increase sample size, we

[24] Jonathan P. Caulkins, *Developing Price Series for Cocaine*, Santa Monica, Calif.: RAND Corporation, MR-317-DPRC, 1994; Jonathan P. Caulkins and Rema Padman, "Quantity Discounts and Quality Premia for Illicit Drugs," *Journal of the American Statistical Association*, Vol. 88, No. 423, September 1993, pp. 748–757; Caulkins et al., 2004; J. Arkes, Rosalie Liccardo Pacula, S. Paddock, Jonathan P. Caulkins, and Peter Reuter, *Technical report for the Price and Purity of Illicit Drugs Through 2003*, Santa Monica, Calif.: RAND Corporation, November 2004.

report a weighted average of Fries et al.'s (2008) eight quarters of prices from 2006 to 2007.

These prices are based on data from a range of low-level purchases (0.1–1 g for crack and heroin, 0.1–2 g for powder cocaine, and 0.1–10 g for methamphetamine) but are reported for a specific amount within that range—namely, 0.75 pure grams for powder cocaine, 0.3 pure grams for crack cocaine, 0.4 pure grams for heroin, and 2.5 pure grams for methamphetamine. Furthermore, those amounts should be understood as the pure amount of drug the customer expected to receive in such a transaction. So Table D.2 also reports the implied dollar value and total weight of such a standard transaction.

For example, the Fries et al. powder cocaine prices of $128 per pure gram for transactions of 0.75 pure grams is essentially buying a bit over 1 g of 70-percent-pure powder cocaine for about $100. Likewise, the $160-per-pure-gram price for 0.3 pure grams of crack corresponds to buying 0.4 g of crack that is 77-percent pure for about $50.

Superficially, it would appear that crack prices are higher ($160 versus $128 per pure gram), but that is mostly due to the price markups observed as one moves from 0.75- to 0.3-pure-gram transactions. The standard model of price markups (or, equivalently, quantity discounts) is a power law with an exponent in the vicinity of 0.8 (Caulkins and Padman, 1993; Caulkins, 2004). We use that transformation to approximate the price per pure gram when buying 1 pure gram. That price is almost the same for powder and crack ($121 versus $126). Likewise, ignoring differences across substances in the exponent, the power law suggests that heroin is roughly 2.6 times as expensive as either form of cocaine and that methamphetamine is about two-thirds again as expensive as cocaine.

Nevertheless, for present purposes, we do want to pay attention to the purchase sizes, and retail purchases are unlikely to involve as much as 1 pure gram. If, half the time, cocaine is purchased as crack for $48 and the other half as powder for $96, then the average price paid by consumers per pure gram used is ($96 + 2.5 × $48) / (0.75 + 2.5 × 0.3) = $144 per pure gram, a figure that we use as our point estimate for the average retail price (Table D.3).

Table D.3: Calculating the Price per Pure Gram of Various Drugs

Parameter	Source	Powder Cocaine	Crack	Heroin	Meth
Pure weight of a standard transaction (pure gms)	Fries et al. Table I-3	0.75	0.3	0.4	2.5
Price per pure gram at standard transaction size	Fries et al. Tables B1 - B4	$128	$160	$375	$169
Implied dollar value of standard transaction	Row 1 * Row 2	$96	$48	$150	$422
Expected purity	Fries et al. Tables B6 - B9	69%	77%	35%	65%
Implied total weight of std transaction (gms)	Row 1 / Row 4	1.1	0.4	1.1	3.9
Suggested price of one pure gram	Row 2 / (Row1^(÷-1)), ÷ = 0.8	$121	$126	$313	$203
Price relative to powder cocaine price for equal pure quantities			1.04	2.58	1.67

Fries et al.'s reported heroin price of $375 per pure gram applies for transactions of $150. Given the tenuous finances of most heroin users, that strikes us as considerably higher than the average retail purchase. Thinking of a $422 methamphetamine purchase as the typical retail purchase seems even less plausible.

Since the compulsive users who dominate consumption all face broadly similar financial constraints, they might all purchase in roughly similar unit-size distributions. So,

for point estimates of the heroin and methamphetamine retail prices, we compute from the table and the price per gram for a $75 purchase with a quantity-discount exponent of 0.8, which turns out to be $447 for heroin and $260 for methamphetamine. Varying the exponent from 0.78 to 0.82 and the dollar value of the transaction to which prices are standardized from $50 to $100 generates ranges for these figures of $401–$524 and $237–$301, respectively. Likewise, for cocaine, the range is $129–$159.

To avoid creating an artificial sense of precision about these numbers, we round them all off, yielding low, best-guess, and high estimates for cocaine ($130, $145, $160), heroin ($400, $450, $525), and methamphetamine ($235, $260, $300).

These data also provide insight into price changes since 2000 and so help bridge the gap between Abt's (2001) *What America's Users Spend* report and present market size for these substances. These changes, as reported in Table D.2, are that between 2000 and 2007 purity-adjusted cocaine and crack prices fell by one-third, heroin prices by one-fifth, and methamphetamine prices by one-eighth.

Import and Wholesale Prices

For all three substances, we sought import/wholesale prices from three sources: NDIC market analyses, STRIDE data,[25] and other estimates in the extant literature. This section summarizes those findings by drug.

As a practical matter, import prices are essentially never available, so we content ourselves with wholesale prices in the Southwest. That means that our DTO revenue estimate will be appropriate assuming that the DTOs have vertically integrated down to that point, which seems plausible.

Note that wholesale prices are rarely reported on a pure-kilogram basis, so we first assemble all available evidence on the wholesale price per kilogram not adjusted for purity, and then also report information on wholesale purity.

Cocaine

Several sources lead us to a range of between $17,000 and $19,000 per kilogram for cocaine that is 62- to 87-percent pure. For one, averaging 2008 wholesale price estimates reported by Texas DEA field divisions[26] gives a range of $17,200–$19,300 per kilogram. This can be disaggregated into a range of $17,700–$19,300 for crack cocaine and $16,843–$24,071 for powder cocaine.

[25] We obtained all 311 observations from the DEA STRIDE database that were denominated in grams (FORM = GMS) and involved purchases of 950 g or more between 2005 and 2007.

[26] Dallas, El Paso, and Houston DEA field divisions; see J. C. Maxwell, *Substance Abuse Trends in Texas: June 2009*, Gulf Coast Addiction Technology Transfer Center, University of Texas Center for Social Work Research, 2009.

Table D.4: Price per Kilogram of Cocaine in Texas, July–December 2008

City	Type	Low ($)	High ($)	Midpoint ($)
Dallas	Cocaine, powder	17,500	27,500	22,500
El Paso	Cocaine, powder	11,000	22,500	16,750
Houston	Cocaine, powder	15,000	26,500	20,750
Laredo	Cocaine, powder	16,000	17,000	16,500
McAllen	Cocaine, powder	12,400	25,000	18,700
Lubbock	Cocaine, powder	21,000	22,000	21,500
San Antonio	Cocaine, powder	25,000	28,000	26,500
Dallas	Crack cocaine	18,500	25,500	22,000
El Paso	Crack cocaine	14,000	14,000	14,000
San Antonio	Crack cocaine	24,000	25,000	24,500
McAllen	Crack cocaine	16,000	16,000	16,000
Midland	Crack cocaine	16,000	16,000	16,000
SOURCE: Dallas, El Paso, and Houston field divisions of DEA and from DEA's Domestic Monitor Program (DMP).				

NDIC's HIDTA Drug Market Analysis for 2008, the most recent with wholesale prices for cocaine, gives a range of $15,000 to $19,000 per kilogram for Houston. This is an increase from a range of $13,500–$17,500 reported in 2006 (NDIC, 2008c). In addition, NDIC's Los Angeles HIDTA reports a range of $17,000–$18,000 per kilogram for cocaine in 2007 (up from $12,000–$14,000 per kilogram in 2006) (NDIC, 2008c).

STRIDE contained 147 cocaine-purchase observations of 950 g or above: 48 from border states, 23 from Florida, 16 from Illinois, and 60 others scattered around the country. We deleted three observations as outliers because their price per kilogram was less than or near one-tenth the highest price per kilogram.[27] All but three observations were for 1- or 2-kg purchases.[28]

The average price per kilogram increased in a consistent and sensible way as one moved away from the southwest border and away from Florida. Within the southwestern U.S. border states, the average price was $16,884 per kilogram (lower in Texas than in California) with an average purity of 76.4 percent.[29] However, we think that medians and IQRs are more informative because they are less sensitive to outliers. Those values were $16,027 per kilogram (IQR $14,271–$19,023) and 82 percent (IQR 61.5–87.3 percent).

Considering the various strands of evidence, we assume a price of $17,000 per kilogram (range of $15,000–$19,000), where those kilograms are understood to be 82-percent pure (range of 62–87 percent).

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[27] Five-and-two-tenths kilograms purchased for $450 ($86 per kilogram); 2.8 kg purchased for $4,000 ($1,400 per kilogram), and 1 kg purchased for $3,500, whereas the highest price was $36,816, and only four other observations had prices over $30,000 per kilogram. The next few lowest prices are suspicious ($5,200, $6,300, and $7,500 per kilogram), but there were no break points in the distribution and there were a half-dozen observations with prices of roughly $10,000 per kilogram. That is one reason we favor medians in this case.

[28] The others included (1) 15 kg purchased for $177,300 in Houston ($11,800 per kilogram), (2) 6 kg purchased for $114,000 in Hyattsville, Maryland ($19,000 per kilogram), and (3) 3 kg purchased in North Miami Beach for $19,000 ($6,300 per kilogram).

[29] The results do not depend on that one 15-kg purchase. If it is omitted, the average price for the southwestern U.S. border states increases to $16,999, leaving it still the lowest-priced region in the country.

Heroin

Heroin in the United States comes primarily from three sources: Colombia, Mexico, and Asia. Both Mexican and some Colombian heroin moves through Mexico en route to U.S. drug markets, but Colombian heroin tends to be more expensive and more pure, so it is important to keep them distinct to the extent possible. As a further complication, there are at least two distinct types of Mexican heroin (brown powder and black tar).

With regard to *Colombian* heroin in Mexico, the Santa Cruz County Anti-Crime Team quoting the *Santa Cruz Sentinel*'s "Special Report: Heroin Highway," gives the following wholesale Colombian heroin price estimates: "About 700–750 grams wholesale costs $70,000–$80,000; 300–350 grams is $35,000–$40,000 wholesale."[30] An NDIC Drug Threat Update for the California Central District in May 2002 lists "South American" heroin being sold for $75,000 per kilogram as opposed to the $15,000 that Mexican black tar was commanding (NDIC, 2002a). These are consistent, in prices per pure gram, with the WDR 2010 report of prices of $45,000–$70,000 for 58-percent pure.

Three sources give recent prices and ranges for *Mexican* heroin. The first two (the Santa Cruz County Anti-Crime Team and NDIC's Los Angeles HIDTA) quote prices of $20,000–$25,000 per kilogram (Maxwell, 2009). The third, the Texas DEA field divisions, has quotes from five locations, one of which is similar ($25,000 per kilogram in El Paso), but the other four are higher, ranging from $25,000 to $50,000 per kilogram. Perhaps this reflects a difference between black tar and brown heroin. The WDR mentions both prices of $20,000–$22,000 for lower-purity heroin.

Table D.5: Wholesale Prices for Mexican Heroin in Southwestern U.S. Border States

Area	Type	Low	High	Average
Dallas, TX[1]	Black Tar, MX	$ 35,000	$ 50,000	$ 42,500
El Paso ,TX[1]	Black Tar, MX	$ 25,000	$ 25,000	$ 25,000
Houston, TX[1]	Black Tar, MX	$ 40,000	$ 50,000	$ 45,000
McAllen, TX[1]	Black Tar, MX	$ 25,000	$ 40,000	$ 32,500
San Antonio, TX[1]	Black Tar, MX	$ 50,000	$ 62,000	$ 56,000
Santa Cruz County, CA[2]	Black Tar, MX	$ 20,000	$ 25,000	$ 22,500
Santa Cruz County, CA[2]	Brown heroin, MX	$ 25,000	$ 25,000	$ 25,000
Los Angeles, CA[3]	Black Tar, MX	$ 20,000	$ 22,000	$ 21,000
Los Angeles, CA[3]	Brown heroin, MX	$ 25,000	$ 25,000	$ 25,000

[1]Texas DEA Field Divisions in the Domestic Monitor Program (DMP), http://www.utexas.edu/research/cswr/gcattc/documents/Texas2009_002.pdf

[2]Santa Cruz County Anti-Crime Team, http://www.santacruzsentinel.com/heroin

[3]NDIC. Los Angeles High Intensity Drug Trafficking Area, 2008 http://www.justice.gov/ndic/pubs27/27495/27495p.pdf

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[30] Santa Cruz County Anti-Crime Team, U.S. Department of Justice, quoted in "Heroin Highway: Sentinel Special Report," *Santa Cruz Sentinel*, spring 2010.

Only one STRIDE heroin observation is directly relevant for price and purity inferences. In San Antonio, in 2005, 1.001 kg of 38-percent pure heroin was purchased for $38,000 per raw kilogram and $100,000 per pure kilogram.

STRIDE is somewhat more useful for purity alone. Mexican heroin, particularly black tar, is not diluted as commonly while it moves down the distribution chain as are powder drugs. So, given the limited number of observations in our STRIDE extract, which had both a heroin signature program value and a reported potency, we look at purity for smaller transactions as well.[31] (Indeed, potency and weight were actually weakly *negatively* correlated among these observations, the opposite of what one typically sees with powder drugs.)

The purity distribution is bimodal. Almost half the observations' purity fell between 9 and 16 percent. The top quarter of observations had purity clustered in the range from 56 to 66 percent. Even the two observations from Mexico are disparate—one 9.6-percent and the other 50.2-percent pure.

Strictly speaking, the median purity was 22.1 percent—but that value falls just below a range between 27.4 percent and 39.8 percent, in which there are no observations. So, if one focuses on the median purity of subsets of the data—e.g., purchases above a threshold size—the median can jump between the mid-20s and low 40s.

There do seem to be some patterns by state. Washington state's observations are predominantly of very low purity. Curiously, both of Alaska's are very high purity. For the southwestern U.S. border states, the median purity is 40 percent, with an IQR of 20–60 percent.

Reviewing these disparate numbers, it appears that there might be greater consistency for price per pure kilogram than either price or purity alone. Where both price and purity are reported, the price per pure kilogram is roughly $100,000–$125,000 per pure kilogram. Where only price is reported, it tends to be at the lower end of the price range ($20,000–$25,000 per kilogram). There are two possibilities. One is that these reflect lower-purity observations, so the rule of thumb of $100,000–$125,000 per pure gram still holds. The second is that black tar sells at a lower price per pure kilogram because it is different, distinguishable, and less preferred in the market (e.g., because it is hard to dilute). For example, if the $20,000- to $25,000-per-kilogram heroin averaged 40-percent pure, that would correspond to only $50,000–$62,500 per pure kilogram.

Heroin import prices are clearly an area in which further work is needed, but, for present purposes, we use a range of $50,000–$100,000 per pure kilogram for Mexican heroin but skewed so it is most likely to be $65,000, and $75,000–$125,000 for Colombian heroin arriving from Mexico.

Methamphetamine

Import prices for methamphetamine are hard to pin down because of dramatic increases in market prices for all forms of methamphetamine from mid-2007 through late 2008. The increase in prices came from a significant decrease in availability of methamphetamine attributed to both greater law enforcement and decreased production in

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[31] In our STRIDE extract, we did not have potency information for the Domestic Monitor Program observations. On the one hand, that is a loss because DMP observations account for a large proportion of STRIDE observations with a heroin signature; on the other hand, all DMP observations are retail.

both Mexico and the United States. The decreased production, in turn, was explained by the decreasing availability of pseudoephedrine, the primary chemical agent in methamphetamine production (NDIC, 2008a). The 2010 *National Drug Threat Assessment*, however, reported that,

> By late 2008, Mexican DTOs had adapted their operating procedures in several ways including smuggling of restricted chemicals via new routes, importing nonrestricted chemical derivatives instead of precursor chemicals, and using alternative production methods.

The result has been a recent increase in methamphetamine availability in the United States, and a corresponding slackening in market price increase (NDIC, 2010). This is consistent with data from the 2009 NSDUH showing that the number of past-month users increased from 314,000 in 2008 to 502,000 in 2009 ($p < 0.05$).

Through 2006, the price from NDIC publications for a pound of methamphetamine in southwestern U.S. border cities was stable within a range of $8,000–$12,000, with the lowest prices seen in San Diego ($6,000 and $10,000 for a pound of ice methamphetamine) (NDIC, 2008a). During that time, national averages for crystal methamphetamine were between 20- and 40-percent higher than prices in border cities (NDIC, 2008b).

In 2007, in areas where methamphetamine had cost $8,000 per pound, prices had risen to $10,500 (NDIC, 2007a). Wholesale prices continued to increase through 2008 (the last year available for NDIC methamphetamine price ranges) to around $18,000–$21,000 in southwestern U.S. border cities (NDIC, 2007a). However, the 2010 *National Drug Threat Assessment* reports that the price per pure gram of methamphetamine decreased 13.6 percent, from $147.12 to $127.28, while the purity has increased 22.1 percent from 57 percent to 69 percent between January 2001 and September 2009 (NDIC, 2010).

Table D.6: Cities Where Wholesale Methamphetamine Price Increases Were Reported, December 2006 to June 2008

City, State	December 2006	December 2007	June 2008
Anchorage, AK	$7,000-20,000/lb	$10,000-20,000/lb	$15,000-20,000/lb
Fresno, CA	$7,500-9,000/lb	$18,000-21,500/lb	$18,500-25,000/lb
Los Angeles, CA	$8,000-2,000/lb	$15,000-18,000/lb	**$16,500-19,500/lb**
Sacramento, CA	$8,000-14,000/lb	$16,000-19,000/lb	$18,000-21,000/lb
San Francisco, CA	$8,000-12,000/lb	$7,000-12,500/lb	$18,000-20,000/lb
Colorado Springs, CO	$5,000-6,000/lb	$14,000-16,000/lb	$22,000-24,000/lb
Denver, CO	$13,000/lb	$16,000-20,000/lb	$24,000/lb
Tampa, FL	$14,000-18,000/lb	$14,000-18,000/lb	$18,000-20,000/lb
Atlanta, GA	$8,000-16,000/lb	$12,000-19,000/lb	$14,000-25,000/lb
Columbus, GA	Not Reported	$14,000/lb	$14,000-25,000/lb
Honolulu, HI	$20,000-30,000/lb	$20,000-45,000/lb	$25,000-50,000/lb
Bismarck, ND	$22,000/lb	$22,000/lb	$24,000-26,000/lb
Portland, OR	$8,000-12,000/lb	$10,000-14,000/lb	$17,000-21,000/lb
Seattle, WA	$6,000-14,000/lb	$12,000-14,000/lb	$10,000-18,000/lb

SOURCE: NDIC (2008d, Table B5).

The STRIDE extract to which we had access had 16 methamphetamine purchases of roughly 1–5 kg, including three from southwestern U.S. border states. Only six of the other 13 were relevant comparables; we exclude four with implausibly low prices (below $4,000 per kilogram), two with purity far below the southwest-border observations, and one from Hawaii. The average price per kilogram for the three methamphetamine observations in the border states was $19,060, compared to $32,913 in the interior states. Purity was somewhat higher for these three observations (84 percent compared to 77 percent) and transaction sizes somewhat smaller (1.5 kg compared to 3 kg), so the lower price does not stem from lower quality or higher market levels.

Official documents report prices per *pound* that are similar to and therefore seem to contradict the three southwest-border STRIDE prices per *kilogram*, which obviously differs by a factor of 2.2. However, the STRIDE observations all came from 2005, when prices per pound were much lower.

So the STRIDE data are again more useful when making judgments about purity. For the kilogram-level observations in southwestern U.S. border states, the median purity was 75 percent (IQR 59–86 percent).

Inasmuch as we estimate revenues by scaling down retail market revenues based on the ratio of import to export prices, it is better to have both the retail and import prices measured for the same years—2006 and 2007, in this case—than to use the more-recent and much-higher import price without having a comparable adjustment for the retail price. Otherwise, we would be combining quantities consumed when prices were lower, in 2006–2007, with import prices now that they are much higher. We opt for a range of $8,000–$18,000 per pound.

Estimates of Mexico's Market Share

U.S. Cocaine Consumption: How Much Does Mexico provide?

Some sources presume or imply that about 90 percent of the cocaine entering the United States comes through Mexico (e.g., UNODC Caribbean Office, 2003), but we believe that it is more properly thought of as an upper bound.

To give an example consistent with the 90-percent figure, when UNODC (2010) estimated the revenues and profits Mexican DTOs generated from exporting cocaine to the United States, it assumed that 191 MT of pure cocaine moved from Mexico to the United States in 2008, which is consistent with the 2010 WDR's finding that 208 MT of cocaine arrived in the hands of the Mexican cartels. Dividing an estimated retail market value of $30 billion by a current retail price of $144 per pure gram and bumping up by 10 percent to account for purchases made in kind gives a figure just under 230 MT, of which 200 MT is approximately 90 percent.

However, the underlying UNODC calculations might have been influenced by estimates of proportions of cocaine flowing along each smuggling path that the interagency Consolidated Counterdrug Database (CCDB) traces and, in particular, a misreading of how those proportions should be interpreted. Reports from the CCDB are not available to the public, but we were able to view an excerpt that contains key footnotes governing its interpretation. They reveal that the CCDB estimate applies to proportions of *documented flows* associated with specific events of which law enforcement (or military) units became aware, either as confirmed "known events," substantiated "high confidence" movements (which involve seizure or postdeparture reporting), or "probable events" that most likely occurred as well but could not be proven. The document warned readers that

> flow percentages are affected by our relative awareness within the transit zone and are not an actual measurement of the distribution of the drug threat. The CCDB receives information on drug movement events from operational efforts and intelligence reporting in the transit zone. Accordingly the CCDB depiction of the distribution of the cocaine flow departing South America represents our awareness of drug movement rather than actual drug flow. The intelligence collection focuses on departures from the Colombian coasts . . . causes an imbalanced awareness of cocaine movement. . . . Given an even situational awareness, we believe cocaine movement through the Caribbean Corridor would be shown to be much higher than presently shown.

This is not surprising. Analysts often prefer to focus on hard numbers rather than speculate, so they give a careful accounting of what they do know, but no specific statement about what they think the actual flow proportions are. And it would also not be surprising if detailed notes from a nonpublic document were lost in the sequence of cites and quotes of the 90-percent figure.

Given this, we reduce the base-case estimate for the proportion of the U.S. cocaine market served by transshipment by Mexican DTOs to 80 percent but allow a fairly broad range for this parameter (60–90 percent) to reflect uncertainty in that parameter.

As an aside, it is perhaps worth explaining why we do not attempt a supply-side estimate for the total size of the U.S. cocaine market. Supply-side cocaine estimates were informative for the United States in the 1980s, when the United States accounted for the bulk of global consumption, but now that the United States accounts for only about one-

third of global consumption, uncertainty about consumption elsewhere makes supply-side estimates necessarily less reliable than estimates built up from U.S. demand.[32]

U.S. Heroin Consumption: How Much Does Mexico Provide?

There are two central questions for estimating Mexican DTOs' heroin export revenues: (1) What market share does Mexican heroin have in the United States? And (2) What market share does Colombian heroin transshipped through Mexico have? We were able to do analysis that sheds insight on the first, but the second parameter remains almost completely unknown, at least to us.

Most market-share estimates for Mexican heroin rely, in one way or another, on the Heroin Signature Program (HSP). The HSP can determine the region of origin for any given sample of heroin as being from Mexico, South America (effectively, Colombia), Southwest Asia (predominantly Afghanistan), or Southeast Asia (predominantly Myanmar).

HSP data indicate that 90 percent of heroin samples come from the Western Hemisphere, and supply-side estimates suggest that Colombia no longer produces much heroin. Ergo, it would seem, most heroin consumed in the United States comes from Mexico.

The conundrum is that much of the HSP data, by weight and by number of observations, indicate that the heroin comes from South America, not Mexico. This puzzle has challenged drug analysts for many years.[33] Figure D.2 illustrates the issue graphically.

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[32] U.S. data are better, on average, than international data at estimating consumption, so even if there were zero uncertainty about amounts of cocaine produced (which there is not), the demand-side estimates would still be more reliable for the United States because the supply-side estimate requires subtracting consumption outside the United States. If that non-U.S. consumption is both greater in total and measured with greater relative error than is U.S. consumption, then, necessarily, the uncertainty surrounding U.S. demand-side estimates will be smaller than the uncertainty about U.S. consumption based on global supply-side estimates (unless, for some reason, measurement error in production and non-U.S. consumption were negatively correlated). The situation is different for heroin because, even though the United States consumes a very small share of global illegal-opiate production, the United States does still consume the lion's share of Mexico's opiate production.

[33] As DASC (2002, p. 48) put it succinctly nearly a decade ago,

> the ratio of Mexican-to-Colombian heroin is severely inconsistent between the two main components necessary for estimating availability: (1) CNC [Crime and Narcotics Center] production estimates indicate that Mexico produced much more heroin than Colombia in most recent years; (2) DEA Heroin Signature Program & US Customs seizure data show the opposite.

Figure D.2: Number and Distribution of Heroin Signature Observations, by Source and State

NOTE: Red = Mexican, yellow = South American, blue= Southwest Asian, green = unknown.

We prefer not to focus on numbers or weight of seizures directly, because that can be heavily influenced by enforcement policy and smuggling tactics. In the extreme, if smugglers employ a strategy that is profligate with respect to seizure risk (perhaps economizing on some other dimension) along a smuggling route upon which enforcement lavishes considerable resources, then the proportion of heroin seized along that route could be much higher than along other routes.

We prefer instead to examine the proportion of retail purchases in each state that come from each source zone, as an indication of that source zone's market share within that state. We then take a weighted average of those market shares across states, weighting by some proxy for the proportion of the country's heroin use that occurs in that state.

There are no satisfactory proxies, but those weaknesses are offset by the simplicity of the spatial distribution of source-zone market share. Mexican heroin predominates west of the Mississippi, ranging from roughly 50 percent of the HSP observations in Texas to almost 100 percent in the Pacific Northwest. South American heroin dominates in the Northeast, Southeast, and Great Lakes and accounts for the majority of observations elsewhere east of the Mississippi.[34] Mexican heroin has been showing up east of the Mississippi (Díaz-Briseño, 2010), and that is reflected in STRIDE HSP, but, to date, it appears mostly in states that do not account for the bulk of heroin consumption. (See Table D.7.)

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[34] All proportions are of HSP observations for which the source region was identified. The 13 percent of HSP observations coded as "HUN" (unknown) were prorated across the other regions in proportion to those other regions' counts.

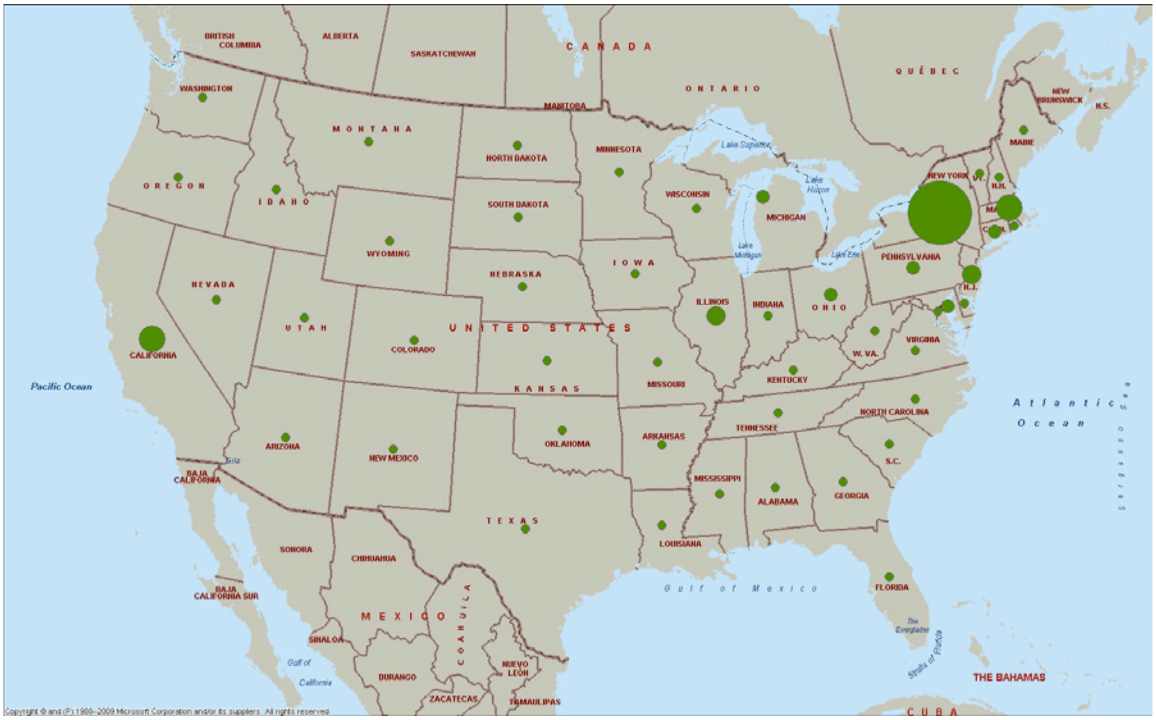
Table D.7: Heroin Signature Program Observations, by Region, and the Region's Share of Treatment Episode Data Set Heroin Admissions

	Source Zone Shares of STRIDE HSP Obs.				
	Mexican	SA	SW Asia	SE Asian	TEDS Share
Far West	93%	6%	2%	0%	15%
Arizona/NM	76%	24%	0%	0%	1%
Texas	55%	45%	0%	0%	2%
Northeast/GL	3%	81%	16%	0.4%	78%
Heartland	40%	56%	4%	0%	3%
South East	0%	99%	1%	0%	1%
Market Share	20%	67%	13%	0.3%	

Past efforts, such as those of the Drug Abuse Steering Committee (DASC, 2002), have focused on the proportion of DAWN emergency room reports and medical examiner–reported deaths that were east of the Mississippi. In 2000, the most recent year for which data were available, 65 percent of heroin deaths and 80 percent of emergency room mentions were east of the Mississippi. Since then, as now, Mexican heroin dominated only in the West, DASC (2002) concludes that this line of reasoning points toward concluding that 20 percent of the U.S. market was Mexican heroin.

A concern with DAWN is the fact that many of its cities are in a territory where South American heroin predominates, which is not in any way the result of a coherent sampling strategy. Likewise, there could be differences between east and west in how common heroin use is in the medium-sized cities, which are not covered by DAWN. We prefer TEDS to DAWN because TEDS is state level and includes every state (Figure D.3). Nevertheless, our analysis based on TEDS leads to essentially the same result: a 20- to 25-percent market share.

Figure D.3: Treatment Episode Data Set Heroin Treatment Admissions, by State



For additional verification, we also examined heroin-related hospital discharges in the NIS. While the data cannot be weighted to the state level, it is possible to generate region-specific counts (Northeast, Midwest, South, and West). We defined the discharge as heroin related if the diagnosis or external cause of injury codes mentioned heroin (*International Classification of Diseases*, 9th rev. [ICD-9] 9605.01, E850.0, and E935.0) and did not restrict the analysis to the primary diagnosis. Using a similar weighting algorithm to the one discussed above (although specific to region instead of state), we find a similar market share for Mexican heroin 2005–2008: 22–26 percent.

Finally, we also looked at prison-inmate survey data.[35] This is not strictly valid, since the inmate survey is not designed to give state-level estimates. Nevertheless, given the limits of the other measures, we thought it important to look at all possibilities. Applying the same logic as before, we estimate that 33 percent of state prison inmates who were daily or near-daily heroin users before entering prison would have been using Mexican heroin. This could be something of an upper bound when interpreted as applying to the market as a whole, including nonprisoners, because the Northeast and Great Lakes states that are the center of South American heroin markets have lower rates of imprisonment than do other states, such as Texas. On the other hand, the Deep South has some of the highest rates of incarceration and is also South American heroin territory. We attempted some ad hoc adjustments for this. They tended to reduce the estimated Mexican heroin market share, but not greatly.

Given this assorted collection of evidence, we judge that 20–33 percent of heroin users are in locations dominated by heroin with a Mexican heroin signature, with 25 percent being a best guess. Note that this is not consistent with many supply-side

[35] We thank Eric Sevigny for providing these prison survey data.

estimates, which imply that most heroin consumed in the United States originates in Mexico. As Paoli, Greenfield, and Reuter (2009) note, however, there are reasons for skepticism about those particular supply-side estimates, including the fact that seizures in Colombia were actually increasing, not decreasing, at the same time the supply-side production estimates were falling very sharply.

Turning now to the question of how much Colombian heroin moves through Mexico, we have no hard data. The 2010 *National Drug Threat Assessment* claims that "Colombian DTOs are now, to a large extent, relying on Mexican DTOs to smuggle heroin overland into the United States rather than conducting their own air courier smuggling operations." However, that is hard to reconcile with South American heroin being so scarce west of Texas. In the absence of better information, we use the same market range for Colombian heroin transshipped through Mexico as we do for Mexican heroin itself—that is, equivalent to thinking that half of the heroin imported from Mexico was originally produced in Colombia.

U.S. Methamphetamine Consumption: How Much Does Mexico Provide?

Data limitations are particularly acute for methamphetamine, so they deserve special mention. On the demand side, there are two significant problems. First, the various standard data systems are not consistent in whether they track methamphetamine or amphetamine, and whether amphetamine is understood to be a broad class of chemicals that includes methamphetamine (as in the phrase "amphetamine-type stimulants") or just the specific chemical. In some cases, the question is even broader, asking about "stimulants."

Perhaps more problematic, the footprint of methamphetamine use does not match the footprint of the data-collection system (Nicosia et al., 2009). Methamphetamine is not a national drug. There are sharp differences across regions, differences that have evolved over time, with methamphetamine being most common west of the Mississippi and where cocaine and crack are least used. Furthermore, methamphetamine is not primarily an urban drug, so data-collection systems centered on major urban areas (such as DAWN) might understate its use. This bias is compounded for arrest-based systems (notably, ADAM), because African Americans are highly overrepresented within arrestee populations but methamphetamine use is very low among African Americans.

On the supply side, it is important to recall that methamphetamine is a synthetic drug, not one derived from crops, so there is no such thing as a supply-side estimate grounded in satellite photos. There have been efforts to create supply-side estimates by tracking amounts of precursor chemicals, but those are problematic because the precursors have legitimate uses, in many cases.

Given the difficulty of finding insightful data, we rely on DEA estimates about the share of meth that is consumed in the United States that comes from Mexico. In the 2009 DEA budget justification, it was reported that

> Current drug and lab seizure data suggests that approximately 80 percent of the methamphetamine used in the United States originates from larger laboratories operated by Mexican-based syndicates on both sides of the border, and that

> approximately 20 percent of the methamphetamine consumed comes from small toxic labs in the United States.[36]

This suggests that an upper-bound estimate of the share of methamphetamine coming from Mexico is 80 percent. A middecade estimate from DEA suggests that "between 65–80% of all [methamphetamine] consumed in the U.S. is smuggled into the country from Mexico."[37]

As noted earlier, there have been dramatic shifts in methamphetamine consumption and production over the decade. This suggests that results can be highly dependent on which year is analyzed. Based on the 2010 *National Methamphetamine Threat Assessment*, it appears that methamphetamine production is increasing in Mexico:

> After gradually declining since 2006, domestic methamphetamine availability has rebounded and is at a 5-year high as a result of increasing large-scale production of the drug in Mexico and, to a lesser extent, the increasing prevalence of small-scale production in the United States.

The report attributes the increase to the DTOs' ability to circumvent precursor chemical sale and import restrictions and notes a large increase in meth lab seizures from 2008 to 2009 (51 and 215, respectively), as well as an increase in meth seizures at the border.

The report does not estimate the share of U.S. meth consumption that comes from Mexico, but it implies that DEA's pre-2009 estimates might be too low. Thus, we inflate the 65- to 80-percent range to 70–85 percent. If this still underestimates the actual share of meth consumed in the United States that is imported from Mexico, then our estimates of the share of drug export revenues from marijuana will be inflated.

Summary

Table D.8 summarizes the low, base, and high values we use in the point estimates and Monte Carlo simulation of DTO revenue from these other three drugs and, hence, in estimating the proportion of their drug revenues that are due to marijuana.

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[36] Drug Enforcement Administration, *FY 2009 Performance Budget: Congressional Budget Submission*, Washington, D.C., 2009.

[37] Celinda Franco, *Methamphetamine: Legislation and Issues in the 109th Congress*, Washington, D.C.: Congressional Research Service, Library of Congress, 06-RS-22325, January 9, 2006.

Table D.8: Marijuana Inputs and Exploratory Values for Other Drugs Used in Simulation

Drug	Low	Base	High
Marijuana			
U.S. marijuana market (MT)	1,500	3,300	4,900
Market share of Mexican marijuana (%)	40	54	67
Import price ($ per kg)	880	880	880
Cocaine			
Value of U.S. market at retail ($ billions)	25	30	35
Retail price ($ per pure kg) (1,000 × price per pure g)	130,000	145,000	160,000
Import price ($ per kg, not adjusted for purity)	15,000	17,000	19,000
Purity at wholesale/import level (%)	62	82	87
U.S. market share exported from Mexico (%)	60	80	90
Mexican heroin			
Value of U.S. market at retail ($ billions)	7	10	15
Retail price ($ per pure kg) (1,000 × price per pure g)	400,000	450,000	525,000
Import price ($ per kg, not adjusted for purity)	20,000	22,500	25,000
Purity at wholesale/import level (%)	25	35	40
U.S. market share (%)	20	30	33
Colombian heroin			
Value of U.S. market at retail ($ billions)	7	10	15
Retail price ($ per pure kg) (1,000 × price per pure g)	400,000	450,000	525,000
Import price ($ per kg, not adjusted for purity)	45,000	60,000	75,000
Purity at wholesale/import level (%)	60	60	60
U.S. market share exported from Mexico (%)	20	30	33
Methamphetamine			
Value of U.S. market at retail ($ billions)	3	5	8
Retail price ($ per pure kg) (1,000 × price per pure g)	235,000	260,000	300,000
Import price ($ per kg, not adjusted for purity)	17,637	30,865	39,683
Purity at wholesale/import level (%)	59	75	86
U.S. market share exported from Mexico (%)	70	77.5	85

Appendix E: Quotes About Mexican-Marijuana Market Share in U.S. Department of Justice Publications

Table E.1: Quotes About Mexican-Marijuana Market Share

Location	Year	Source	Direct Quote
Arizona	2009	HIDTA Drug Market Analysis (NDIC, 2007a)	Mexican commercial-grade marijuana is the most commonly abused illicit drug in the Arizona HIDTA region.
Arkansas	2008	Drug Market Analysis (NDIC, *Arkansas Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs6/6184/6184p.pdf	Most of the marijuana available in the state is produced in Mexico, although some cannabis is cultivated locally.
Atlanta	2009	HIDTA Drug Market Analysis (NDIC, *Atlanta High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32763/32763p.pdf	Mexican DTOs with ties to the Southwest border area and Mexico supply the vast majority of powder cocaine, ice methamphetamine, commercial-grade marijuana, and heroin available in the Atlanta HIDTA region. . . . Most of the marijuana available in the region is produced in Mexico or Canada, but some is produced locally at outdoor and indoor cannabis grow sites.
California	2008	Border Alliance Group Drug Market Analysis (NDIC, 2008a)	Mexican commercial-grade marijuana, domestically grown marijuana, and BC Bud (high potency Canadian marijuana) are readily available throughout the CBAG [California Border Alliance Group] region. Mexican DTOs dominate and control the Mexican marijuana market in the region and are beginning to use cultivation methods that yield plants ready for harvest in 90 days; these cultivation methods will enable the DTOs to produce at least three crops per year at a grow site. Additionally, the availability of high-potency marijuana, produced at an increasing number of indoor cannabis grow sites in the region as well as at domestic locations outside the region, is increasing.
Chicago	2009	HIDTA Drug Market Analysis (NDIC, *Chicago High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32768/32768p.pdf	Commercial-grade Mexican marijuana is widely available and abused in the Chicago HIDTA region, and the availability of and demand for high potency marijuana are increasing . . . most of the marijuana distributed in the HIDTA region is commercial-grade.
Colorado	2003	Drug Threat Assessment (NDIC, *Colorado Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs4/4300/4300p.pdf	Marijuana, primarily produced in Mexico, is the most widely available and frequently abused illicit drug in Colorado.
Connecticut	2003	Drug Threat Assessment Update (NDIC, *Connecticut Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs5/5333/5333p.pdf	Most of the marijuana available in Connecticut is produced in Mexico; however, locally produced marijuana and Canada-produced marijuana also are available.
Delaware	2003	Drug Threat Assessment Update (NDIC, *Delaware Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs4/4025/4025p.pdf	Most of the marijuana available in Delaware is produced in Mexico; however, locally produced marijuana also is available.

Location	Year	Source	Direct Quote
District of Columbia	2003	Drug Threat Assessment Update (NDIC, *District of Columbia Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs4/4000/4000p.pdf	Most of the marijuana available in D.C. is produced in Mexico and is transported from southwestern states, primarily via package delivery services.
Florida	2003	Drug Threat Assessment Update (NDIC, *Florida Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs5/5169/5169p.pdf	Most of the marijuana available in Florida is produced in Jamaica or Mexico.
Georgia	2003	Drug Threat Assessment Update (NDIC, *Georgia Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs3/3669/3669p.pdf	Most of the marijuana available in the state is produced in Mexico, although marijuana produced in Georgia and surrounding states also is available.
Gulf Coast	2009	HIDTA Drug Market Analysis (NDIC, *Gulf Coast High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32769/32769p.pdf	Most of the marijuana available in the region is produced in Mexico, but some cannabis is grown locally at outdoor and, to a lesser degree, indoor grow sites. Much of the high-potency marijuana available in the region is transported from sources of supply in Canada and northern California.
Hawaii	2009	Drug Market Analysis (NDIC, *Hawaii High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32770/32770p.pdf	Hawaii is one of the principal cannabis cultivation and marijuana production areas in the nation.
Houston	2009	HIDTA Drug Market Analysis (NDIC, *Houston High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32771/32771p.pdf	Very little drug production occurs in Houston because of the ready availability of drugs from Mexico.
Illinois	2002	Drug Threat Assessment Update (NDIC, *Illinois Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs1/1010/1010p.pdf	The dominant type of marijuana available in the state is produced in Mexico.
Indiana	2002	Drug Threat Assessment Update (NDIC, *Indiana Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs1/1011/1011p.pdf	Marijuana produced in Mexico is the dominant type; however, locally produced marijuana also is available in the state.
Kansas	2003	Drug Threat Assessment (NDIC, *Kansas Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs3/3600/3600p.pdf	Most of the marijuana available in the state is produced in Mexico, although some cannabis is cultivated locally.
Kentucky	2002	Drug Threat Assessment (NDIC, *Kentucky Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs1/1540/1540p.pdf	Marijuana is the most widely available and frequently abused illicit drug in Kentucky; it remains the foremost cash crop throughout the state. . . . Local independent producers also distribute Mexico produced marijuana, often using it as filler for their product.
Lake County, Illinois	2009	HIDTA Drug Market Analysis (NDIC, *Lake County High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32772/32772p.pdf	Commercial-grade Mexican marijuana is the most widely available and abused illicit drug in Lake County; the availability of and demand for high-potency marijuana are increasing.
Los Angeles	2009	HIDTA Drug Market Analysis (NDIC, *Los Angeles High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32773/32773p.pdf	Mexican DTOs and criminal groups based in the Mexican states of Guerrero, Michoacán, Nayarit, Oaxaca, and Zacatecas produce most of the marijuana available in the Los Angeles HIDTA region; however, Mexican and, to a much lesser extent, Asian and Caucasian DTOs and criminal groups also produce significant quantities of domestic marijuana in the Los Angeles HIDTA region.

Location	Year	Source	Direct Quote
Louisiana	2001	Drug Threat Assessment (NDIC, *Louisiana Drug Threat Assessment*, 2001) http://www.justice.gov/ndic/pubs0/666/666p.pdf	Most marijuana distributed in the state is transported from Houston and Dallas after being smuggled across the Southwest border.
Maine	2003	Drug Threat Assessment Update (NDIC, *Maine Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs5/5764/5764p.pdf	Most of the marijuana available in Maine is produced in Mexico; however, locally produced marijuana and high-grade marijuana produced in Canada also are available.
Maryland	2002	Drug Threat Assessment (NDIC, *Maryland Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs1/1827/1827p.pdf	Most of the marijuana available in Maryland is produced in Mexico.
Massachusetts	2003	Drug Threat Assessment Update (NDIC, *Massachusetts Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs3/3980/3980p.pdf	Most of the marijuana available in Massachusetts is produced in Mexico; however, locally produced marijuana and Canada-produced marijuana also are available.
Michigan	2009	HIDTA Drug Market Analysis (NDIC, *Michigan High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32774/32774p.pdf	Marijuana is widely available and abused throughout the region. Commercial-grade Mexican marijuana is the most prevalent type, although locally produced and high-potency Canadian marijuana are also commonly available.
Midwest	2009	HIDTA Drug Market Analysis (NDIC, *Midwest High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32775/32775p.pdf	Mexican commercial-grade marijuana is the most widely available and abused illicit drug throughout the HIDTA region.
Milwaukee	2009	HIDTA Drug Market Analysis (NDIC, *Milwaukee High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32776/32776p.pdf	Most marijuana available in the region is commercial-grade Mexican marijuana; however, law enforcement officials report that the availability of high-potency marijuana has increased significantly in Kenosha, Milwaukee, and Racine Counties.
Minnesota	2002	Drug Threat Assessment (NDIC, *Minnesota Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs1/1158/1158p.pdf	Marijuana is widely available throughout the state. Marijuana produced in Mexico is most prevalent; however, locally produced marijuana also is available.
Nebraska	2003	Drug Threat Assessment (NDIC, *Nebraska Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs4/4934/4934p.pdf	Marijuana is the most widely available and frequently abused illicit drug in Nebraska. Most of the marijuana available in the state is produced in Mexico, although some cannabis is cultivated locally.
Nevada	2009	HIDTA Drug Market Analysis (NDIC, *Nevada High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32777/32777p.pdf	Most of the marijuana available in the region is produced in Mexico and transported overland to the region.
New England	2009	HIDTA Drug Market Analysis (NDIC, *New England High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32778/32778p.pdf	Marijuana abuse is pervasive throughout the HIDTA region. According to NDTS [*National Drug Threat Survey*] 2009 data, nearly all (103 of 104) state and local law enforcement agency respondents in the NE [New England] HIDTA region characterize marijuana availability as high to moderate in their jurisdictions. High-potency marijuana from domestic and Canadian suppliers and commercial-grade Mexican marijuana are readily available.
New Hampshire	2003	Drug Threat Assessment Update (NDIC, *New Hampshire Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs4/4123/4123p.pdf	Most of the marijuana available in New Hampshire is produced in Mexico; however, high quality BC Bud from Canada and locally produced marijuana also are available.

Location	Year	Source	Direct Quote
New Jersey	2003	Drug Threat Assessment Update (NDIC, *New Jersey Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs6/6380/6380p.pdf	Most of the marijuana available in the state, particularly in Newark, originates in Mexico and Jamaica.
New Mexico	2002	Drug Threat Assessment Update (NDIC, *New Mexico Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs07/803/803p.pdf	Most of the marijuana available in New Mexico is produced in Mexico; however, cannabis is cultivated in the state by local independent growers.
New York	2002	Drug Threat Assessment (NDIC, *New York Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs2/2580/2580p.pdf	Most of the marijuana available in New York is produced in other states or in Mexico, Jamaica, and Canada; however, marijuana produced in New York also is available.
North Carolina	2002	Drug Threat Assessment (NDIC, *North Carolina Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs1/1052/1052p.pdf	Marijuana availability is increasing throughout North Carolina. Mexico-produced and, to a lesser extent, locally produced marijuana are the most common types available; however, Canada-produced marijuana also is available.
North Dakota	2002	Drug Threat Assessment (NDIC, *North Dakota Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs1/1052/1052p.pdf	Most of the marijuana seized in the state is produced in Mexico.
Texas	2007	North Texas HIDTA (NDIC, *North Texas High Intensity Drug Trafficking Area Drug Market Analysis*, 2007) http://www.justice.gov/ndic/pubs23/23253/23253p.pdf	Local outdoor marijuana production is unnecessary and generally unprofitable because of the large quantities of inexpensive Mexican marijuana available in Dallas/Fort Worth.
Ohio	2009	HIDTA Drug Market Analysis (NDIC, *Ohio High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32785/32785p.pdf	Most of the marijuana available and abused in the HIDTA region is commercial-grade Mexican marijuana that is transported to the region primarily from the Southwest border by Mexican DTOs.
Oklahoma	2002	Drug Threat Assessment (NDIC, *Oklahoma Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs2/2286/2286p.pdf	Most of the marijuana available in the state is produced in Mexico; however, locally grown, higher-potency marijuana also is available.
Oregon	2009	HIDTA Drug Market Analysis (NDIC, *Oregon High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32786/32786p.pdf	Marijuana is the most widely available and frequently abused drug in the HIDTA region; 25 of the 26 state and local law enforcement agency respondents to the NDTS 2009 report that the drug is highly available in their jurisdictions. Mexican DTOs and criminal groups are the primary distributors of commercial-grade Mexican marijuana.
Pennsylvania	2003	Drug Threat Assessment Update (NDIC, *Pennsylvania Drug Threat Assessment Update*, 2003) http://www.justice.gov/ndic/pubs6/6180/6180p.pdf	Most of the marijuana available in the state is produced in Mexico; however, significant quantities of locally produced marijuana and marijuana produced in other states, as well as marijuana produced in Canada and Jamaica, also are available.
Philadelphia/Camden	2009	HIDTA Drug Market Analysis (NDIC, *Philadelphia/Camden High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32787/32787p.pdf	Commercial- grade Mexican marijuana is the most widely available and abused illicit drug in the region; increasing availability of high-potency marijuana, both Canadian and locally produced, is drawing new users to the drug.
Rocky Mountains	2009	HIDTA Drug Market Analysis (NDIC, *Rocky Mountains High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32789/32789p.pdf	The high demand for marijuana has prompted Mexican drug trafficking organizations (DTOs) to continue to transport large quantities of marijuana from Mexico and to expand their cannabis cultivation operations in the HIDTA region.

Location	Year	Source	Direct Quote
South Carolina	2002	Drug Threat Assessment Update (NDIC, *South Carolina Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs1/1222/1222p.pdf	Most of the marijuana available in the state is produced in Mexico, although marijuana produced in the state also is available.
South Texas	2009	HIDTA Drug Market Analysis (NDIC, *South Texas High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32791/32791p.pdf	[M]ost San Antonio grow sites are capable of producing only personal use quantities of the drug and do not contribute significant amounts to the local drug market, which is dominated by low-cost Mexican marijuana.
Tennessee	2002	Drug Threat Assessment (NDIC, *Tennessee Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs1/1017/1017p.pdf	Marijuana, produced primarily in Mexico, is the second greatest drug threat to Tennessee. Marijuana is the most readily available and commonly abused drug in the state; however, its distribution and abuse are generally not associated with violent crime.
Utah	2003	Drug Threat Assessment (NDIC, *Utah Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs3/3619/3619p.pdf	Marijuana produced by Mexican criminal groups in Mexico and California is the most common type available in the state.
Vermont	2003	Drug Threat Assessment (NDIC, *Vermont Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs3/3999/3999p.pdf	Most of the marijuana available in Vermont is produced in Mexico; however, high quality BC Bud from Canada and locally produced marijuana also are available.
Virginia	2002	Drug Threat Assessment Update (NDIC, *Virginia Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs4/4531/4531p.pdf	Most of the marijuana available in Virginia is transported from southwestern states.
Washington, D.C./Baltimore	2009	HIDTA Drug Market Analysis (NDIC, *Washington/Baltimore High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32764/32764p.pdf	Most commercial-grade marijuana available in the region is transported by Mexican DTOs from Mexico through southwestern states such as California, Arizona, and Texas.
Washington	2003	Drug Threat Assessment (NDIC, *Washington Drug Threat Assessment*, 2003) http://www.justice.gov/ndic/pubs3/3138/3138p.pdf	Locally produced marijuana is the predominant type available throughout the state. Marijuana produced in Canada and Mexico also is available in the state.
West Texas	2009	HIDTA Drug Market Analysis (NDIC, *West Texas High Intensity Drug Trafficking Area Drug Market Analysis*, 2009) http://www.justice.gov/ndic/pubs32/32792/32792p.pdf	Cannabis cultivation, both indoor and outdoor, is limited in the West Texas HIDTA region as a result of the wide availability of Mexican marijuana. According to NDIC NDTS 2009 data, five of the six responding agencies report that cannabis is not cultivated in their areas.
West Virginia	2002	Drug Threat Assessment (NDIC, *West Virginia Drug Threat Assessment*, 2002) http://www.justice.gov/ndic/pubs5/5266/5266p.pdf	Most of the marijuana available in West Virginia is produced in Mexico.
Wisconsin	2002	Drug Threat Assessment Update (NDIC, *Wisconsin Drug Threat Assessment Update*, 2002) http://www.justice.gov/ndic/pubs1/1159/1159p.pdf	Marijuana produced in Mexico is the dominant type; locally produced marijuana is available to a lesser extent.