Comment to the United States Sentencing Commission
Public Hearing on Methamphetamine
Submitted by Jonathan Caulkins
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Note: These comments are my own and do not reflect those of my university or any other organization with which I am affiliated.

I have been studying various aspects of drug policy for more than 35 years, with particular emphasis on understanding drug markets and the organizations and supply chains that supply them. Thank you for this opportunity to comment on methamphetamine market patterns as they pertain to the Federal Sentencing Guidelines.

As is generally understood, Part D of those Guidelines bases sentences on quantity possessed via the Section 2D1.1 Drug Quantity Table (with various adjustments). That Table distinguishes Methamphetamine (sometimes referred to Methamphetamine mixture) from "Methamphetamine (actual)" and "Ice". The first is the total weight of a mixture containing any amount of methamphetamine. The second is the weight of the methamphetamine itself ("pure weight"), and "Ice" is a mixture containing d-methamphetamine hydrochloride of at least 80% purity. It takes 10 times as much weight of methamphetamine mixture to trigger the same sentence as a given weight of methamphetamine (actual) or of "Ice".

I will address five questions: (1) When might it make sense for sentencing decisions to be based on the *pure* weight of a controlled substance as opposed to the *total* weight of a mixture containing that substance? (2) Do those conditions pertain to methamphetamine sold in contemporary U.S. markets? My answer will be "no". (3) From a drug markets perspective, should sentences for a given quantity of methamphetamine be longer than for the same quantity of cocaine? Again, my answer will be "no". (4) Do available data on harms to people who use drugs and to the larger society suggest that a given quantity of methamphetamine is associated with more harm than the same quantity of crack? Again, my answer will be "no". Finally, (5) If the Sentencing Commission were to eliminate the 10-fold difference in weights required to trigger a given sentence, how should that gap be closed? I suggest that it may make more sense to sentence "methamphetamine (actual)" and "Ice" the way methamphetamine mixture is sentenced now, rather than the opposite. Even that change would still leave methamphetamine sentenced more harshly than an equal weight of cocaine (though not of cocaine base).

1. When might it make sense to vary sentences based on drug purity?

Inasmuch as "the dose makes the poison", superficially there is good reason to base sentences on the pure quantity of a controlled substance associated with a case, not the total quantity of a mixture containing that substance. Suppose two similar people each consumed 100 milligrams of powder. For the first person, that powder was 99% methamphetamine by weight and 1% non-psychoactive diluents, while for the second the powder was only 1% methamphetamine and 99% diluents. We would expect the psychoactive and physical effects – including the risk of overdose – to be greater for the first person. Likewise, if these two people took such doses day after day

for a year, the risk of developing substance use disorder would be greater for the first person than for the second.

Why then aren't all drug sentences based on pure quantity? There are many reasons, and some are practical. If sentences are based on pure quantity, then the police and prosecutors have the burden of proving what was the purity of the drug mixture. That requires nontrivial laboratory analysis, as opposed to a simple field identification test. A chain of custody would need to be maintained to the lab. Since only a portion of the total quantity gets analyzed, there could be questions as to whether the purity was the same throughout the larger bag from which the lab sample was taken. There may also be concerns about inconsistencies in testing practices.

If the drug's purity mostly fell within a narrow band, that extra burden, as well as the risk that a good case might fail to achieve conviction because of some challenge to the quantitative lab testing, might not be worth the trouble. E.g., if almost all units seized were between 85% and 95% pure, there would be little chance of great injustice occurring if all samples were just presumed to be 90% pure. Indeed, even if (almost) all units were 40-60% pure, there might be only modest potential benefits of the more precise approach. The ratio of pure quantity across two bags with the same total weight, one that is 60% pure and the other that is 40% pure is only 1.5:1. The multiples in weight when stepping up one row in the Drug Quantity Table are mostly larger than that. E.g., the methamphetamine quantity range for Level 32 (1.5 – 5 kg) is about triple the range for Level 30 (0.5 – 1.5 kg) in that 1.5 is three times 0.5, and 5 is more than three times 1.5.

Many drugs display relatively modest variation in purity at any given time and in any given market, with the majority of samples falling with a range whose upper end is only twice the lower end. So, for example, cocaine sentencing distinguishes between cocaine and cocaine(base), but sentences are not based on purity.

That is not an intrinsic physical property of cocaine. Cocaine can be diluted so it can appear in a range of purities. Indeed, Hesse et al. (2021) report that the distribution of cocaine purity in Denmark is distinctly bimodal, with distinct low- and high-purity samples averaging around 20% and 80% purity, respectively. Low-purity type cocaine dominated in that market from 2006-2012, then there was a transition, and from 2016 until the end of their data in 2019 high-purity type cocaine was more common. So, at that time and in that country one might perhaps have wished to have different sentencing rules for these distinct types of cocaine. But such a bi-modal purity distribution has not generally been observed in U.S. cocaine markets, at least not in recent decades.

Illegally manufactured fentanyl in the U.S. today is different. Fentanyl frequently appears in the form of counterfeit pills. With an average of roughly 2 milligrams of pure fentanyl in a pill or tablet that weighs about 120 milligrams, that purity (by weight) is less than 2%.[1] Fentanyl is also sold as a powder. The purity of fentanyl powder is highly variable, but is often considerably higher than 2%. The 2025 DEA National Drug Threat Assessment contains a graph (Figure 11,

[1] DEA (2022) describes an analysis of 471 fentanyl tablet samples in its CY2021 report as containing an average of 2.2 mg of fentanyl (median 2.1 mg) with a range from 0.01 to 8.4 mg per tablet. The quantity per tablet has decreased somewhat since then (DEA, 2025).

page 23) of monthly average purity of fentanyl powder seizures. That average is almost always at least 10% and in mid-2023 peaked at well over 20%. So, if there were two defendants, each caught in possession of equal weights of material containing fentanyl, one with counterfeit fentanyl pills and the other with fentanyl powder, the latter could well have possessed 5 or even 10 times as much pure weight of fentanyl. A 10-fold difference in weight is at least two rows, and perhaps three, in the Drug Quantity Table and so translates into 4-6 base offense levels.

The disparity can be even more extreme. At one time, particularly before 2019, dark web distributors of counterfeit fentanyl pills could order nearly pure fentanyl powder directly from China (see, e.g., Caulkins et al., 2023). Imagine two such people who each ordered an ounce (28.35 grams) of that fentanyl powder to press into pills. One was arrested before they had a chance to press the powder into pills. That person would face a Base Level 20 offense. But if police raided the second dealer's premises a few hours later, after that powder had been pressed into 120 milligram pills each containing 2 pure mg of fentanyl, those 28.35 gm / 2 mg = 14,175 pills with a total weight of 1.701 kilograms would trigger a Base Level 32 offense. The accident of timing of the police raid could produce a 12-level difference.

There are counterarguments to this reasoning. Someone could argue that 2 mg of pure fentanyl in a pill is more dangerous than 10 mg in a 100-mg "dime bag" of powder because the dime bag is more likely to be purchased by an experienced opioid user who has developed tolerance, whereas a counterfeit pill can tempt someone who is opioid-naïve and more vulnerable to overdose. Or someone could argue that lower purity forms are more dangerous, because they contain more adulterants.

I am not arguing that sentencing based on pure weight is the only fair approach. Rather, I am just trying to illustrate one set of circumstances under which one can credibly make a case for sentencing based on pure weight.

A second, related argument that has been offered pertains when drugs are diluted as they move down the distribution chain, so that higher purity is a proxy for being closer to the source. E.g., if cocaine at import were 80% pure, the importers sold to regional distributors who "cut" the drugs one for one making them 40% pure, the regional distributors sold to 2nd level wholesalers who cut it again to 20% purity before selling it to 1st level wholesale dealers who cut it again to 10% pure before selling to retailers, then purity would be a useful proxy for market level.

However, using purity as a proxy for market level only becomes necessary when quantity does not itself serve that function. E.g., if for some reason a high-level trafficker were caught with only a small quantity, but that quantity was highly pure, that might help distinguish that person from a lower-level dealer possessing the same quantity but with lower purity. Often, though, cases involving higher level traffickers also involve larger quantities. Indeed, that is the premise underlying the Drug Quantity Table. So this second argument is somewhat strained even when a drug is diluted as it moves down the distribution chain.

Furthermore, as the next section discusses, contemporary methamphetamine markets simply do not meet these conditions that could possibly justify sentencing based on pure weight.

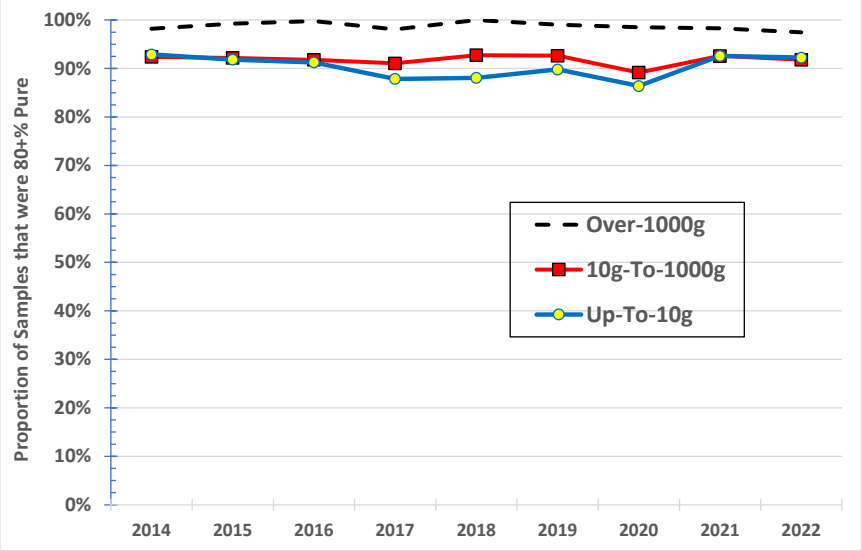
2. Distinguishing types of meth for sentencing makes little sense today

Almost all methamphetamine sold in U.S. markets today is highly pure, at least if one focuses on law enforcement samples. Furthermore, most samples today are almost entirely the optical isomer d-meth; racemic mixtures of d-meth (which is more psychoactive) and l-meth is largely a thing of the past.

That is the common view in the literature, including in Toske and McKibben's (2022) detailed discussion of the evolution of meth purity and production practices, which draws primarily on the DEA's Methamphetamine Profiling Program (MPP). It is also the conclusion of the Sentencing Commission's own (2024) report based on data from a random sample of sentenced cases. For example, the Commission's report found that the average purity for street-level dealers (91.3%) was only marginally below that for wholesalers (94.1%) or high-level suppliers (95.2%). Hence, meth purity cannot be used as a proxy for the market level of the defendant since apparently dilution is uncommon.[2]

Appendix A of this document provides additional evidence supporting that view. For example, Figure A.2 (reproduced here for convenience) plots the proportions of meth observations that were 80% or more pure, among 62,835 methamphetamine samples analyzed for purity by the Drug Enforcement Administration's Labs. For all three weight classes (up to 10 grams, 10-1,000 grams, and over 1,000 grams), the vast majority of observations were pure enough to meet the Sentencing Guidelines' definition of being Ice.

Figure A.2: Share of DEA LIMS Methamphetamine Samples Listed as Being at Least 80% Pure, by Weight Class



The Sentencing Guidelines' sharp distinction between sentences for Ice and Methamphetamine (actual) on the one hand, and for other methamphetamine on the other, should have created incentives to push the market toward selling less pure forms of methamphetamine. Yet, evidently those incentives have not achieved suppression of high potency methamphetamine.

[2] The report also suggests that purity has not been a good indicator of the defendant's role; there was no appreciable difference between the average purity possessed by owners of the drug vs. non-owners (i.e., employees, staff).

3. Market-based arguments for sentencing meth like cocaine

A case can be made that from the drug markets' perspective, sentencing for methamphetamine should be matched to that of cocaine, so that the same weight of each substance triggers the same or nearly the same sentence. Both cocaine and methamphetamine are powerful, addictive psychostimulants, and they fill broadly similar roles in the illegal marketplace.

Consider first amounts consumed per person. Direct comparison of individual doses is difficult because, as with most illegal drugs, the quantity taken varies widely from person to person (e.g., because of tolerance). Also, the two drugs have very different durations of action, so a heavy user of meth may take fewer doses per day than a heavy user of cocaine. It is more meaningful to compare quantities consumed over an extended period of time, such as a month or year of use, not how much is ingested in any given use session.

Data on consumption patterns in the U.S. market overall are dated. The best source – the What America's Users Spend on Illegal Drugs (WAUSID) series – has not been updated since 2016 (Midgette et al., 2019). Those estimates of market totals for that year were:

Table 1: Estimates of U.S. National Market Totals in 2016

	Quantity (pure)	Value of Retail Sales	Number of Chronic Users
Methamphetamine	171 MT	$27 Billion	3.2 Million
Cocaine	145 MT	$24 Billion	2.3 Million

For both drugs, consumption is dominated by chronic users, which the WAUSID series defines as people who use four or more times per month. Many people use infrequently, but they consume so much less per capita that they account for a quite small proportion of total market demand and consumption.

Dividing the number of chronic users by the pure quantity consumed suggests that a (pure) kilogram of meth supports 18.7 chronic users per kilogram (3.2M / 171,000 kgs = 18.7) for one year, which is only marginally more than the 15.9 chronic users supplied for one year per pure kilogram of cocaine (2.3M / 145,000 kgs = 15.9).

Drug traffickers create two types of harm which might justify their sentencing and punishment. One is supplying drugs, and so supporting chronic use, addiction, overdose, etc. Hence, the previous paragraphs and the next section look at health-related outcomes per unit weight. The second type of harm is the collateral damage created by illegal markets, including violence, corruption, and distorting incentives for pursuing legal work. Broadly speaking, such market harms are driven by the money made, not by weight per se. All other things equal, an expensive illegal drug will stimulate more market-related harm per kilogram than will a cheaper drug.

In U.S. markets today, selling a given weight of methamphetamine generally produces less revenue for traffickers than does selling the same weight of cocaine. Note: Whereas the previous paragraphs referred to pure kilograms, now with a different data source, the analysis will be of prices per unit weight not adjusted for purity.

Appendix B uses 2,416 recent law enforcement price observations from the National Drug Price Portal (NDPP) – which was created by the Appalachian HIDTA – to show that (1) The prices of what law enforcement describes as "methamphetamine" and "ice" are all but indistinguishable and (2) The prices of methamphetamine/ice are lower per unit weight than are cocaine prices, so pound for pound, meth/ice is less valuable to traffickers than cocaine.

The Appendix uses standard adjustments for quantity discounts to pool all those observations into a single analysis, but the gist is easy to see when focusing just on the five most common transaction sizes reported in those data. See Table B.1, which is reproduced here for convenience.

Table B.1: Average Price per Gram for Five Standard Transaction Sizes
(Numbers of data points in parentheses)

	Cocaine	Crack	Ice	Meth	Meth/Ice
1 Gram	$90.83 (160)	$85.07 (70)	$43.90 (51)	$46.44 (132)	$45.75 (183)
1/8th Oz (3.5-3.6 gm)	$64.09 (21)	$54.50 (6)	$26.31 (17)	$29.75 (77)	$29.13 (94)
1 Oz. (28-28.35 gm)	$41.25 (169)	$32.97 (25)	$9.98 (44)	$11.49 (170)	$11.18 (214)
1 Pound	$28.91 (9)	NR bc only 3 data points	$3.38 (51)	$4.12 (122)	$3.90 (173)
1 Kg	$21.20 (87)	$23.60 (5)	$6.28 (15)	$5.11 (27)	$5.53 (42)
Mark-up from pound to gram levels	$61.92		$40.59	$42.33	$41.86
Mark-up from kilo to gram levels	$69.63	$61.47	$37.69	$41.33	$40.23

The key observations are that prices in the "Ice" and "Meth" columns are very similar, and that their combined averages (far right column) are systematically lower than those for either cocaine (the leftmost column) or crack (2nd column from left). That means that a given weight of methamphetamine is worth less monetarily to drug traffickers than the same weight of cocaine. Furthermore, the last two rows show that the increase in value per gram as drugs are moved from wholesale market levels (pound and kilogram sized transactions) to retail (gram sized transactions) is greater for cocaine than for methamphetamine. So, drug sellers make more money from distributing a given weight of meth than they do from distributing the same weight of cocaine.

That data source does not provide import or manufacturing prices, but one can see that even if the import price of cocaine were as high as $21 per gram (so $21,000 per kilogram),[3] and the meth somehow arrived free, the markup between import/production and retail sale would be larger per gram for cocaine than it is for methamphetamine.

[3] The import price of cocaine can't plausibly be larger than the kilogram-level price, because prices get marked up at least somewhat between any pair of market levels.

Hence, when focusing on person-years of consumption supplied, an argument can be made for equal sentences for equal quantities of methamphetamine and cocaine. Further, when focusing on drugs dealers' net revenues from trafficking, and hence their incentives for committing market related violence and other offenses, one can argue that a greater not a lesser quantity of methamphetamine should be required to trigger the same sentence as a given quantity of cocaine.

4. Harms per unit weight for methamphetamine (actual) and crack

Along with colleagues Greg Midgette and Peter Reuter, I have drafted a paper (Caulkins et al., 2025) that, among other things, compares cocaine (in the form of crack) and methamphetamine, based on what is known about their harms per unit weight, both to people who use those drugs and to broader society. It is not a comprehensive assessment, but rather focuses on concrete and accessible data concerning four specific harms:

- Medical Examiner mentions of deaths in which a psychoactive substance is identified as an acute cause of death[4]
- Emergency Department admissions recorded by the Drug Abuse Warning Network (SAMHSA, 2022).
- Addiction measured by dependent or high-frequency use, and
- Crime proxied by adult male arrest events involving the drug.

The approach divides nationwide total harm by total consumption and so elides complexities of defining what weight constitutes a dose or estimating how many doses are taken per day. The paper details the calculations and their limitations, including the aforementioned issue that there have been no national market estimates since 2016. The two key summary tables are reproduced here. The first describes the amount of harm per unit weight, with ranges (low-, medium-, and high) stemming from uncertainty about the total quantities consumed in the country.

Table 2: Measures of Crack and Methamphetamine Harms per Unit Weight

Outcome/drug		Deaths/100kg	ED visits/1kg	Dependent users/1kg	Adult Male Arrests/1kg
Crack	Low	12.8	1.8	12.0	6.5
	Middle	18.8	2.6	17.6	9.5
	High	27.5	3.8	25.8	14.0
Meth	Low	11.8	2.9	11.5	7.0
	Middle	19.2	4.7	18.7	11.4
	High	49.0	12.1	47.8	29.0

The second compares average estimated harms associated with 28 grams of crack or 5 grams of methamphetamine *actual*. Note: 28 grams of crack and 5 grams of methamphetamine *mixture*

[4] NCHS, *U.S. Overdose Deaths In 2021 Increased Half as Much as in 2020 – But Are Still Up 15%* (2022), https://www.cdc.gov/nchs/pressroom/nchs_press_releases/2022/202205.htm.

currently receive the same sentence. So, this 2nd table shows that even if all methamphetamine cases were sentenced as is methamphetamine mixture, the methamphetamine penalties would still be "too long" relative to those for crack in the sense that for weights triggering equal sentences, the quantity of methamphetamine involved would be associated with less harm according to these measures.

Table 3: Estimated harms associated with 28 grams or crack and 5 grams of methamphetamine

	Quantity	Deaths	ED visits	Chronic Users	Adult Male Arrests
Crack	28g	0.0042	0.0586	0.3933	0.2138
Methamphetamine	5g	0.0010	0.0237	0.0936	0.0568
Crack to Meth Harm Ratio		**4.4**	**2.5**	**4.2**	**3.8**

5. Ways of closing the methamphetamine sentencing gaps

My sense is that many people find it difficult to continue to justify the 10-fold gap in quantities needed to trigger a given sentence for methamphetamine, depending on the type of methamphetamine. Whatever the balancing of arguments pro and con for this gap in the past, methamphetamine market conditions have changed over the last 10 to 20 years. In today's market, the great majority of methamphetamine samples have nearly the same purity and potency, so many would judge it to be both simpler and more equitable to have one schedule of sentences for all forms of methamphetamine.

That raises the question: in which direction should the gap be closed? I suggest that "Ice" and "Methamphetamine (actual)" be sentenced as methamphetamine mixture is today because that would bring methamphetamine sentencing thresholds more in line with those of cocaine, which is the other powerful psychoactive stimulant that is commonly sold in U.S. drug markets.

A kilogram of either substance – cocaine or methamphetamine – supports about the same amount of high-frequency use in the country as a whole. For drug sellers, owning or distributing a given weight of methamphetamine provides less financial reward, and so less incentive for market-related violence and corruption, than owning or distributing the same quantity of cocaine. And even after that change, regarding the harms just discussed, methamphetamine sentences would still arguably be too harsh relative to those for crack, let alone those for cocaine in other forms.

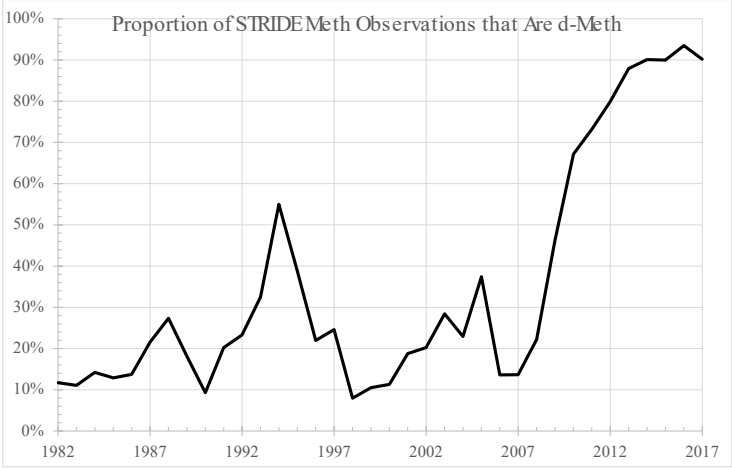
Appendix A: The distribution of methamphetamine purity in contemporary U.S. markets

Toske and McKibben (2022) review the quantitative history of methamphetamine purity and synthesis methods based on data from the DEA's Methamphetamine Profiling Program (MPP). They report that the average purity of these law-enforcement based samples was over 90% from 2011 until 2020 (the last year covered by their analysis).

Toske and McKibben (2022) also report that the proportion of that methamphetamine that is d-meth (the isomer that is bioactive in humans) is now consistently high. In the past, when different synthesis methods were employed, methamphetamine often appeared as a racemic mixture of both d- and l- isomers (the latter not having the same psychoactive effects). In such cases there could be a disparity between the purity (% by weight that is methamphetamine) and the potency (% by weight that is the type of methamphetamine that is psychoactive), but that disparity gap was quite low by the final periods of their analysis.

Toske and McKibben's disparity figures only cover 2011 – 2020, but my colleague Greg Midgette produced a related time series over a longer period of time that we hope to include in a future journal article. (So, this plot is not yet peer-reviewed.) Figure A.1 shows the proportion of methamphetamine observations in the Drug Enforcement Administration's STRIDE data that were predominantly d-meth dating back to the early 1980s. It shows clearly that at one time d-meth was the exception, so tougher sentencing policies designed to punish it more than the less potent racemic mixes had a basis, but that by a decade or so ago, the racemic mixtures had shrunk to be a very small share of the market, or at least the market as sampled by DEA's STRIDE observations.

Figure A.1: Proportion of DEA STRIDE Methamphetamine Observations that were Predominantly d-Meth, as Opposed to Being a Racemic Mixture



The Toske and McKibben perspectives are the standard view, but it is worth noting one recent dissenting perspective. Koncsol et al. (2025) argue in a pre-print article (i.e., not yet peer-reviewed) that methamphetamine as received by end users is not uniformly of high purity. They analyze samples from a community-based drug checking program in Los Angeles County, California from February 2023 to November 2024. Their data pertain to what users receive, not purity at other market levels. Of the 69 quantitatively-assayed samples that purchasers said they expected to be methamphetamine, one did not contain methamphetamine. Among the other 68, the mean and standard deviation of purity were 57.9% and 20.0%, respectively.

There are various ways of reconciling these different findings. Koncsol et al.'s samples came from just one place and time, which might not have been typical. Or it might be that at the very bottom of the distribution chain, at market-levels below those reflected in DEA data,

methamphetamine purity may be lower than it is in cases seen through the lens of federal law enforcement.

We add a few additional perspectives based on other data sources with complementary strengths.

DEA LIMS Data for the U.S.

The DEA no longer makes its STRIDE datasets fully available to the public, but does provide a public use file with transaction-level observations from 2014-2022 whose weight and purities have been discretized.[5] These data are now referred to as LIMS data (Laboratory Information Management System), but so far as I understand it, their nature is the same as what used to be referred to as STRIDE data.

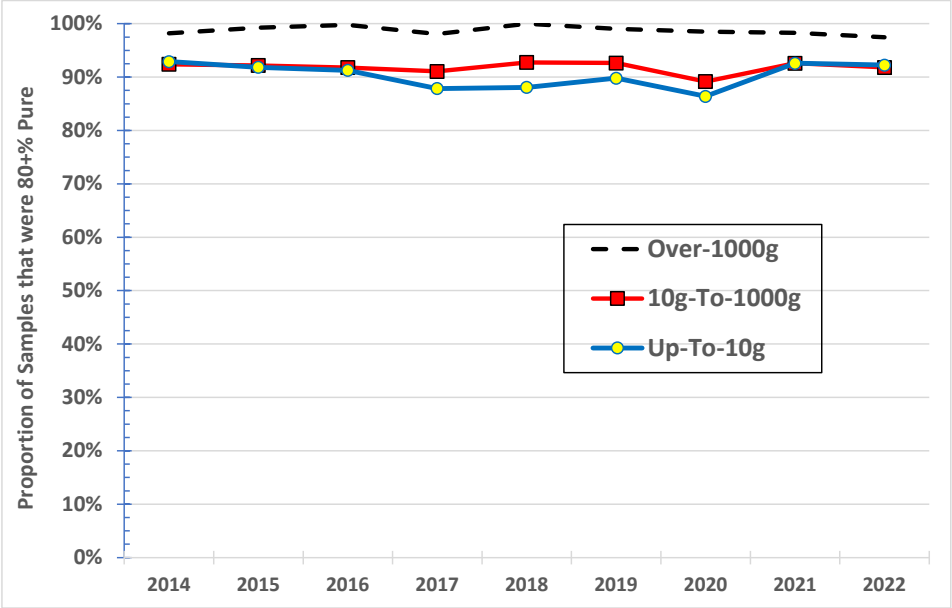
Weight in the public use LIMS file is trinary, distinguishing observations that are up to 10 grams from those that are 10 – 1,000 grams and those that are over 1,000 grams (i.e., over one kilogram). Purity is reported in 10 percentage point ranges (0-10%, 10%-20%, etc.). That lets us observe what proportion of methamphetamine observations in this law-enforcement derived data set are at least 80% pure.[6]

Figure A.2 plots these proportions for all three weight classes. To be clear on how to read the graph, it is not showing average purity. It shows what proportion of observations are pure enough to meet the statutory definition of being "Ice" (assuming they are mostly d- meth, as Toske and McKibben suggest is increasingly the case). The key observation is that almost all of these 62,835 samples in all three weight bins would meet that Ice-defining purity threshold.

[5] Data available at DEA Laboratory Information Management System (LIMS) Data.

[6] To be more precise, these are the proportions of observations with purity of 80% or more among those for which purity is reported. There are also observations whose purity is listed as blank; those are excluded when computing these proportions. The purity field is mostly blank before 2014, so the graph starts in 2014. For the years covered, there were 62,835 observations with a non-blank purity reported.

Figure A.2: Share of DEA LIMS Methamphetamine Samples Listed as Being at Least 80% Pure, by Weight Class



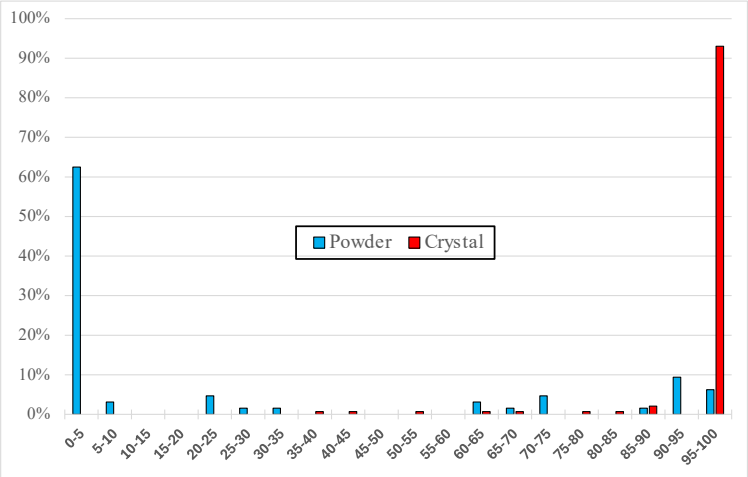
DAS Data from Canada

The Canadian analog to the DEA's Laboratory system is the Drug Analysis Service and Cannabis Laboratory (DAS). DAS is willing to share transaction level purity data in full detail, not discretized to deciles, and distinguishes methamphetamine observations by type, so I can show its full distribution.

I have been receiving DAS data for a little over a year. There are 230 observations from February 2024 through May 2025 whose "entered result" for drug type was methamphetamine hydrochloride. I focus on the 64 that were a "powder or grainy substance" (i.e., "Description" field was B) and the 143 "crystalline substance" (field Q), and so excluding the handful of tablets, liquids, and two observations labeled simply as "material".

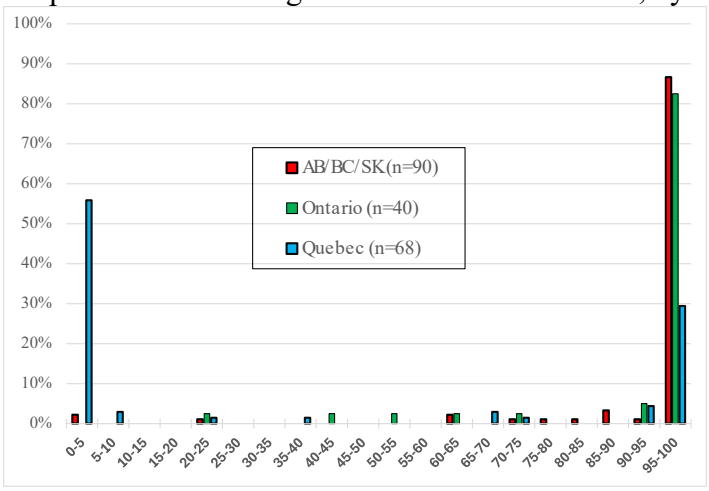
Figure A.3 shows the stark difference in the distribution of purities for powder (blue bars) and crystal (red bars) methamphetamine in the Canadian data. The vast majority (95.8%) of the crystal meth observations are more than 80% pure, whereas only a modest proportion of the powder observations are. Figure A.2 suggests that the U.S. market now predominantly looks like the red bars.

Figure A.3: Proportion of Canadian DAS Methamphetamine Hydrochloride Powder & Crystalline Samples Listed as being 80-90% or 90-100% Pure, by Weight Class



There is sharp spatial variation within Canada. The Quebec methamphetamine market is primarily powder (49 of 68 observations), whereas the other markets are primarily crystalline (124 of 139 observations), and so more closely resembles most markets in the U.S.
Figure A.4 shows that in Ontario and in Alberta/BC/Saskatchewan (combined) the meth purity is almost always very high, whereas in Quebec it is almost always either very high (95+%) – the crystal observations there – or very low (0-5%), the powder observations. In this regard, whereas the U.S. market once looked like Quebec's current market, now it looks more like the rest of Canada.

Figure A.4: Proportion of Canadian DAS Methamphetamine Hydrochloride Powder & Crystalline Samples Listed as being 80-90% or 90-100% Pure, by Weight Class



Appendix B: Data on Cocaine and Methamphetamine Prices

This appendix documents that (1) The prices of what law enforcement describes as "methamphetamine" and "ice" are all but indistinguishable and (2) The prices of methamphetamine/ice are lower per unit weight than are cocaine prices, so pound for pound, meth/ice is less valuable to traffickers than cocaine.

The U.S. federal government (notably NDIC, ONDCP and DEA) used to regularly publish data on the prices of illegal drugs (e.g., DEA, 2003; Fries et al., 2008; Midgette et al., 2019), but no longer do, at least to the same degree. Fortunately, the National Drug Price Portal (NDPP), provided by Appalachia HIDTA and ONDCP, provides an alternative. The Appalachian HIDTA has undertaken an ambitious effort to collect price reports from scores of law enforcement agencies around the country and has shared those data with me for limited research use. I was able to analyze those data, and they support the two points above.

Many but not all prices are reported for standard round number quantities, and the first five rows of Table 1 show the average prices for the five most common standard unit quantities: 1 gram, an "8-ball" (3.5-3.6 grams), 1 ounce, 1 pound, and 1 kilogram. Prices per gram are listed separately for "cocaine" and "crack", and for "ice" and "methamphetamine".

The prices in the "ice" and "methamphetamine" columns are very similar. Indeed, a standard two-sided t-test for differences in means finds that only for the pound-level prices are the differences statistically significant at the $p = 0.05$ level, and even in that row the differences are not substantively different. The $4.12 per gram price for ice at the pound level is only 5.6% greater than the $3.90 per gram for methamphetamine.

Hence, the last column reports the weighted average of the prices in the "ice" and "meth" columns, and those are the prices I compare to the prices in the "cocaine" column. I do not average the prices of "cocaine" and "crack", because the differences in prices in those columns are somewhat larger, although still not very large.

Table B.1: Average Price per Gram for Five Standard Transaction Sizes
(Numbers of data points in parentheses)

	Cocaine	Crack	Ice	Meth	Meth/Ice
1 Gram	$90.83 (160)	$85.07 (70)	$43.90 (51)	$46.44 (132)	$45.75 (183)
1/8th Oz (3.5-3.6 gm)	$64.09 (21)	$54.50 (6)	$26.31 (17)	$29.75 (77)	$29.13 (94)
1 Oz. (28-28.35 gm)	$41.25 (169)	$32.97 (25)	$9.98 (44)	$11.49 (170)	$11.18 (214)
1 Pound	$28.91 (9)	NR bc only 3 data points	$3.38 (51)	$4.12 (122)	$3.90 (173)
1 Kg	$21.20 (87)	$23.60 (5)	$6.28 (15)	$5.11 (27)	$5.53 (42)
Mark-up from pound to gram levels	$61.92		$40.59	$42.33	$41.86
Mark-up from kilo to gram levels	$69.63	$61.47	$37.69	$41.33	$40.23

The key observation when comparing the cocaine (leftmost) column and the meth/ice (rightmost) column is that per unit weight, the meth/ice prices are always lower than are the corresponding prices of cocaine. That means that a given weight of methamphetamine is worth less monetarily to drug traffickers than the same weight of cocaine. At the ounce to kilogram market levels, meth is worth only about 13%-27% as much per unit weight as cocaine; at the lower market levels (gram and 8-ball levels), meth is roughly half as valuable per unit weight as cocaine.

In some sense drug dealers care more about the money they can make moving drugs from one market level down to a lower market level. The last two rows show the net revenue per gram a drug dealer can make from moving each drug from wholesale market levels (pound and kilogram size transactions) down to the retail (gram) market level. Drug dealers would earn more per unit weight of cocaine distributed, roughly 1.5 times as much per unit weight as for distributing methamphetamine.

The Appalachian HIDTA data contain other observations for intermediate quantities (e.g., 2 grams, 3 ounces, 1.5 pounds). In total, there are 2,416 price observations from 2024-2025 that are described as being cocaine, crack, ice, or methamphetamine and whose size is described in terms of a non-zero weight (grams, ounces, pounds, or kilograms) not dosage units.

One standard approach for normalizing observations of varying weights is to model the price per gram as being log-linear in the transaction weight (Caulkins, 2007). Regressing the log of price per gram on the log of transaction size, with dummy variables for drug type and permitting the slope of that relationship to vary across drugs uses all of the data and produces the same conclusions: (1) There is no statistically significant difference between the prices of "methamphetamine" and "ice", either in levels or slope and (2) Cocaine is more expensive per unit weight than methamphetamine across market levels.

The regression model results are shown below. The key parts are highlighted with color and printed bold. The yellow shading shows that intercept and slope interaction terms for ice are not statistically significant at standard levels because the p-values in those rows (bolded numbers) are greater than 0.05. (Methamphetamine is the omitted drug type, so these coefficients measure the difference between ice and methamphetamine.)

The orange shading shows that the intercept capturing the difference in price per gram of cocaine vs. methamphetamine is positive. The p-value of 0.000 is less than the standard 0.05 threshold indicating statistical significance of the coefficient. The coefficient's value of 0.2848 (in a log-linear model) indicates that cocaine is a bit less than twice as expensive per unit weight as methamphetamine, on average across the range of weights covered in the data base.

Table B.2: Results of Regressing Log Price per Gram on Log Transaction Size and Dummy Variables for Drug Type, Allowing Different Slopes by Drug

Regression Statistics					
Multiple R	0.8913				
R Square	0.7944				
Adjusted R Square	0.7938				
Standard Error	0.2273				
Observations	2416				
ANOVA					
	df	SS	MS	F	Sig F
Regression	7	480.6928	68.6704	1328.987	0
Residual	2408	124.4243	0.051671		
Total	2415	605.1171			
	Coefficients	Std Error	t Stat	P-value	
Intercept	1.6250	0.0113	144.1987	0.0000	
Log(Q, grams)	-0.3963	0.0070	-56.3120	0.0000	
Ice	-0.0031	0.0236	-0.1299	0.8966	
Cocaine	0.2848	0.0165	17.2502	0.0000	
Crack	0.2913	0.0195	14.9271	0.0000	
Ice-Slope	-0.0089	0.0140	-0.6375	0.5239	
Cocaine-Slope	0.1685	0.0108	15.5313	0.0000	
Crack-Slope	0.0214	0.0212	1.0103	0.3125	

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