Measuring the Deterrent Effect of Enforcement Operations on Drug Smuggling, 1991-1999

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Executive Summary

This study takes a mixed qualitative-quantitative approach to studying the deterrent effect of drug enforcement operations on cocaine trafficking. For the purposes of this study, a drug enforcement operation has a deterrent effect if drug smugglers are displaced from a previously preferred route/method into a less desirable smuggling route/method, thereby increasing their risk of being caught and other costs associated with smuggling (e.g., transportation fees). The increased costs presumably will be passed on to consumers.

The qualitative portion of the study is based on the expectation that interviewing smugglers can tell us much about what factors – especially drug enforcement – affect their decision making process. Using statistical analysis we then show how specific counterdrug operations undertaken between 1991 to 1999 impacted cocaine prices (both retail and wholesale) and trafficker behavior. This analysis provides the basis for an on-going replicable effort aimed at measuring the impact of drug enforcement operations on the cocaine smuggling system.

Summary of Results

Interviews With High-Level Drug Smugglers

We interviewed a purposive sample of high-level cocaine smugglers in federal prisons. We were especially interested in learning how smugglers assess risk and how these factors vary by method and role of smuggler. We conclude from our interviews with smugglers that the biggest deterrents are:

- Threat of informants, whether cooperating defendants or confidential informants
- Prison terms of 25 years or greater
- Ability to be prosecuted under dry conspiracy charges (i.e., they need not be caught in possession of the drug to be convicted)

We also found that smugglers don't perceive much of a threat on the water because they believe that law enforcement lacks the necessary assets to spot them. If spotted, they are certain law enforcement can't catch them, and if caught, the use of sophisticated compartments makes it virtually impossible for the drugs to be located. This supports a need for enhanced interdiction capability in the water.

In terms of sentences (if caught) smugglers expect a sentence of 10 years. But 25 years to life is more realistic under current sentencing guidelines (for high-level smugglers). The prospect of facing 25 years in prison was adequate to deter 100 percent of those interviewed. This begs the question of why the U.S. is not making sentencing guidelines more widely known in the smuggling community. Smugglers acknowledged in our interviews that they stay abreast of drug enforcement activities through local newspapers in their home countries. Accordingly, publishing U.S. sentencing guidelines in Colombian and Mexican newspapers could be an inexpensive method of deterrence. At one point, U.S. Customs had considered placing billboards at U.S. ports of entry displaying the penalties for smuggling drugs into the United States. Given what we learned in our interviews with drug smugglers, this may be worth reconsidering. Also, it would seem that cultivating more confidential informants via investigative

operations – and making it known that this is a key component of our counterdrug strategy – would be an effective deterrent.

Summary of Statistical Analysis of Counterdrug Enforcement Operations

The following table summarizes our quantitative assessment of the impact of counterdrug enforcement on two main outcomes: effect on cocaine prices in the U.S. and effect on displacing drug trafficking activity from one transportation route and method to another.

Summary – Effect of Deterrent Events on Cocaine Prices and Trafficker Behavior

	Increase Cocaine Prices	Alter Trafficker Behavior
Arrival & Transit Zone Operations		
Hard Line	Yes	Yes
Zorro II	No	N/A
Gateway	No	Yes
White Shark I	No	No
White Shark II	No	No
Frontier Shield	No	No
Border/Gulf Shield	Yes	Yes
White Shark III	No	Yes
Brass Ring	No	No
River Sweep	No	Yes
Frontier Lance	No	No
Conjuntos I	No	No
Conjuntos II	Yes	No
Two Dozen	No	Yes
Source Zone Operations		
Support Justice III	Yes	N/A
Support Justice IV	Yes	N/A
Stand-down	No	N/A
Shoot-down	Yes	N/A
Trafficker Arrests/Deaths		
Arrests/Deaths	Yes	N/A
Orejuela Brothers Arrest	Yes	N/A

Based on these analyses, source zone interdiction operations and the arrest or death of major drug traffickers appear to have very significant effects on increasing cocaine prices in the U.S. The impact of the source zone interdiction operations is likely due to success in temporarily reducing the supply of cocaine to the United States. Since cocaine prices are expressed in terms of price per pure gram, the increase in prices (particularly at retail level) are the result of increased 'cutting' by the dealers. This would be a fairly quick and obvious way to deal with a temporary shortage in supply.

The positive effect of operations Hard Line, Border/Gulf Shield and Conjuntos II on cocaine prices implies that these operations had a very real impact as well and either caused traffickers to increase their fees and/or reduced the supply of cocaine to U.S. markets.

Although the remaining transit and arrival zone interdiction operations examined do not have a statistically significant impact on cocaine prices in the U.S., many exhibit an impact on trafficker behavior. This suggests that these operations were effective enough to force smugglers to change their transportation routes and/or methods. However, as the counterdrug community has long recognized, drug traffickers' ability to get drugs from South America into the U.S. is limited only by their creativity. Accordingly, it appears the ability of these operations to impact cocaine prices was ameliorated by the availability of alternative transportation routes/methods.

Recommendations for Further Research

This report does not provide the final word on the effectiveness of counterdrug operations. Indeed, we were disappointed with and often perplexed about the lack of data available on the activities of interdiction assets. This was most notably the case with the interdiction activities of the Department of Defense. Ironically, better data was available on what drug traffickers were doing than on the activities of U.S. drug interdiction assets. Without the requisite data, no statistical procedures, no matter how sophisticated, can provide compelling arguments about the effectiveness of interdiction programs.

We have developed methods to evaluate program effectiveness, and this report makes recommendations for how those methods could be employed in future studies. Still, serious program evaluations will require:

Greater cooperation from all federal agencies involved in drug enforcement operations. Our statistical analysis uncovered a high degree of interaction among the operations considered in our models. That is, the impact of an operation is quite different when examined in the context of other operations or activities occurring at or around the same time. The models' ability to accurately identify the impact of specific operations would be improved with more comprehensive data on drug enforcement resource levels and activities.

Expanded Scope of Analysis. Our analyses in this study were based on cocaine movement data and price series. There is no reason, except for the limits imposed by time and funding, that an analyst could not go directly to the issue to see if drug enforcement operations affect consumption. Consumption is measured in surveys such as the National Household Survey on Drug Abuse and the Arrestee Drug Abuse Monitoring survey. Because these are collected on a more or less continuous basis, they could provide another way of monitoring the ultimate effect of interdiction.

Improved Analysis. As this report shows, this study posed difficult analytic problems. We struggled to overcome many of them through considering multiple variations of outcome data, the introduction of control variables, and the application of sophisticated statistical techniques. We did not overcome them all. For example, one area that warrants further exploration is the creation of regional drug price series. STRIDE data tend to over-represent East Coast markets (particularly Washington, D.C.) Accordingly, the effect of operations such as Hard Line that target smuggling across the southwest border, are lost

when examined against a price series constructed from the larger data set. By creating a regional price series for the southwest border, we were able to pick up an otherwise obscured impact of operation Hard Line on retail prices.

Improved Asset Data. Better interdiction asset data is critical for the modeling. Fluctuations in assets affects the ability to detect smugglers and hence the quality of data in the Consolidated Cocaine Data Base (CCDB)[1]. Significant interdiction assets that contribute at each stage of the interdiction process (detection, pursuit, and capture), as well as area in which it operates and date of operation, must be collected.

Incorporate All Cocaine Movement Data. Follow-on work could consider all events in the CCDB, not just those used for Interagency Counterdrug Performance Assessment Working Group (ICPWG)[2] purposes. We were constrained to the ICPAWG events only for this study because of the time period under consideration (1990-1999). Using all cocaine movement events would provide more richness to the analysis.

Perform Analysis of a Regional "Cocaine System". Perform comprehensive analysis that considers -- for a particular region – the effect of counterdrug operations on all aspects of the "cocaine system" including demand, prices, and cocaine movement into and out of the area. By narrowing the focus to one area, a more detailed model can be built that could then be extended to other areas.

Develop Predictive Models. Building on this work, develop models that will provide analysts the ability to predict smugglers' responses to certain interdiction scenarios.

Include Significant Seizure Events. Future work should consider the deterrent effect of large seizures. This could easily be incorporated into the current model.

[1] A repository of data that describes drug movement originating in South America and destined for U.S. and non-U.S. markets.

[2] These data are a subset of the CCDB data and include those drug movements that were interdicted en-route to their destination.

1. Background

This study examines a crucial question: What kind of effect do interdiction and other drug enforcement activities have on drug smuggling? Do they actually deter smuggling, or is their effect more one of disruption and displacement? The answer to this question is of considerable importance, owing to the significance of drug abuse in the United States as well as the annual expenditure on drug enforcement and treatment. More than fifty agencies of the federal government are involved in drug supply and demand reduction strategies, and the annual budget for these agencies is approximately 17 billion dollars. It is estimated that when federal, state and local expenditures are combined, the U.S. spends roughly 30 billion dollars annually on drug control efforts.

While the Office of National Drug Control Policy (ONDCP), the U.S. Customs Service, and the U.S. Coast Guard have made great headway in the area of performance measurement, measuring the outcomes of counterdrug operations remains a challenge. ONDCP, as part of their Performance Measures of Effectiveness (PME) system, has sponsored development of improved measurements of drug flow as one gage of interdiction effectiveness. However, questions regarding the existence and value of other outcomes (such as displacement and increases in trafficker operating costs) and the impact of counterdrug operations on drug prices in the U.S. remain unanswered. While billions of dollars are spent on interdiction activity, only thousands are spent learning how those billion could be more effectively used.

Recognizing this lacuna in evaluation research, ONDCP, the U.S. Customs Service, and the U.S. Coast Guard jointly funded Abt Associates in a study that examines the relationship drug enforcement operations in the source[3], transit[4], and U.S. border entry regions[5] and the corresponding deterrence effect on cocaine smuggling. For the purposes of this study, a drug enforcement operation has a deterrent effect if drug smugglers are displaced from a previously preferred route/method into a less desirable smuggling route/method, thereby increasing their risk of being caught and other costs associated with smuggling (e.g., transportation fees). The increased costs presumably will be passed on to consumers.

This study has three principal components. First, we interviewed convicted drug traffickers to learn their perceptions about the risk of transporting cocaine into the United States. Second, we studied how cocaine prices were affected by various drug enforcement operations and events. And third, we examined the best available data about cocaine movements through the transit zone to see whether there is a correlation between movements and interdiction activity. Results appear in the following sections of this report; technical material appears in the appendices.

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[3] The source zone refers to countries that cultivate, produce and export cocaine, primarily the South American countries of Colombia, Peru, Bolivia, Venezuela, and Ecuador

[4] The transit zone for cocaine refers to the area that includes the Caribbean Sea, the Gulf of Mexico, Central American, the northern coast of South America, Mexico, the Eastern and the Western Pacific.

[5] The arrival zone is any Port of Entry (POE) into the U.S., or any point between ports of entry

2. Research Approach

Evaluating Deterrence

We have taken a mixed qualitative-quantitative approach to studying the relationship between drug enforcement operations and cocaine trafficking. The qualitative portion of the study is based on the belief that interviewing smugglers can tell us much about what factors affect their decision making process and the extent to which drug enforcement efforts play a role. To date, perceptions about deterrence have been built largely on an understanding of drug smuggling from the perspective of those charged with the task of intercepting, arresting and prosecuting smugglers. There have been notably few studies of drug smuggling and the impact of interdiction efforts from the perspective of those involved in the process themselves - drug smugglers. We interviewed a sample of high-level cocaine smugglers in federal prisons to determine how smugglers assess risk, what smugglers perceive as risk, and how these perceptions vary according to the smuggler's role in the organization.

The first step in the quantitative analysis was to evaluate how certain types of counterdrug measures affect cocaine prices. To the extent that drug prices in the United States are affected by supply, successful interdiction operations should increase cocaine prices, at least until cocaine traffickers adapt. Accordingly, this part of the analysis evaluated how selected interdiction and other drug enforcement operations, conducted between 1991-1999, affected monthly cocaine prices (at both retail and wholesale levels). We used time-series analysis techniques to accommodate the facts that the effects of operations on prices are likely delayed and could be distributed over time (rather than happening in a single period).

Demonstrating that prices are temporarily sensitive to interdiction events is important, but that demonstration says nothing about how traffickers actually adapt to special counterdrug operations. The objective of the second part of the quantitative analysis was to determine whether or not traffickers respond to interdiction operations by altering how and where they move drugs through the transit zone and across U.S. borders. Specifically, when a special interdiction operation is focused on a specific geographic area and transportation mode for a defined period, we would expect two adjustments:

- Traffickers would reduce shipments through the targeted geographic area and by the targeted conveyance mode for the period of operation; and

- They would increase shipments through other geographic area and conveyance modes for the same period of operation.

The approach taken here is different from that taken for the price series. For the price-series, the analysis was focused on national or regional prices, so there was one observation per month. In this second part of the analysis, the focus is on geographic/conveyance mode combinations, so there are seventeen observations per month. Inferences are based on the time-series (as above) and also on the cross-section (the seventeen observations per month).

The Cocaine Threat and Evolution of Drug Trafficking Organizations

Being able to evaluate the effect of specific counterdrug efforts is particularly important given the magnitude of the drug problem. The volume of cocaine production in South American source countries was estimated at roughly 666 metric tons in 1999 (Layne, 2000). Estimates developed by Abt Associates (1999) indicate that approximately 300 metric tons of cocaine entered the U.S. in 1999, roughly 45 percent of the total production[6]. While these figures may not be precise, they provide rough gauges against which the magnitude of cocaine importation can be understood. (Appendix A presents an analysis of cocaine flow.)

Trafficking behavior and cocaine prices are influenced by many factors, not the least of which are the nature and roles of the various drug trafficking organizations. For many years, Colombian organizations dominated the cocaine industry – from production to transportation to distribution. Over the past decade, however, this monopoly crumbled as non-Colombian organizations, particularly Mexican, challenged the stranglehold Colombia once had on the industry. The incarceration of the Cali Cartel kingpins in 1995 and 1996 has further increased the influence of the Mexican drug trafficking organizations on U.S. markets and enabled less established trafficking groups in Colombia to assume a greater role. (Appendix B provides detailed information about the history of drug smuggling organizations.) It is interesting to note that much of these changing dynamics appear to be attributable to drug enforcement. One wonders, for example, if Mexican organizations would be as powerful as they are today had Colombian organizations not been denied access to more direct transportation routes and forced to turn to routes through Mexico. Given the effect that the dismantlement of the Cali Cartel had on the drug industry, one must also consider the impact of investigative efforts as well.

Accordingly, one of the dilemmas in deterrence research is that it poses the question, "What would have happened if some interdiction activity was not present?" Measuring what would have happened in the absence of some intervention is difficult. It is useful to think of the deterrence that results from interdiction as operating on a continuum. At one end of the continuum, is the level of smuggling in the absence of any interdiction effort. Here drug smugglers would be free to move their supplies with impunity. The other end of the continuum would be perfect deterrence, in which the level and sophistication of interdiction efforts would successfully deter all efforts to bring drugs into the U.S. Such a system would have to combine the certainty of detection and arrest with certainty of conviction and appropriately severe penalties to deter all smuggling activities. Implicit in such a calculus is the notion that these costs would exceed the hypothesized benefits of smuggling (cash, thrills, relationships, etc.) by such a level as to prevent anyone from smuggling.

Of course we know that perfect deterrence does not exist. The presence of strong demand for drugs in the United States and the high margin of profit create powerful incentives for smuggling. Deterrence operates to stop some fraction of the drugs that begin on a smuggling venture into the U.S. The questions that arise include which aspects of the deterrent effort are most effective and what steps do smugglers take to reduce the risk of losing their payload, being captured, and being punished? It is to those questions that the current study is devoted.

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[6] The remaining 55 percent are comprised of 260 metric tons and 100 metric tons for non-U.S. consumption. Thus, 300/(260+660+100)=45%

There is strong evidence that deterrence can be measured (Appendix C presents an overview of prior research) and that some level of deterrence of drug smuggling exists. In this paper we will show how specific drug enforcement operations undertaken between 1991 to 1999 impacted cocaine prices (both retail and wholesale) and trafficker behavior. This analysis can provide the basis for an on-going replicable effort aimed at measuring the impact of drug enforcement operations on the larger cocaine smuggling system.

3. Interviews With High-Level Cocaine Smugglers

Our interviews with incarcerated drug smugglers provided valuable insight into their motives, decision-making processes, perceptions of threat, risk thresholds, and how they deal with those risks. Much of the information obtained through these interviews would not have otherwise been attainable. Although a great deal of information is captured and documented by investigators and prosecutors, that information is intended largely for prosecution purposes – not for research. Since deterrence is driven largely by perception, future evaluations of the efficacy of drug enforcement operations and tactics would benefit greatly by conducting similar interviews on a routine basis.

Smuggler Sample

Sample selection procedures were developed to identify high-level drug smugglers who have experience smuggling large loads of cocaine into the United States. We focused on smugglers who were experienced with evading counterdrug enforcement activities and would be cognizant of the risks associated with smuggling drugs into the U.S. The goal was to identify at least 100 such prisoners (sentenced from 1992-1998) and, predicting a 50% response rate, to obtain 50 interviews. Appendix D fully details the sample selection process.

Ultimately we interviewed 34[7] high-level cocaine drug smugglers housed in ten separate prison facilities (access to high security institutions was not a problem). Interviewees varied in age from 32 to 70, with an average age of 48. Participants in the study were arrested for their current offense between 1988 and 1997, and 59% of the sample was arrested in 1993 or later. According to the pre-sentencing reports, subjects' average period of incarceration was 25 years. Sentence lengths ranged from 10 months to 470 months.

Excluding those who claimed this was their first drug related offense (5 respondents), the average length of involvement in drug smuggling was 14 years. Results from the interviews indicate that the average number of career smuggling trips among interviewees was 30, ranging from 1 to 200. Excluding those who said that the instant offense represented their first time, respondents averaged 39 trips before apprehension. Thirty-two percent of these reported involvement in over 50 trips during their careers. Although smugglers' exaggerations must be taken into account when interpreting load amounts, over half of the sample (59%) reported average load sizes of 500 kilograms or more.

Interview Results

Motivation

Most observers infer that there is a single reason that individuals become involved in crime -- to make money. However, this assumption has been called into question by recent research. Extensive interviews with active residential burglars (Wright and Decker, 1994), armed robbers (Wright and Decker, 1997) and

[7] Our sample overly represents smugglers from the Florida area. This seems to be a function of our sample selection criteria. We excluded couriers or "mopes", including those who smuggled 15 kilograms or more.

crack sellers (Jacobs, 1999) demonstrate that while money was the primary motivation for involvement in crime, it was not the only motivation. Things such as keeping up appearances, maintaining a party lifestyle, and acting in concert with friends and relatives often served to motivate these individuals to engage in crimes.

> Interviewer: "So 10 years [in prison] is about the point where you start to think this isn't worth it?"
> It depends on the money. (4)

We found few individuals who remained involved in drug smuggling owing to their commitment to a lifestyle of thrill seeking. However, all of our subjects could recount aspects of a prior smuggling enterprise that included considerable thrill, a thrill that they missed while in prison. While the pursuits of a "rush" or "thrill" were hardly the primary motivations, they were nonetheless welcome attributes of the involvement in drug smuggling. For those who remained in drug smuggling over a prolonged period of time (roughly ten years) and were assigned more responsibility for the loads, the calculus of a conservative businessman came to dominate.

> Interviewer: "Was it worth being caught?"
> If I tell you no, I'd probably be lying. I look forward to smuggling. You know, when you run and get that second wind how you feel? (1)

Balancing Risk and Reward

Assessing Risk

We attempted to understand how smugglers balanced risk against reward. We spent considerable time querying subjects about these topics. We attempted to have them discuss their perceptions of risk and reward for their first, typical and most recent drug smuggling trip. It quickly became evident that such sophisticated balancing of risks and rewards was well beyond the ken of most of our subjects. Risk to them was a constant, but its calculation was hardly representative of a "criminal calculus" suggested by rational choice or deterrence theorists. Instead, risk was accepted as a given that had to be "neutralized" – if only in their mind – in order for the smuggling event to take place. (Methods for neutralizing risk are discussed below.) We also learned that risk tolerance is dynamic, typically based on age and life-stage concerns and commitments, such as family, financial status, and status in the community. A key element in the ability to neutralize – or, more appropriately, *rationalize* – risk was the magnitude of the reward. In the end, any doubts were quelled with reference to the volume of reward that awaited them upon the successful completion of a drug smuggling event.

Perceptions of Risk

Smugglers' perceptions of the pathways to getting caught were rather straightforward and can be grouped into four categories: a confidential informant or 'snitch' from inside the group, government interdiction operations, investigative surveillance or undercover operations, or an act of nature or mechanical breakdown.

By far, informants, whether cooperating defendants or confidential informants, are feared more than any other potential means of being caught. Typically, a cooperating defendant is an individual that has been caught by a law enforcement agency of the U.S. government, and in turn for his cooperation with the

government receives consideration against his sentence. Confidential informants have inside knowledge of a group's operations and for any number of reasons (monetary compensation by the government, revenge, or a sense of duty) agree to share this knowledge with the government. Informants destroy the illusion that smugglers build around themselves that they will not be caught. The use of confidential informants, as well as devoting resources into actively fostering the belief that their use is widespread, is a powerful tool in combating drug smuggling.

> Interviewer: "How many times do you think you could smuggle drugs into the United States without getting caught?"
> If it hadn't been for a snitch, I could have done it indefinitely. The money overrode any -- any rational judgement. (21)
>
> Unless there is an informant involved your odds are 95 percent in your favor. Zero, zero [chance of getting caught.] (30)
>
> There is no way the United States can stop it unless they got somebody that tells them. I mean, they have a lot of planes out there. They have a lot of things, but there's always a way. There's no way the United States is going to stop it. When you're making money, your mind sometimes -- you think you're indestructible. (3)

Most traffickers perceived government interdiction and investigative operations as manageable risks – ones that could be overcome by altering their routes and methods and being careful in selecting their associates. Ten percent of the smugglers stated that Customs P-3s and aerostat balloons where a definite deterrent. In the case of P-3s, they would wait them out and they also found ways to thwart the aerostats by terrain masking techniques or simply waiting until one was down. Despite this attitude, several of those interviewed were ultimately done in by these 'manageable risks'.

> I knew they were going to get caught because earlier in the day he called me. And the big cigarette boat that came up had just given him the cocaine and he told me, "I gotta little problem." I'm like, "What's going on?" He tells me, "Well I got a plane flying over me." So I'm like, "We got problems, bro." (14)
>
> I realized they were the Coast Guard when they were about a mile from me, by the way they were approaching going around. I had two options sink the boat or get caught. So I got caught. (20)
>
> Interviewer: "If you look back on it now are there things that you see that should have made you suspicious?"
> Yes, for instance the way they spend money. They were very cautious about spending money. Actually, we used to go to dinner or we used to go out and I was the one that was paying the bills. They didn't pay for anything. The way they were dressing they didn't dress like the average drug dealer. They dress very shoddy. (33)
>
> All of a sudden my gut said these are cops and they are going to put you in prison, and my other self said no, no, no, no you know. If you would walk into a bar and look around for the

> scroungiest, evilest looking person, that was the cop. They're sitting there with tattoos, with earrings, the leather jacket, hair. That's the cop. You could pick them out in a minute. (30)
>
> Interviewer: "So what nationality was the boat captain?"
> Customs. (10)

Sometimes things go wrong. This axiom applies to a variety of life's circumstances, including drug smuggling. Boats run out of gas, break down, are late, and encounter unexpected contingencies. When this happens, the odds of being caught increase dramatically.

> So he had a yacht a 68 footer in Aruba at the time. So what he did, he load the yacht and instead of sending to Holland he diverted. The boat breaks down out of Santa Domingo. The Coast Guard comes two days later to get the vessel. (25)

Techniques to Neutralize Risk

Many of the transportation managers identified some of the techniques they used to avoid detection. The primary means of keeping control was to trust only a handful of people, or keep the smuggling venture in the family. The subjects we interviewed took a number of other steps to minimize the risk of being caught. First, they trusted a small circle of confidants, whom (ideally) they had worked with in the past. By trusting few people and limiting their contacts to previous associates, they were attempting to limit their exposure to confidential informants or government agents. When these approaches were not available to them, they would select their associates based on their reputation in the smuggling "community". The importance of having someone to vouch for a potential associate was critical.

A few of the smugglers felt that maintaining an element of surprise or spontaneity in the operation was beneficial. Therefore, they felt it was best to periodically change patterns or switch to alternate methods. Almost all of the smugglers indicated that they would try to bring in the load during the holidays or on weekends when ports, airports, and marinas are the busiest. Another technique a few smugglers discussed was always having a "plan B" if there was threat from law enforcement, such as a second drop point or returning to the mid-shipment point.

Smugglers stated the best rule was to be suspicious and do research. Many of the smugglers talked about monitoring the activities of Coast Guard and Customs. Almost all used surveillance, tracking, and detection equipment. Many smugglers felt that watching the news, reading the newspaper, and articles written in Colombian weekly papers, like Semana and Cambia, had enough information to identify the major interdiction efforts.

> "When you're in this kind of business, you want to find out your odds, what kind of surveillance the government is using, what interdiction efforts." (14)

None of the smugglers talked about any systematic way to collect and share information, except in cases where word of mouth included a number of transportation groups who worked for the same broker or contact. There was, of course, communication within transportation groups. When special operations or new surveillance technologies were put into practice by the U.S. smugglers reacted with sufficient speed by altering routes or changing methods.

Fifteen of the smugglers reported using sophisticated hidden compartments on boats. Most felt that there was little chance of detection with this technique. The problem for law enforcement is that it is very difficult to do a comprehensive search on the water (some reported being stopped and boarded and searched by the Coast Guard up to five times, but with no discovery of drugs). As an additional security measure some smugglers would build additional hatches or create options for law enforcement agents who board their boat to feel like they conducted a good search. On the other hand, they openly admitted that it would be virtually impossible to identify a hidden compartment unless you compared a similar boat to the smuggler's boat. This could only be done once at shore or as part of a seizure. Others had found that really the only way law enforcement ever found the drugs was to break up the boat.

> So the only way to avoid this was to make a seal – tight – sealed compartments. So what I used to do, I used to build the compartment, put fiberglass inside of it, paint it with gel coat, and then on the trap door, I would set it up with rubber all around it, and I would set up a vacuum pack." (5)

> So, in the center of the boat, down along the keel, there is a very large gas tank. It held 110 gallons. And I also had another tank up in the – underneath—well, it was up in a little depression up in the cubby cabin, and I would run the main tank empty, and then I'd pop the hatch, pull the main tank out and set it on the side, and then, when I climbed down into the hull, all up underneath between the floor and the hull of the boat was just an enormous amount of room." (21)

> "They found it. I mean, if you put the boat through a grinder, you're going to find it sooner or later. So that's how they found the secret compartment." (26)

> "Wouldn't find compartment because did not fit profile, there was not anything suspicious situation, and my demeanor was that of being very relaxed." (21)

There were a number of tactics that boat captains and transportation managers used to avoid detection. One was to blend in with normal traffic by arriving and departing with other similar boats, having good navigational equipment, using commercial routes, remaining close to land and other islands, and to be on the water during holidays, regattas, and weekends. Another smuggler noted that he spent a lot of money on the boats and on fishing equipment for a realistic look. Boat owners would change the name and registration of the boat, paint it, and sometimes switch the registration to the country that was going to be used as mid-shipment point.

> "Go out and buy old boat and I registered that in my old name. Then I took the numbers off of it and put it on my boat. So, therefore—and then I also painted my boat, changed the color of my boat and also changed the appearance." (21)

There were a number of behaviors that smugglers avoided because they felt these actions to be too suspicious, e.g., traveling during bad weather, carrying extra fuel, not having fish on a fishing boat, and being on the water during odd hours.

However, many of the smugglers noted that they didn't worry about tracking law enforcement when they are on the water. If they noted they were being tracked their options were to surrender, throw the load overboard, sink the boat, return to mid-shipment point, or try to outrun law enforcement. If the drugs were not in a compartment and the boat was fast, smugglers generally returned to the mid-shipment point, often Cuba or the Bahamas. It was usually not the best option to throw the load overboard because it was usually packaged to float, it took time, and there is no way to be absolutely sure it is law enforcement until they are right on top of the boat. If the load is secured in a compartment a boarding was viewed to be a not bad option -- law enforcement boarded and released almost every boat with a compartment used by the smugglers in this sample.

A final technique used to minimize risk was to bribe officials who may have responsibility for drug trafficking detection and enforcement. We were regaled with numerous stories of the ability to bribe officials in Caribbean countries to look the other way when drugs were being smuggled.

Evaluating Deterrence

One of the ways that we attempted to measure deterrence was to ask closed-ended questions that forced subjects to consider the potential effect of different levels of arrest, conviction, and incarceration. This proved more difficult than we anticipated. By and large, the subjects in our study did not think of risks in terms of probabilities in the way that governmental agencies and social scientists do. Many of the subjects could not conceptualize risk in the probability terms we asked them to assess it in[8].

Role of Arrest

We began by asking subjects to think about whether they would continue to smuggle drugs if their chance of arrest was 1 out of 100, 10 out of 100, or 50 out of 100. Fourteen of the subjects did not provide a direct answer to this question, illustrating their difficulties in addressing probability-based questions. However of those who did answer the question, none reported being deterred by a 1/100 chance, 94% reported that if the risk of arrest was 10/100 they would still offend and 63% said that they would offend if the chance of being arrested was 50/100. Clearly, risk of arrest has to be high in order to yield a deterrent effect. Because the gain is so high, and their experience tells them that it is relatively easy to successfully complete the act, levels of arrest don't seem to be especially potent threats to deterring drug smugglers. The ability to neutralize the likelihood of arrest and the consequences of arrest was an important process for drug smugglers. After all, at one level they know they are up against the collective power of the U.S. government, and on the other hand, we have noted that most smugglers convince themselves that the odds are in their favor, as objectively they seem to be. We found confirmation of this belief from most of our subjects who believed that their chances of being caught were, on the whole, very slim.

> I can tell you, you can do it all the times you want, and we cannot get caught. Well if we break down, okay, if we get unlucky, like there happens to be a cop right there when you're coming in you know, those chances you always got that. (2)

[8] While these results seemly refute the Rockwell study, it is important to note that our sample is entirely different than that in the Rockwell study (see Appendix C).

Role of Conviction

Similar conclusions can be drawn from the analysis of the deterrent effect of conviction. Here we asked subjects about their decision to continue to smuggle drugs in the face of three different chances of being convicted, 1/100, 10/100, or 25/100. Further illustrating the difficulty of utilizing such a calculus, only 12 subjects were able to complete this segment of the interview. Not surprisingly, no one would be deterred by the potential of a 1/100 chance of being convicted. While 71% of the subjects would still offend with a 10/100 chance of conviction, no one would continue to offend with a 25/100 chance of conviction. Clearly, the prospect of conviction appears to provide a more powerful deterrent than does arrest. However, prior to being convicted themselves, most of those interviewed had perceived their chance of being convicted as slim.

> I didn't -- I had no idea how the -- the legal system worked. I was totally unaware of how it was stacked, and it's stacked pretty steeply in their favor. Even if you have -- even if their case is weak, they can get you convicted. They could convict a dead cat, I think. (21)

> Interviewer: "What did you think your chances of being convicted were?"
> Slim and none. I had no idea that the government operated the way they operate. Like I said as far as myself and the general public is concerned you get caught with your hands in the cookie jar, you did it. I never had it around me or anything like that. (24)

> They told me one day, Hey the law is 10 to life. So what? I didn't know. I didn't know that five people could stand in court and lie against me and get me conviction because with the trip that I got convicted 27 years, I had nothing to do with that trip. (2)

Role of Prison Terms

We asked about the deterrent effect of various prison terms: 5-years, 10-years, and 25-years. In the current configuration of USSC guidelines, five years is no longer a realistic sentence for drug smuggling. Not surprisingly, none of the 14 smugglers who answered the question reported being deterred by a sentence of this length. Little deterrent effect was added by doubling this sentence to ten years as 75% of the subjects said that they would continue to offend if a sentence of this length awaited them upon conviction. Interestingly, however, not one subject indicated that they would still offend if sentences were 25 years, a figure that corresponds closely to the average sentence received by members of our sample. The findings suggest that, at least for this group of high-level drug smugglers, 25-year sentences yield considerable deterrent value. The correspondence between this finding and the current level of sentences suggests an interesting opportunity for the U.S. government to increase deterrence through the widespread publication of typical sentence length throughout regions of the country, and world that produce large number of individuals involved in drug smuggling.

Just as in the case of prosecution and conviction, prior to their sentencing, most subjects had no idea regarding the likely penalties that they could receive. This is not surprising, as few citizens are very knowledgeable regarding sentencing guidelines. The knowledge of the conspiracy charge and the elements necessary to prove such a charge are not understood. This was reflected in the smuggler's decisions to take the risks that they did. They saw little chance of arrest or conviction, and figured that sentences would be finite and relatively short, on average about ten years. Once in prison, enlightened by experience, their views changed sharply.

I had no idea whatsoever [about the possible sentence]. (21)

I thought maybe 10 years, I always accepted 10 years. Maybe if I would have had something concrete that I knew I was going to get that time, I would have stopped. (26)

I didn't know they didn't have it [parole]. I could handle 10 years without parole. I couldn't handle any more. (29)

Interviewer: "Do people on the street know about the sentencing guidelines?"
Not really because you know, like if you take my sentence and put in marijuana instead of cocaine like they did I would never get this sentence, you know? (33)

Of course you do [think about the sentence]. But when you're making money, your mind sometimes -- you think you're indestructible. (3)

I never thought they were going to give me life. (17)

Role of Conspiracy

A conspiracy charge does not require an overt act committed on the part of an individual. That is, being captured on tape discussing a drug smuggling opportunity is often sufficient for conviction of a conspiracy to import or conspiracy to distribute charge. In such cases, individuals were quite surprised to find themselves charged with sentences of thirty years, or in some cases, life imprisonment. A second element of the process of catching drug smugglers bears note in this context. Most of the individuals we interviewed were not caught with drugs in their possession. Had they been caught with drugs or in a conspiracy where there were actually drugs, it would have been known as a "wet" conspiracy. However, there are "dry" conspiracies, where no drugs are ever involved and the prisoners were convicted for discussing, arranging, or organizing drug smuggling operations. This is, to observe the obvious, a very powerful tool for law enforcement. Not surprisingly, the individuals convicted in dry conspiracies did not know of such a tactic, and were quite resentful of it. Most saw this law enforcement strategy as inconsistent with the U.S. Constitution.

Interviewer: "What did you think your chances of being convicted were?"
Slim and none. I had no idea that the government operated the way they operate. They said I was being arrested on a violation of narcotics. I said, "Narcotics? I don't have anything on me." They looked at me and laughed and said, "You don't need to." (24)

If I knew about conspiracy I would have been out [of the drug smuggling business] like a bat out of hell. (24)

I didn't know it [conspiracy]. There has always been informants but I didn't know that the government had this program of having people on the street for…I mean what is called a manufactured case. (31)

Do you think people out there understand the conspiracy law?

> No, no. They have to feel it. They have to feel it to know what it is. I never think I'd be convicted. If it doesn't the conspiracy law, I wouldn't be here. (16)

> I thought about it [the risk of getting caught] but I said, well you know I'm not doing anything wrong. I'm not touching any of this stuff. My notion was always you have to get caught with your hand in the cookie jar. (24)

Organizational Structure

Smugglers were asked to describe their role, as it related to the organization or individual they were working with or for. They were also asked about ownership of the drugs and the process involved in organizing a load and transporting it into the United States. From their responses, we were able to get a sense of the structure of drug smuggling organizations and how drugs are moved from South America to the U.S. As we began talking to smugglers about smuggling organizations, we began to hear such terms as "office," "intermediaries," and "broker." We continued to use these terms during all of the interviews so that we could clearly define these entities. In some cases, it seemed to be unclear to the smuggler how their contact in Colombia fit into the structures in Colombia, but in others, it was very clear to the smuggler how loads were arranged and how things were organized. Most often, these smugglers were Colombian or had been managing transportation of drugs for so many years that they had grown to understand how their contacts in Colombia operated. It was these two groups' descriptions that we used to describe the structure of drug smuggling organizations in Colombia during the late 80s and 90s.

Moving Away from Cartels

Because many of the smugglers had experience smuggling drugs since the 1970s and 1980s, we were told about the shift in structure away from cartels and into the less organized groups described above. In many cases, the structure of the organizations resemble the networks described by Williams (1998) a series of connected nodes that are critical to effective functioning of the market. A periphery, linked through trust, insulates the core. The removal of the heads of the Cali cartel caused the organization to splinter into functional units. The units fulfill each of the major importation tasks and respond to the activities generated by a group of individuals who initiate the load. The result was a shift from an organized operation controlled by a few to a number of loosely structured networks that work together to move drugs out of Colombia.

> "It's more spread out now. Ever since all those major groups had either been arrested or turned themselves in or retired…but when a group like that – they say when the Ochoas went in to turn themselves in, all those employees they had, all those people that worked for them, they knew what they were doing… they had the gift of all these connection. So what happened? It all spread around." (26)

> "Well, it is different – its smaller groups now. Like before it was all cartel. It was a group of gentlemen, that, you know, it was like a board. We make decisions together and stuff. Now it is all broken up, but, you know, the drugs are still coming in. Even more than ever." (14)

Figure 1 depicts the structure of a typical organization as related to us by interviewees (although nomenclature that smugglers used to describe organizational structures are not the same terminology as employed by law enforcement). Brokers, located in Colombia, facilitate the movement of drugs by

making arrangements with Supply Office to move the drugs supplied by labs. The Supply Office is the center for moving loads of drugs into U.S. They negotiate costs with transportation crews (via the Office of Transportation) and U.S brokers. Some Colombian brokers work independently of a Supply Office to move loads through a smaller network of contacts. This method has the advantage of increasing profit and independence for the brokers, but the disadvantage of a loss of security and protection that a Supply Office proves.

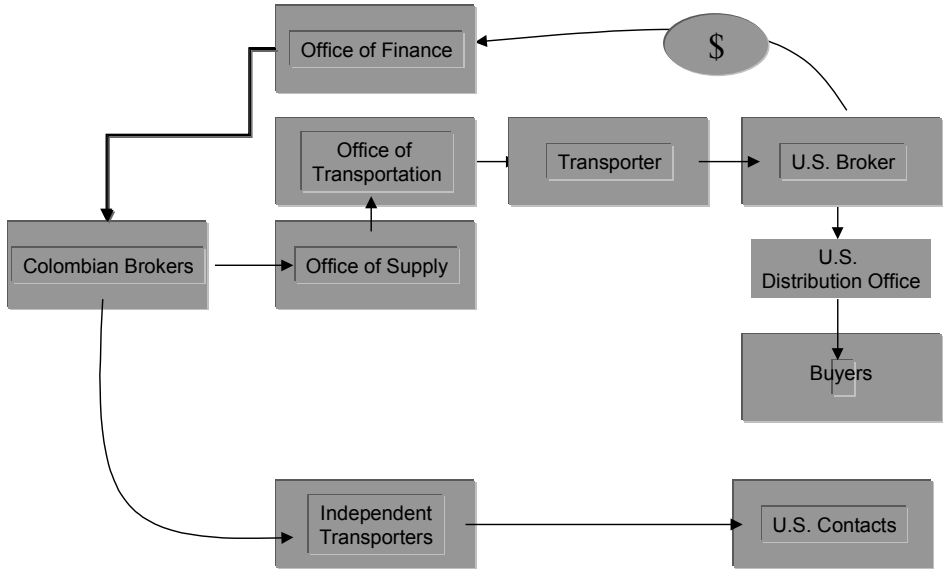
Transportation is handled separately by the Office of Transportation. The manager of this office coordinates all aspects of transportation. The transportation fee is a function of time, cost, method, and risk of route.

U.S. brokers work with U.S. distribution offices to deliver drugs to buyers. The U.S. broker also moves money back to Colombia through the Office of Finance, which launders the proceeds.

This organizational structure affords a great deal of flexibility and protection. For example, the Office of Transportation has no contact with the Office of Finance. Thus, if the money launderer is caught, he has little information about the rest of the organization.

Figure 1

Structure of Smuggling Organizations



Conclusions

We conclude from our interviews with smugglers that the biggest deterrents are:

- Threat of informants, whether cooperating defendants or confidential informants
- Prison terms of 25 years or greater
- Ability to be prosecuted under dry conspiracy charges (i.e., they need not be caught in possession of the drug to be convicted)

We also found that smugglers don't feel much of a threat on the water because law enforcement is unable to spot them. If spotted, they feel law enforcement can't catch them, and if caught, the use of sophisticated compartments makes it virtually impossible for the drugs to be located. This supports a need for enhanced interdiction capability in the water.

In terms of sentences (if caught) smugglers expect a sentence of 10 years. But 25 years to life is more realistic under current sentencing guidelines (for high-level smugglers). The prospect of facing 25 years in prison was adequate to deter 100 percent of those interviewed. This begs the question of why the U.S. is not making sentencing guidelines more widely known in the smuggling community. Smugglers acknowledged in our interviews that they stay abreast of drug enforcement activities through local newspapers in their home countries. Accordingly, publishing U.S. sentencing guidelines in Colombian and Mexican newspapers could be an inexpensive method of deterrence. At one point, U.S. Customs had considered placing billboards at U.S. ports of entry displaying the penalties for smuggling drugs into the United States. Given what we learned in our interviews with drug smugglers, this may be worth reconsidering. Also, it would seem that cultivating more confidential informants via investigative operations – and making it known that this is a key component of our counterdrug strategy – would be an effective deterrent.

4. Analysis of Effects on Cocaine Prices & Trafficker Behavior

In the prisoner interviews, traffickers told us how they assess risks and adjust trafficking activity to ameliorate those risks. Self-reports are subjective, of course, and prisoners may not be entirely truthful. Therefore we also used statistical analysis to objectively estimate how traffickers responded to the threat posed by interdiction. Specifically, we identified special counterdrug enforcement operations and events in the source, transit and arrival zones, and we sought to learn whether those programs had a predictable effect on two measures of drug trafficking:

- Illicit drug prices in the U.S., at both the wholesale and retail levels
- Displacement of drug trafficking activity from one transportation route and method to another

The analysis required several steps. The first step was to identify factors that might affect trafficking behavior. Most important for our purposes, those factors were counterdrug activities that "turned on" and then "turned off" during defined periods. We sought to identify the correlation between our measures of drug trafficking and such periods of active enforcement. We examined a total of 21 counterdrug enforcement operations and events for their effect on cocaine trafficking activity. These *deterrent events* span the time period of 1991 to 1999 and represent:

- Interdiction operations in source, transit and arrival Zones
- Major adjustments to interdiction tactics (e.g., the implementation of a shoot-down/force-down policy in Peru and Colombia)
- Investigative operations (e.g., Zorro II); and
- The arrest or death of major drug traffickers

The *deterrent events* considered in this study (listed in Table 1) were identified through a review of public and limited access materials. The proposed list of deterrent events (with operation start and end dates, affected geographic areas, and affected transportation modes) was critiqued by points of contact at Customs, Coast Guard and ONDCP.

Table 1
Deterrent Events

Event Name	Dates	Description
Arrival & Transit Zone Enforcement Operations:		
Hard Line	Feb 1995 -Jul 1997	Interdiction operation targeting smuggling across the SWB
Zorro II	Dec 1995 -May 1996	Investigative operation targeting organizations moving drugs across SWB
Gateway	Mar 1996 – Feb 1998	Interdiction operation targeting all modes of smuggling through Puerto Rico
White Shark I	Mar 1996 –Mar 1997	Interdiction operation targeting vessels from Mexico to Gulf coast of Texas
White Shark II	Sep 1996 – Oct 1996	Interdiction operation targeting vessels from Mexico to Gulf coast of Texas
Frontier Shield	Oct 1996 – Dec 1996	Interdiction operation targeting vessels to Puerto Rico and Eastern Caribbean
Border Shield	Mar 1997 – Ongoing	Interdiction operation targeting vessels from Mexico to S. California
Gulf Shield	Mar 1997 – Ongoing	Interdiction operation targeting vessels from Mexico to Gulf coast of Texas
White Shark III	Jul 1997 – Sep 1997	Interdiction operation targeting vessels from Mexico to Gulf coast of Texas
Brass Ring	Feb 1998 – Jul 1998	Interdiction operation targeting smuggling through SWB ports of entry
River Sweep	Feb 1998 – Ongoing	Customs operation targeting Haitian freighters in Miami River
Frontier Lance	Mar 1998 – May 1998	Interdiction operation targeting vessels to Jamaica and Hispanola
Conjuntos I	Jun 1998	Land & sea interdiction operation off Panama's Caribbean coast
Conjuntos II	Dec 1998	Land & sea interdiction operation off Panama's Caribbean coast
Two Dozen	Feb 1999	Interdiction operation targeting aircraft and vessels into the Bahamas and Florida
Source Zone Enforcement Operations:		
Support Justice III	Nov 1991 -Apr 1992	Early operation to suppress movement of coca products in South America
Support Justice IV	Jan 1993 -Apr 1994	Follow-on operation to SJ III
Stand-down	May 1994 -Dec 1994	U.S. ceases radar support in South America pending legal review of Peru's and Colombia's force-down policy
Shoot-down	Mar 1995 -Nov 1995	U.S. resumes radar support to Peru and Colombia. Peru earnestly implements force down policy
Trafficker Arrests/Deaths:		
Arrests/Deaths	Various	Various arrests or deaths of major Colombian and Mexican traffickers
Orejuela Brothers	Jun 1995 -Aug 1995	Arrest of the Orejuela brothers

More than government-sponsored enforcement efforts affect trafficking decisions and illicit drug prices. For example, the attractiveness of certain vectors and conveyance mode combinations may vary with the season. Our analyses introduced "control" variables to avoid confusing the effects of enforcement operations with other factors, such as weather, seasonality, and so on. Specifically, *control factors* considered include:

- Major weather events (e.g., hurricanes, tropical storms, and severe El Nino effects). These are detailed in Appendix F.
- Seasonality
- Month-to-month correlation of price data

Deterrent event data were complemented with annual source and transit zone interdiction force laydown data from Customs and Coast Guard. We were unable to obtain this type of information from the Department of Defense, therefore, we used DoD annual interdiction funding levels as published in the annual National Drug Control Strategies as an indicator of DoD interdiction force laydown trends.

The approach used to evaluate the effect of specific deterrent events varied depending upon the nature of the event. For example, since source zone operations affect all transit and arrival zone routes and transportation modes, it was not possible to consider them in the displacement analysis (which evaluates whether interdiction operations displace drug trafficking activity from one transportation route/mode to another).

Effect of Deterrent Events on Cocaine Prices

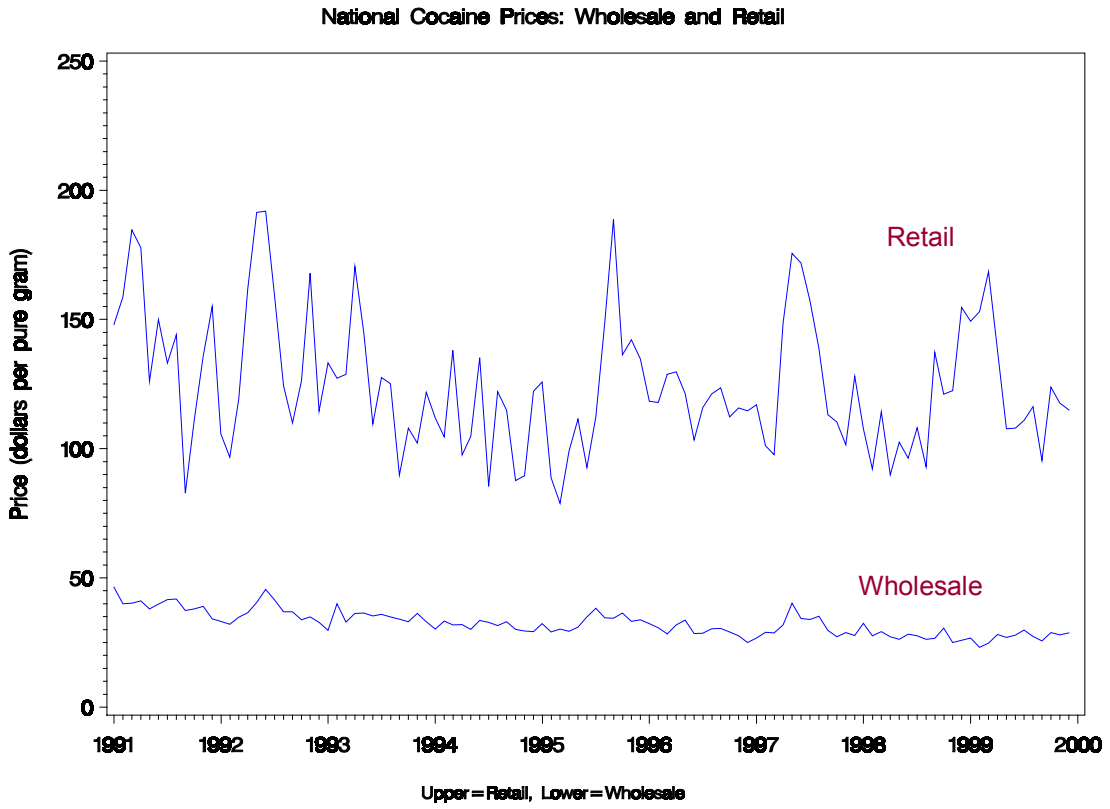
The objective of this analytic approach is to identify the factors that affect cocaine prices in the U.S. We are specifically interested in the impact of various types of counterdrug enforcement operations, but as explained earlier, we control for a variety of other non enforcement-related factors. We used transfer function models to conduct our analysis (details are provided in Appendix E). Put simply, the full price effect of successful enforcement operations/events may unfold over months as markets adjust to higher costs and shortages. Rather than assuming that successful enforcement is instantaneous, a transfer function allows for more realistic incremental adjustments.

Approximating Cocaine Prices

We examined the effect of deterrent events on four levels of cocaine prices – national retail, national wholesale, southwest border retail and southwest border wholesale. The consideration of multiple levels of prices allowed us to evaluate the possibility that different forms of enforcement operations will affect different categories of prices. These price series are presented in Figures 2 and 3 below.

Figure 2

National Cocaine Prices – Wholesale and Retail

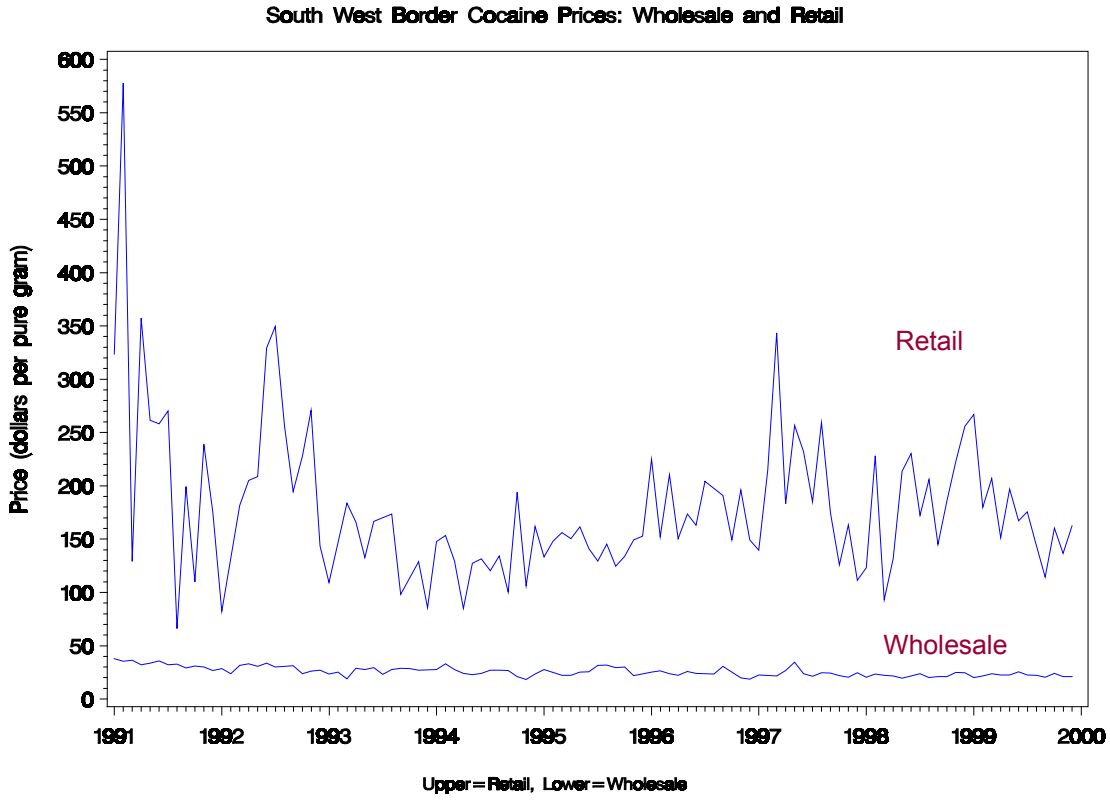


It is important to recognize that estimating cocaine prices is not a matter of simple algebra. First, the data that supports analyses of cocaine prices (STRIDE) is not collected randomly. As such, there is a great deal of bias in the raw data. How data analysts deal with this bias, if they do at all, has a large impact on the resulting estimates. Secondly, the STRIDE data are wrought with grossly outlying values that may be data entry errors (e.g., $1 million for 1 pure gram of cocaine). How analysts deal with such errors also affects the resulting estimates.

Abt Associates has worked with the STRIDE data for over a decade, and we have had the benefit of improving our methods over these years. The price-series used here is an adaptation of the price-series recently provided to ONDCP. The basic methodology is reported in Johnston, Rhodes and Kling (2001). That report provides a quarterly series. The adaptation used here provides a monthly series. The southwest border prices do not appear in the price-series reports, but are based on applying a similar methodology to cocaine purchases from Texas, Arizona, New Mexico and California.

Figure 3

Southwest Border Cocaine Prices – Wholesale and Retail



Consistent with data about the purchasing habits of hardcore drug users, the retail price series is based on purchases of $100 and less. Purchases of around $40 dominate this series. The wholesale price is a construct consisting of purchases of over 100 pure grams, which averages to 417 pure grams at 82% purity.

Methodology

We began our analysis by creating a baseline model for use in all price series evaluations. This baseline model includes control variables representing month-to-month correlation in cocaine price data, seasonality, weather[9], and source and transit zone air and marine interdiction force laydown trends.

We then commenced the process of introducing the individual deterrent events into this baseline model. Recognizing that there would be a delay in the effect of different types of operations/actions on cocaine prices in the U.S., model selection involved choosing both a deterrent event as well as its optimal (from a

[9] A special weather variable including only those weather events effecting routes to the U.S. Southwest Border or Mexico was created for use in modeling southwest border price series.

statistical standpoint) delay. Delay ranges considered were four to six months for the five source zone events, and zero to two months for all other deterrent events. Deterrent events meeting standard statistical criteria of significance were allowed into the model.

The results for each of the four price series are presented in Table 2. Specifically, for each price level, this table identifies whether a deterrent event had a statistically significant effect on cocaine prices in the U.S. If so, the table indicates whether that effect was to increase prices (as indicated by a 'positive' entry) or to decrease prices (as would be indicated by a 'negative' entry). Deterrent events found to have no statistically significant effect are indicated with an entry of 'none'.

Table 2
Effect of Deterrent Events on Cocaine Prices in the U.S.
(delay of effect, in months, is in parenthesis)

	National Retail Prices	National Wholesale Prices	SWB Retail Prices	SWB Wholesale Prices
Arrival & Transit Zone Events				
Hard Line	None	None	Positive (0)	None
Two Dozen	None	None	None	None
Zorro II	None	None	None	None
Gateway	None	None	None	None
Frontier Shield	None	None	None	None
Border/Gulf Shield**	Positive (1)	Positive (2)	None	None
Brass Ring	None	None	None	None
River Sweep	None	None	None	None
Frontier Lance	None	None	None	None
Conjuntos I	None	None	None	None
Conjuntos II	None	None	Positive (1)	None
Source Zone Events				
Support Justice III	Positive (4)	Positive (5)	Positive (4)	Positive (5)
Support Justice IV	None	None	None	Positive (5)
Stand-down	None	None	None	None
Shoot-down	Positive (6)	Positive (6)	None	None
Trafficker Arrests/Deaths				
Arrests/Deaths***	None	None	Positive (1)	None
Orejuela Brothers Arrest	Positive (1)	Positive (0)	None	Positive (0)

** *Due to the high collinearity between Gulf Shield and Border Shield, the two operations are represented in our model by one combined variable.*

*** *The Arrests/Deaths variable for SWB prices includes only arrests or deaths of major Mexican traffickers*

Effects on National Wholesale Prices

Four deterrent events were found to have statistically significant effects on national wholesale prices of cocaine: Operation Support Justice III, Shoot Down, the arrest of the Orejuela brothers, and Operation Border/Gulf Shield. The effect of the two source zone interdictions, Support Justice III and Shoot Down was to increase wholesale prices by $3.53 per pure gram five to six months after initiation of the operation. The effect of Orejuela arrests was to increase wholesale prices by $4.71 in the month of the arrest, and the effect of long-active Border/Gulf Shield was to increase wholesale prices by $4.52 with a delay of two months.

These effects are shown in the accompanying graphs (Figures 4 and 5). Figure 4 shows the effect of the deterrent events only, while Figure 5 shows the final model (which takes into account the effect of monthly correlation, time, and weather events). The continuous line represents wholesale prices. The dashed line represents wholesale prices predicted from the model. The timing of deterrent events is shown at the bottom of the graphs. The lower sequence shows the actual timing of the individual deterrent events, while the upper sequence shifts these by the optimal delay estimated in the model. For example, Support Justice IV actually started in January 1993, but its effect began five months later in May 1993. Thus the interdiction response in the predicted (dashed) line is contemporaneous with Support Justice IV shifted by five months. Also, note that although Shoot Down actually preceded Orejuela arrests by three months, the effect of the latter was realized first. Indeed, wholesale prices were kept elevated for 12 consecutive months, first by Orejuela arrests (three months) and then by Shoot Down (nine months).

We identified a positive month-to-month correlation in the data (suggesting a momentum of prices) for both national wholesale and national retail prices (discussed below), but no seasonal effect could be detected in the final models. In addition, both wholesale and retail prices were affected by weather. Thus wholesale prices in months with hurricanes every day (e.g., April, May and June 1997) are expected to be $4 higher than months with no hurricanes (e.g., the four months preceding April 1997). Similarly, retail prices are expected to be $17 higher in hurricane-saturated months than in hurricane-free months. The effects of weather and month-to-month correlation are evident from the figures depicting the final models for national wholesale and national retail prices. In particular, high prices in the spring of 1997 appear to be largely attributable to the high frequency of hurricanes during that period.

National Retail Prices

The same deterrent events found to be significant in predicting national wholesale prices were similarly found significant in predicting national retail prices. The effect of the two source zone operations, Support Justice III and Shoot Down was to increase wholesale prices four and six months later by $30 per pure gram and $26 respectively. The effect of the Orejuela arrests was to increase wholesale prices by $33, and the effect of long active Border/Gulf Shield was to increase wholesale prices by $30. In both latter cases, the delay was by one month.

These effects are depicted in Figures 6 and 7. For wholesale prices, the effects of Shoot Down and Orejuela arrests were strictly adjacent, giving rise to two plateaus of elevated prices lasting 12 months. For retail prices, in contrast, the two interdictions were additive for the month of September 1995, and this combined effect appears to largely account for the unusually large spike in retail prices that month. The final model predicts a still higher price because of the high hurricane percentage in August (48% or

15 days) and September (32% or 10 days), the effect of hurricanes in August on prices in September being explained by the positive month-to-month correlation.

Southwest Border Wholesale Prices

The model indicates that wholesale prices at the South West Border were influenced by the three interdictions with the arrest of the Orejuela brothers having a dynamic effect[10] with no delay, and the two source zone interdictions having non-dynamic effects each with a five month delay.

The effect of Support Justice III and Support Justice IV was to increase wholesale prices five months later by $5.47 per pure gram and $3.14 respectively. The effect of the Orejuela arrests was to increase wholesale prices by $3.84 in the month of the arrest, $2.66 the next month, and $1.86 the following month. Since the last Orejuela arrest was in August 1995, prices began an exponential decline towards their original level starting in September 1995. These effects are shown in Figures 8 and 9.

South West Border Retail Prices

The arrest or death of major Mexican drug traffickers (January 1996, February 1997, and July 1997) and Operation Conjuntos II (December 1998) were found to increase South West Border retail prices one month later by $68 and $95 respectively. These effects are represented in Figures 10 and 11 by spikes in the model at the appropriate months, and in three of the four cases, by coincident spikes in the data.

The effect of Support Justice III was to increase wholesale prices by $59 four months after initiation of the operation, $34 in the next month, and $19 in the following month, approaching a total increase of $137. However, what is more evident from the figure is the subsequent exponential decline starting in September 1992.

Operation Hard Line had a similar dynamic effect while it was in full operation. The initial increase in prices was about $6 approaching a total increase of $46, half of which would be achieved by the fifth month. This effect was attenuated as Hard Line ramped up (February 1995 through December 1995) and ramped down (September 1996 through July 1997). These effects induced an S-shape to the modeled curve from February 1995 through July 1997.

[10] The existence of a 'dynamic' effect indicates the impact of an operation on prices occurs over the course of several time periods, rather than all at once.

Figure 4
Effect of Deterrent Events on National Wholesale Cocaine Prices

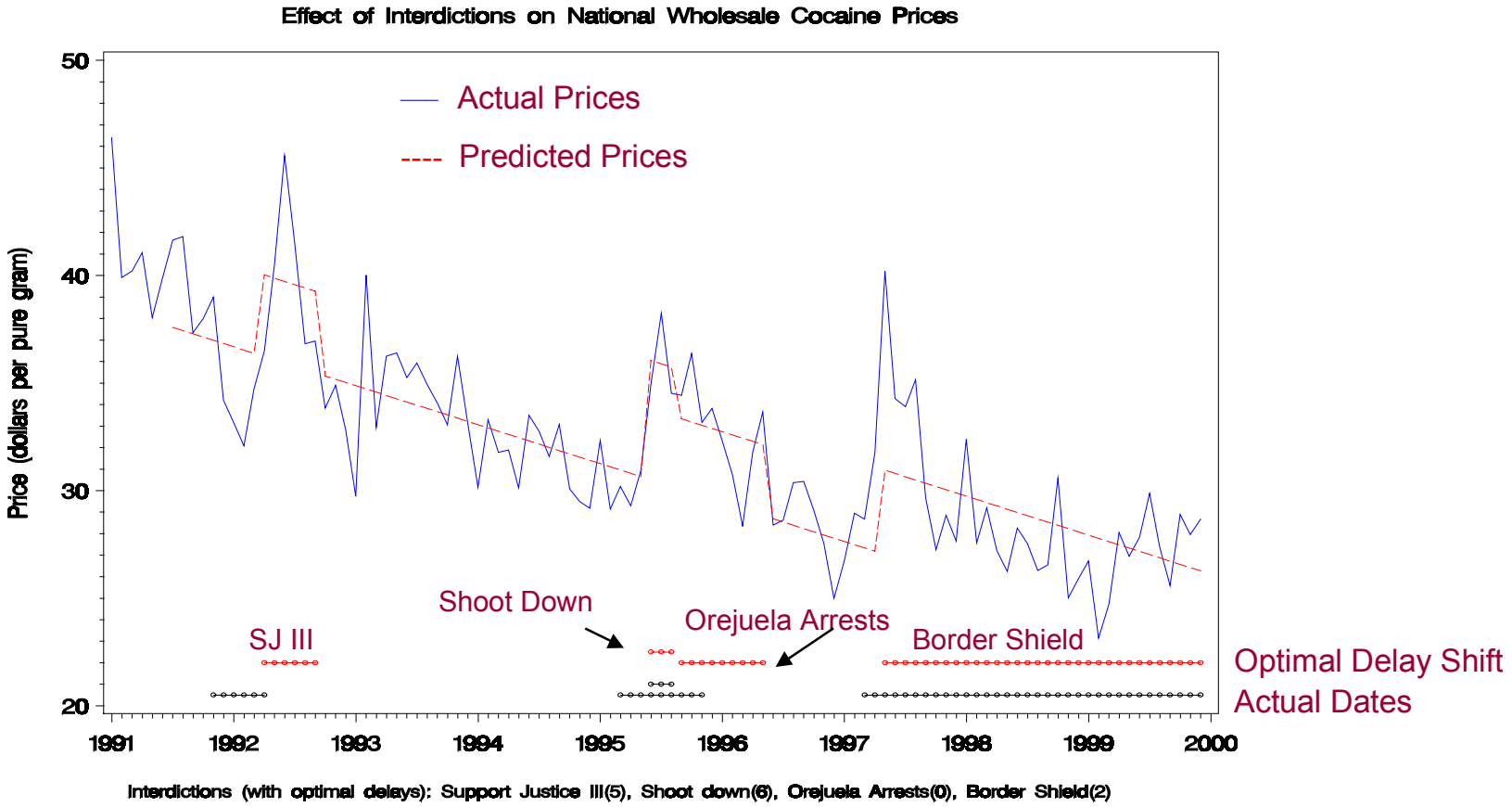


Figure 5
Effect of Final Model on National Wholesale Cocaine Prices

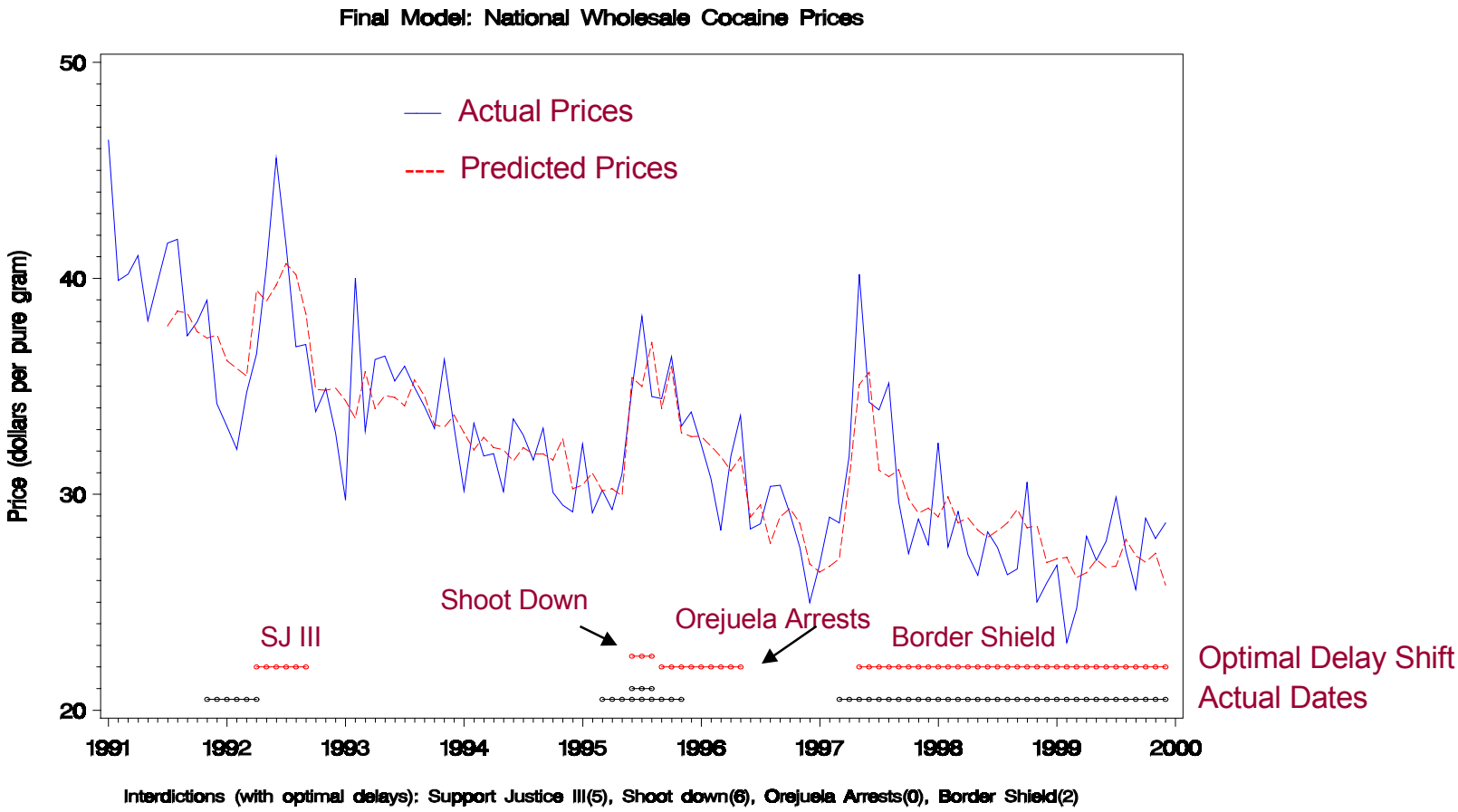


Figure 6
Effect of Deterrent Events on National Retail Cocaine Prices

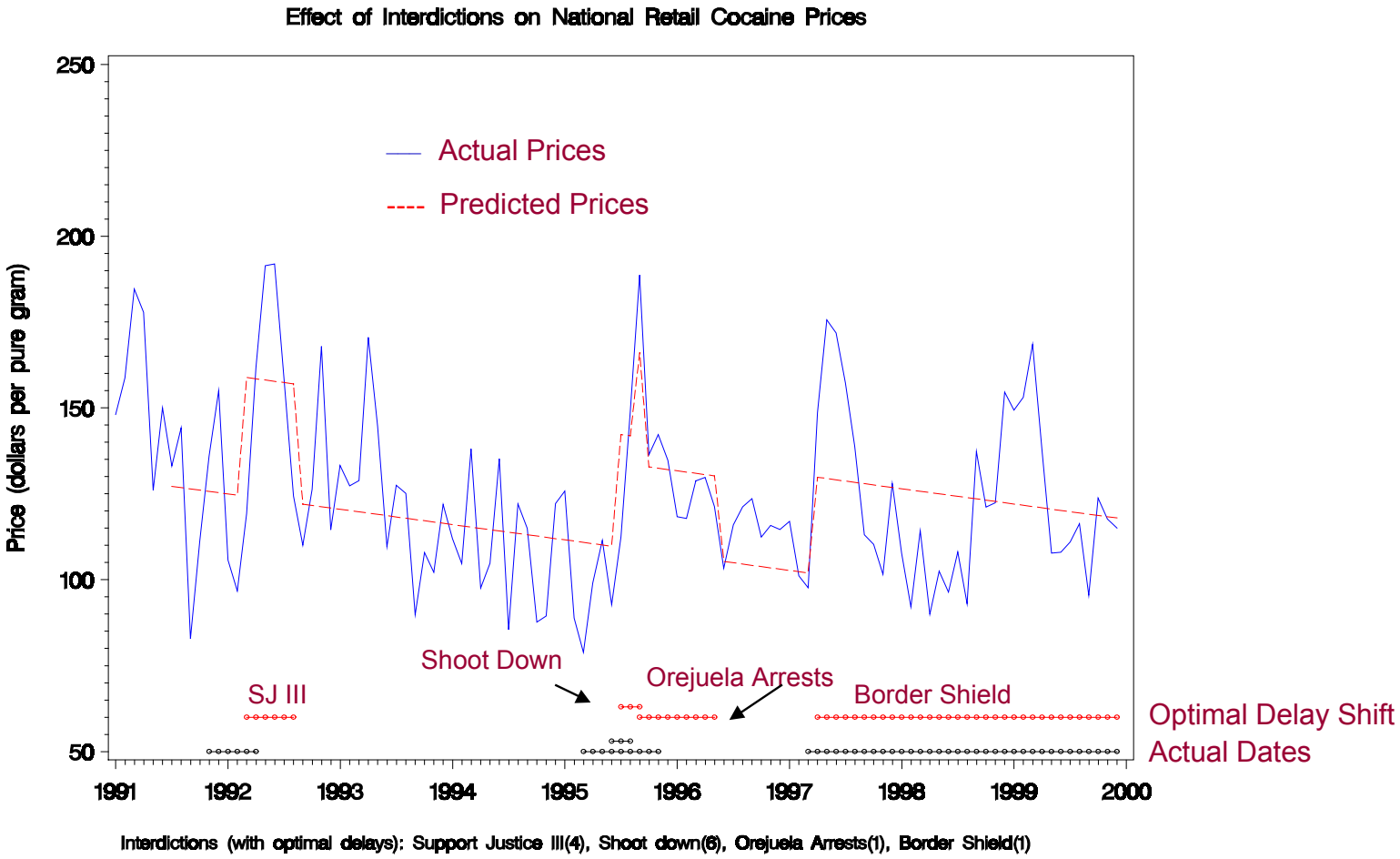


Figure 7
Effect of Final Model on National Retail Cocaine Prices

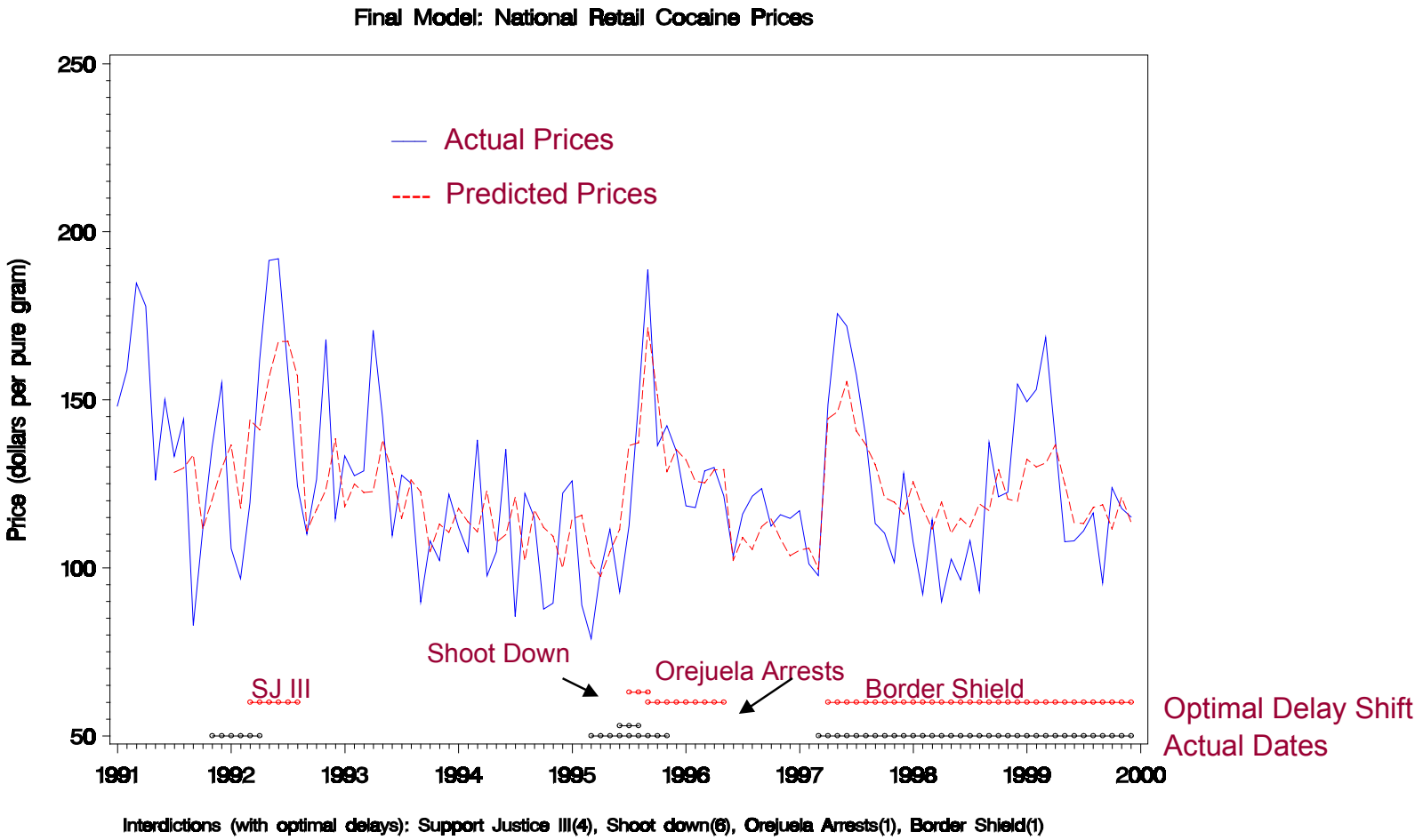


Figure 8
Effect of Deterrent Events on Southwest Border Wholesale Cocaine Prices

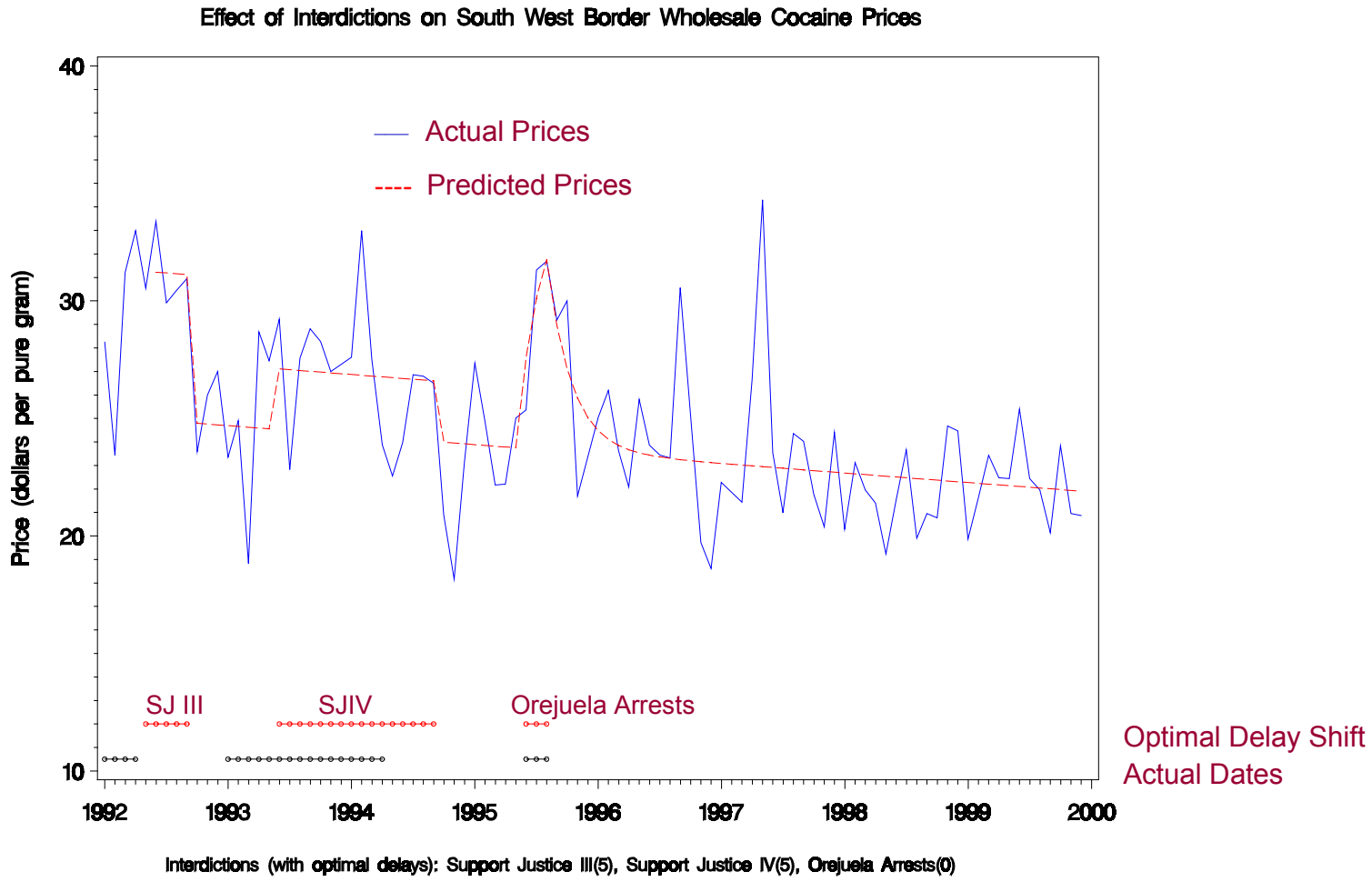


Figure 9
Effect of Final Model on Southwest Border Wholesale Cocaine Prices

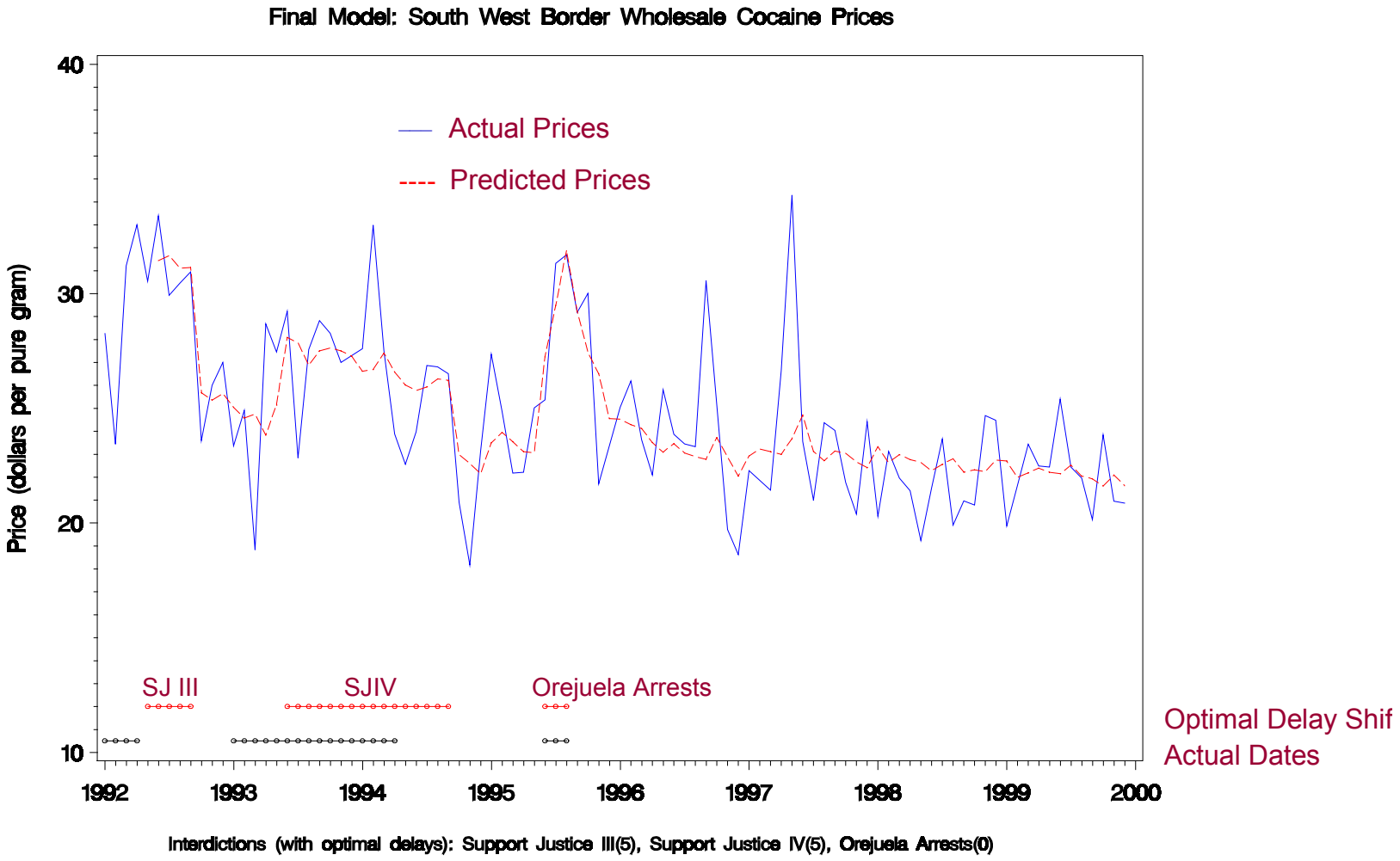


Figure 10
Effect of Deterrent Events on Southwest Border Retail Cocaine Prices

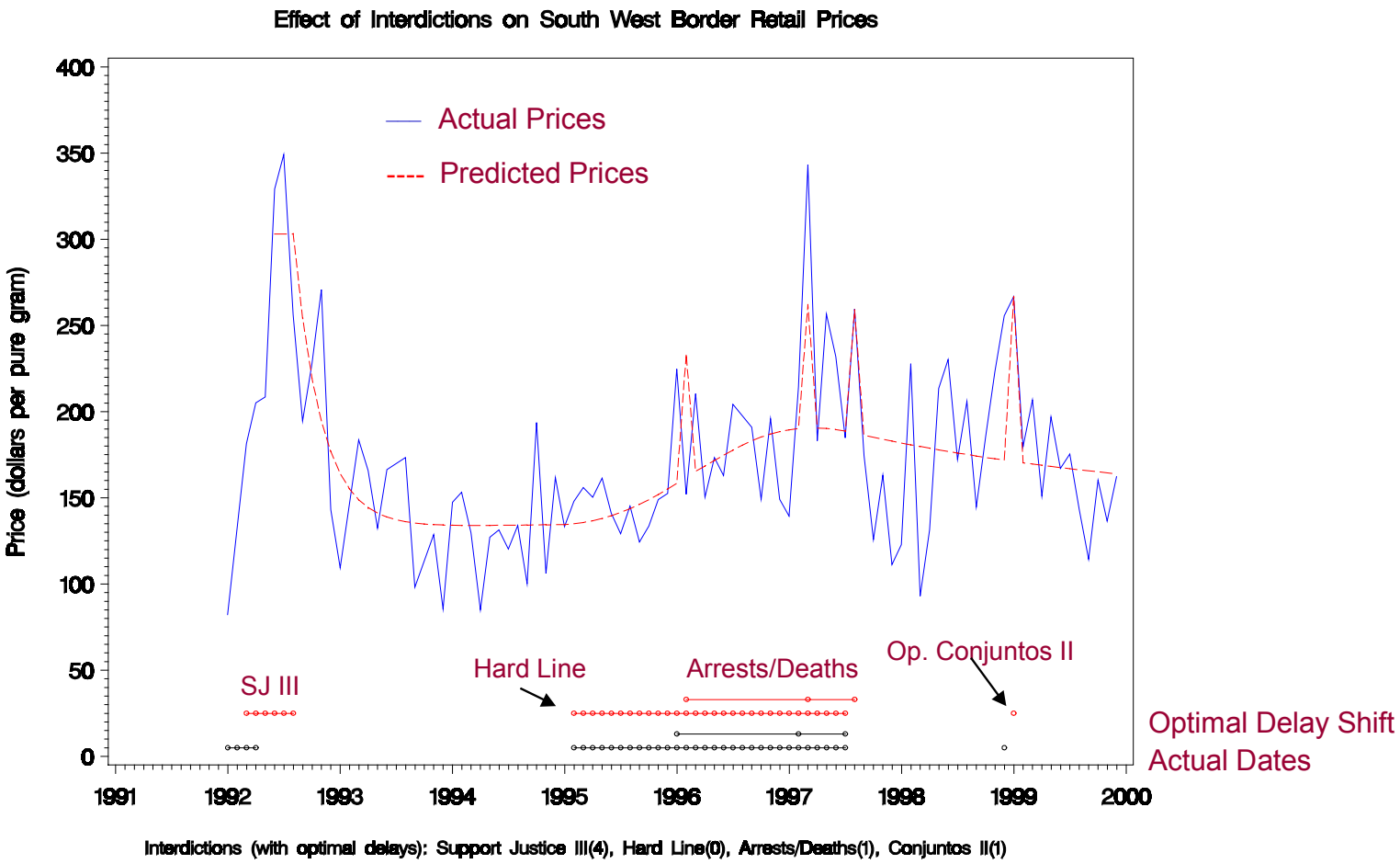
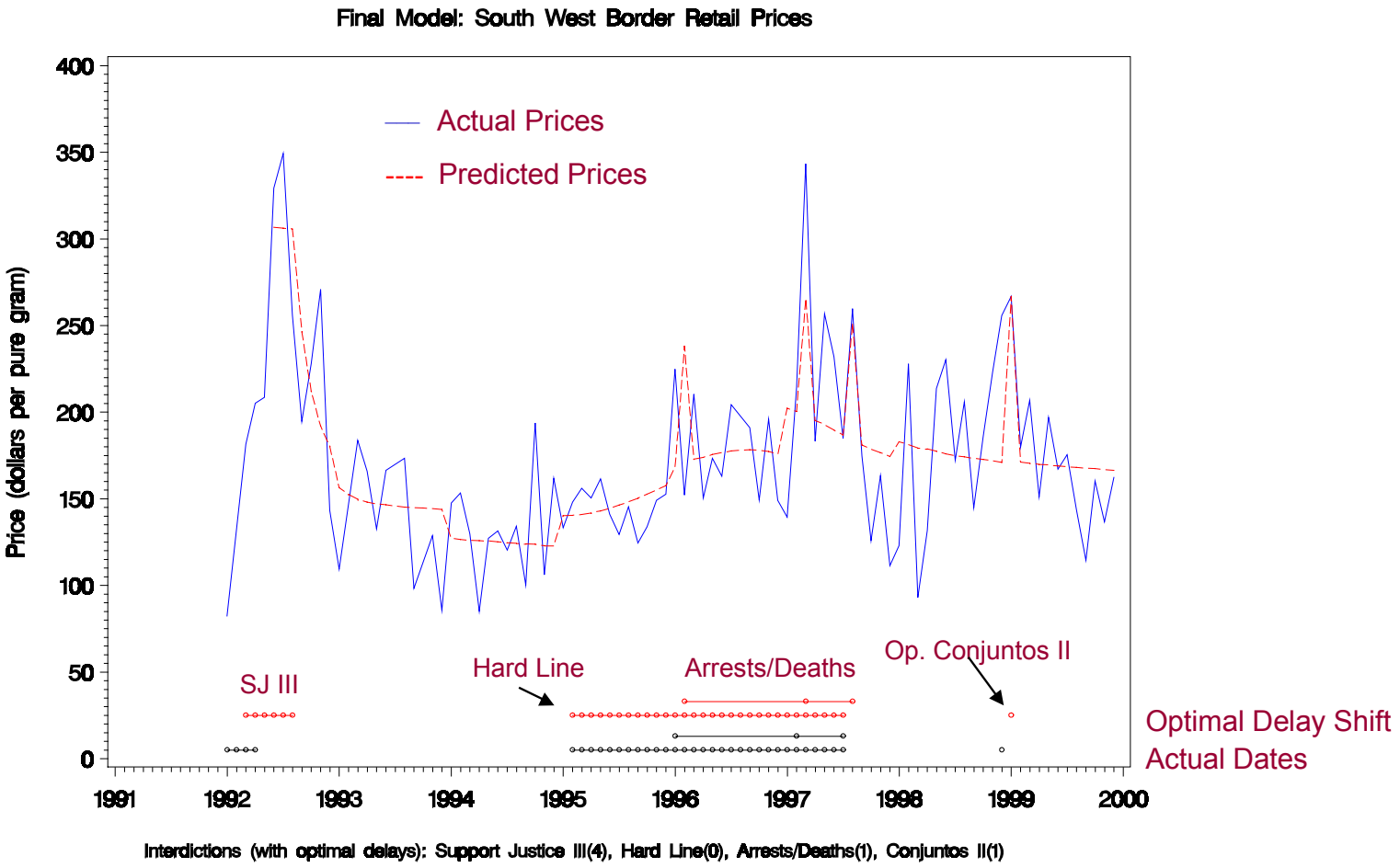


Figure 11
Effect of Final Model on Southwest Border Retail Cocaine Prices



Effect of Deterrent Events on Cocaine Movement

We argued above that successful enforcement efforts should increase cocaine prices, at least until cocaine traffickers adapt. Demonstrating that prices are temporarily sensitive to interdiction events is important, but that demonstration says nothing about how traffickers actual adapt to additional anti-drug operations. This section provides some detail about those adaptations. The objective of this part of the analysis is to determine whether or not traffickers respond to interdiction operations by altering how and where they move drugs through the transit zone and across U.S. borders. Specifically, when a special interdiction operation is focused on a specific vector and transportation mode for a defined period, we would expect two adjustments:

- Traffickers would reduce shipments through the targeted vector and by the targeted mode for the period of operation; and
- They would increase shipments through other vectors and modes for the same period of operation.

Characterizing Trafficker Behavior

Data from the interagency Consolidated Counterdrug Database (CCDB) was used as the indicator of trafficker behavior in the transit zone. This database contains drug smuggling event data dating back to 1991 and supports two primary types of analyses: (1) evaluations of drug flow from areas of production to consumption countries, and (2) assessments of the performance of counterdrug forces against that movement[11]. For purposes of this study, we used those events, called *known events,* within the CCDB that support counterdrug performance assessments. Known events are distinguished by (1) seizure or observation of drugs; (2) observation of activity that could not be reasonably attributed to anything other than drug smuggling; and/or (3) highly reliable intelligence. We chose to use known event data for our study because it has been captured since 1991, while event data used to support flow assessments date back to only 1996. Although using only known event data results in a large loss of data points, the value gained by expanding the time span of the study to 1991 outweighs this loss.

Smuggling event data were grouped into ten movement vectors. The vector breakout is consistent with that used by the Interagency Assessment of Cocaine Movement (IACM) and includes: Eastern Pacific, Western Caribbean, Jamaica/Cuba/Bahamas, Hispanola, Puerto Rico/USVI, Lesser Antilles, Southeast U.S., Northeast U.S., Southwest Border, and U.S. West coast. Arrival zone vectors (i.e., the last 4 listed) include only those events where the event moved directly from South America into the U.S., by-passing any transshipment countries. Figure 12 displays these vectors.

[11] CCDB Users Guide

Figure 12

Cocaine Movement Vectors

Events were further broken down into two modes – non-commercial air and marine movements. Technically, the marine category covers both commercial and non-commercial marine events. By definition[12], only those commercial (i.e., port-to-port) marine movements that are actionable at sea are considered by the CCDB for performance evaluation purposes. Since this definition inherently excludes certain forms of commercial marine movements (such as cargo containers), we felt that making a distinction between commercial and non-commercial marine events would be somewhat misleading and under-represent commercial marine smuggling events. To the extent we are modeling the effect that marine interdiction operations have on marine smuggling activity in the transit zone, the general criteria of 'actionable at sea' is adequate for our purposes.

[12] CCDB Users Guide

Methodology

Our analysis tests whether or not interdiction operations displaced trafficking activity from those vectors/modes against which the operation was targeted to other vectors/modes. To conduct this test, we examined cocaine shipments (using the data set described earlier) through each of 10 vectors by two transportation modes (maritime and air) monthly for the period 1991-1999 (108 months). Ostensibly, this provided 2,160 data points, but in fact, there were no shipments through three of these vector/mode combinations[13]. Therefore, analysis used 1,836 data points.

We considered counts of cocaine shipments in two ways. The first was to include all shipments known through any combination of intelligence or observation by interdiction assets. The second was to consider only those shipments for which there was intelligence (i.e., some form of corroborating information) on the event. The second measurement is a subset of the first. Each measure has relative advantages and disadvantages. The measure based on shipments identified through intelligence or observation is the more comprehensive of the two. The disadvantage to this measure is that observations may be sensitive to the level of interdiction actually conducted in a vector and targeted against the mode. That is, interdiction activity can affect the measurement of drug movements, and thus, we might mistakenly infer that shipments have changed when only the measurement process has changed.

The second method of identifying shipments avoids this measurement problem by limiting measurements to shipments on which there was intelligence. This provides a measure that is relatively immune to changes in interdiction activity levels in the various vector/mode combinations. The disadvantage to this measure is that it is likely sensitive to changes in intelligence resource levels. Moreover, it excludes data from what is already a sparse data set for some vector/mode combinations. Given the mixed advantages and disadvantages of these two measurements, we repeated the analysis using both approaches.

As noted, our analysis attempts to explain the number of shipments through each vector, by each transportation mode, for every period as a function of several variables including special interdiction activities. To test our hypotheses, we used an estimation based on a Poisson distribution. Appendix E describes our analytic approach in detail.

We first sought to establish a baseline against which the effectiveness of interdiction could be measured. The baseline model includes variables that control for the following:

- The paucity of event data in certain vector/mode combinations
- Shifts in shipment frequency across vector/modes that are not related to special interdiction operations
- Seasonality

[13] Vector/mode combinations for which no shipments were identified include: Southwest Border/marine; Northeast U.S./non-commercial air; U.S. West Coast/non-commercial air. The absence of maritime movements across the U.S./Mexico land border is expected for obvious reasons. Since we considered only direct shipments from Colombia to transshipment or destination points, the lack of non-commercial air shipments in the Northeast U.S. and U.S. West Coast vectors is not surprising.

There is strong evidence from these baseline models that shipments are cyclical, that the trends vary across vectors and modes, and that the vector/mode combinations vary in the number of shipments that are typical. More importantly for our purposes, there is evidence that the baseline model for shipments with intelligence is void of any influence from interdiction operations. That suggests we are 'starting with a clean slate' when we begin to introduce specific interdiction operations into the model. As expected, however, this is not the case with the baseline model for shipments based on intelligence and/or observation.

Interdiction operations were represented by variables that were coded 1 for the vector/mode/time the operation took place. Typically, this was a period of more than one month. For each of these periods, we defined a complement variable coded 1 for every vector/mode that was *not* the target of the interdiction. For example, during the period when Gateway was operational, the GATEWAY variable was coded 1 for vector/mode combinations that were Gateway targets. During this same period, a variable NGATEWAY was coded 1 for vector/mode combinations that were not Gateway targets. During periods when Gateway was not operational, both GATEWAY and NGATEWAY were coded zero.

Continuing with the Operation Gateway illustration, we expected the variable GATEWAY to have a negative correlation with the number of shipments. If shipments moved from vectors/modes that were targeted by Gateway to those vector/modes that were not, then the parameter associated with GATEWAY should be negative while the parameter associated with NGATEWAY should be positive. In fact, because the model's controls for time trends is imperfect, we examine the difference between the regression parameter associated with NGATEWAY and the regression parameter associated with GATEWAY. If this difference is positive and statistically significant, then we infer that Gateway probably caused smugglers to shift to alternative vectors and modes.

We proceeded to add individual interdiction operations to the baseline model to see whether they have an appreciable effect on drug movements. For example, to examine the effects of Gateway, we add GATEWAY and NGATEWAY to the baseline model and test to see if the differences between the NGATEWAY and GATEWAY parameters are positive and statistically significant. We repeated this for each of the border and transit zone interdictions. Operations indicating statistical significance independently were included in a final regression model to ascertain their significance when examined within the context of other operations. The results of these final models are presented in Table 3 below.

Based on this analysis, five of the border interdictions seem to cause traffickers to move shipments from where the interdiction happened to where it did not. We note the apparent effectiveness of Hard Line, Gulf Shield, Border Shield, White Shark III and River Sweep. Regarding transit zone interdiction, Gateway appears to have been effective.

Table 3

Effect of Transit Zone and Border Operations on Displacing Drug Smuggling Activity From Targeted Smuggling Routes and Methods

	Geographic Vectors Affected	Analysis Based on Events With Intelligence	Analysis Based on All Movement Events
Border Operations			
Hard Line	US Southwest Border Western Caribbean Eastern Pacific	None	Positive
Brass Ring	US Southwest Border Western Caribbean Eastern Pacific	None	None
Gulf Shield	Southeast US	Positive	Positive
Border Shield	US West Coast	Positive	Positive
River Sweep	Southeast US Hispanola	Positive	Positive
White Shark I	Southeast US	None	None
White Shark II	Southeast US	None	None
White Shark III	Southeast US	****	Positive
Transit Zone Operations			
Two Dozen	Southeast US Jamaica/Cuba/Bahamas	None	Positive
Conjuntos (I and II)	Western Caribbean	None	None
Frontier Lance	Hispanola Jamaica/Cuba/Bahamas	None	None
Frontier Shield	Puerto Rico/USVI Lesser Antilles	None	None
Gateway	Puerto Rico/USVI	Positive	Positive

**** Indicates that data were too sparse to test the significance of the operation.

"Positive" – indicates that the operation had a statistically significant *positive* effect on displacing drug smuggling activity.

"Negative" – indicates that the operation had a statistically significant *negative* effect on displacing drug smuggling activity.

"None" – indicates that the operation had *no* statistically significant effect on drug smuggling activity.

Conclusions

Based on these analyses, source zone interdiction operations and the arrest or death of major drug traffickers appear to have very significant effects on increasing cocaine prices in the U.S. The impact of the source zone interdiction operations is likely due to success in temporarily reducing the supply of cocaine to the United States. Since cocaine prices are expressed in terms of price per pure gram, the increase in prices (particularly at retail level) are the result of increased 'cutting' by the dealers. This would be a fairly quick and obvious way to deal with a temporary shortage in supply.

The positive effect of operations Hard Line, Border/Gulf Shield and Conjuntos II on cocaine prices implies that these operations had a very real impact as well and either caused traffickers to increase their fees and/or reduced the supply of cocaine to U.S. markets.

Although the remaining transit and arrival zone interdiction operations examined do not have a statistically significant impact on cocaine prices in the U.S., many exhibit an impact on trafficker behavior. Figures 13 through 16 display all CCDB movement events for four periods during 1998, by vector. The shading represents the total flow through each vector, and the pie charts represent the distribution of this flow by conveyance[14]. The figures clearly show not only switches in geographic vector, but mode of transportation.

This suggests that operations were effective enough to force smugglers to change their transportation routes and/or methods. However, as the counterdrug community has long recognized, drug traffickers' ability to get drugs from South America into the U.S. is limited only by their creativity. Accordingly, it appears the ability of these operations to impact cocaine prices was ameliorated by the availability of alternative transportation routes/methods.

[14] It is important to note that these are not the data we used for analysis, as they include both ICPAWG and flow events

Figure 13 — CCDB Cocaine Events, January 1998

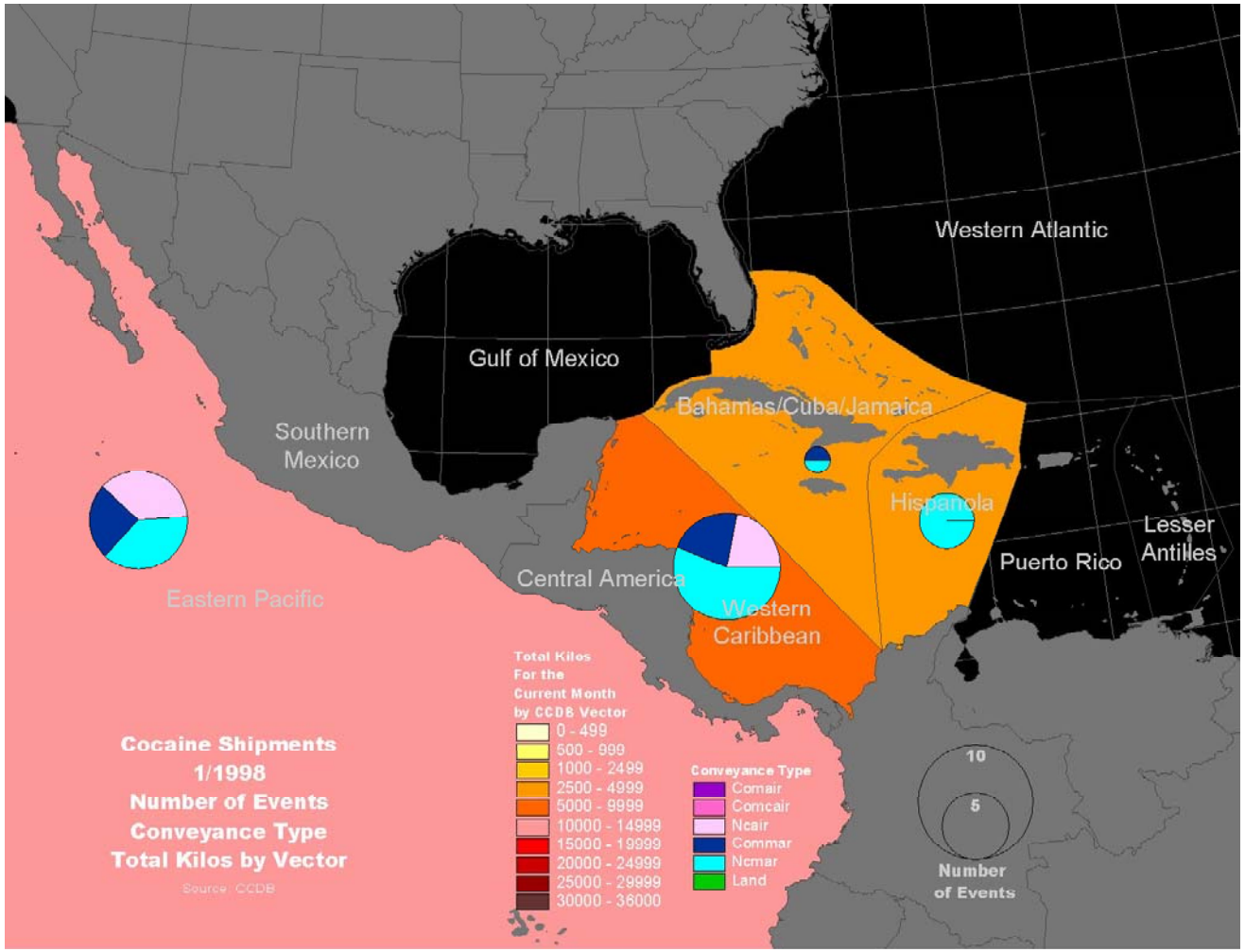


Figure 14 – CCDB Cocaine Events, April 1998

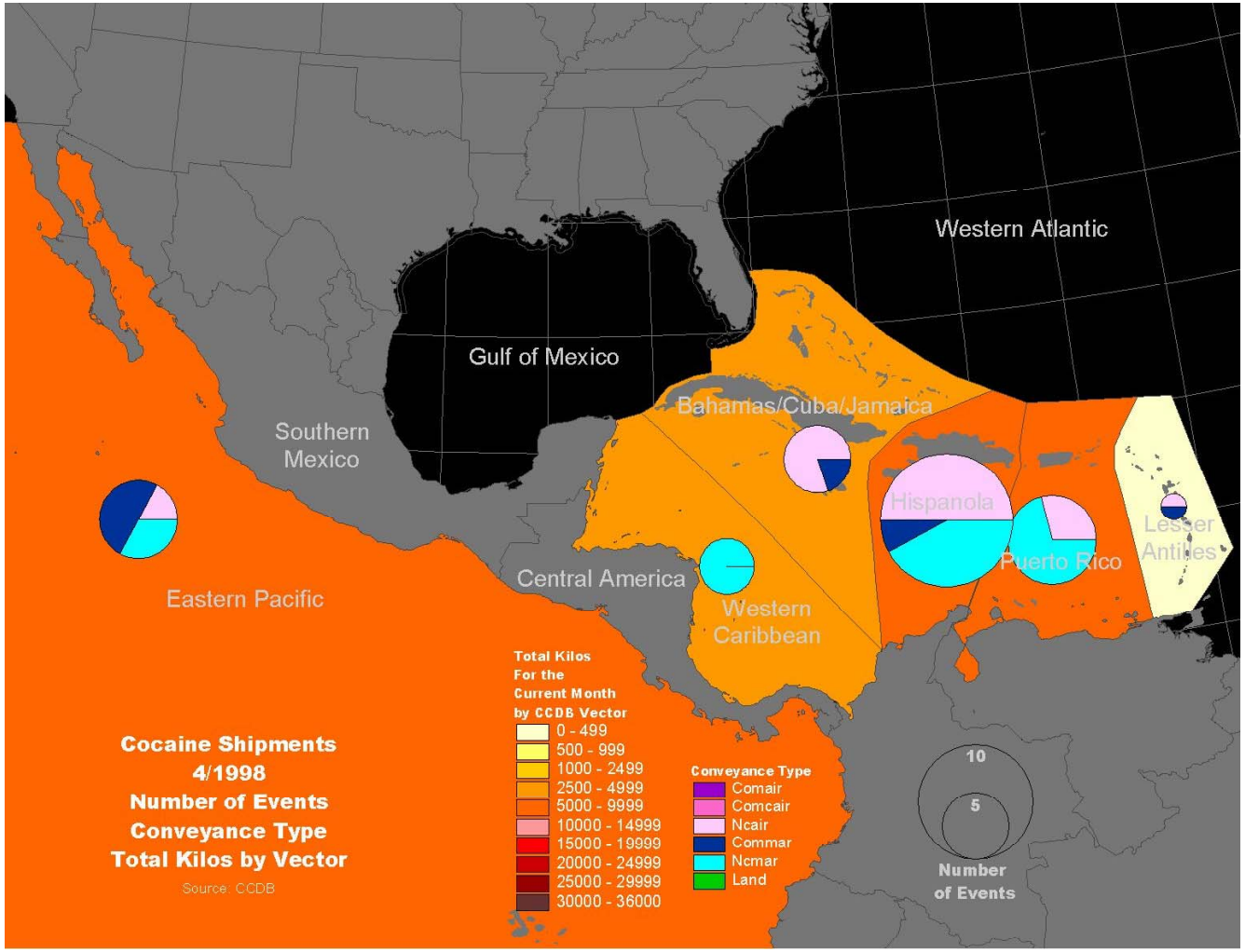


Figure 15 – CCDB Cocaine Events, September 1998

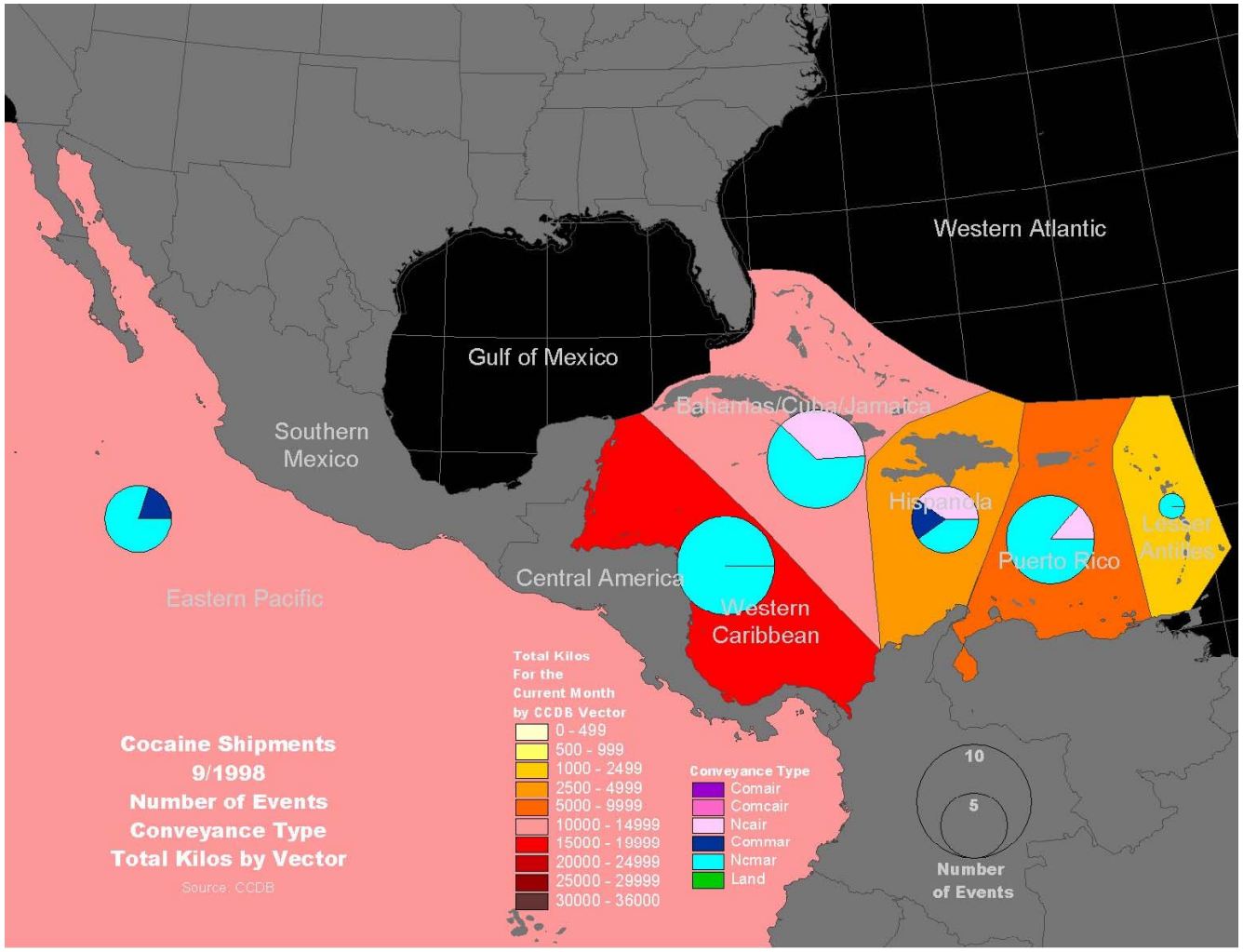
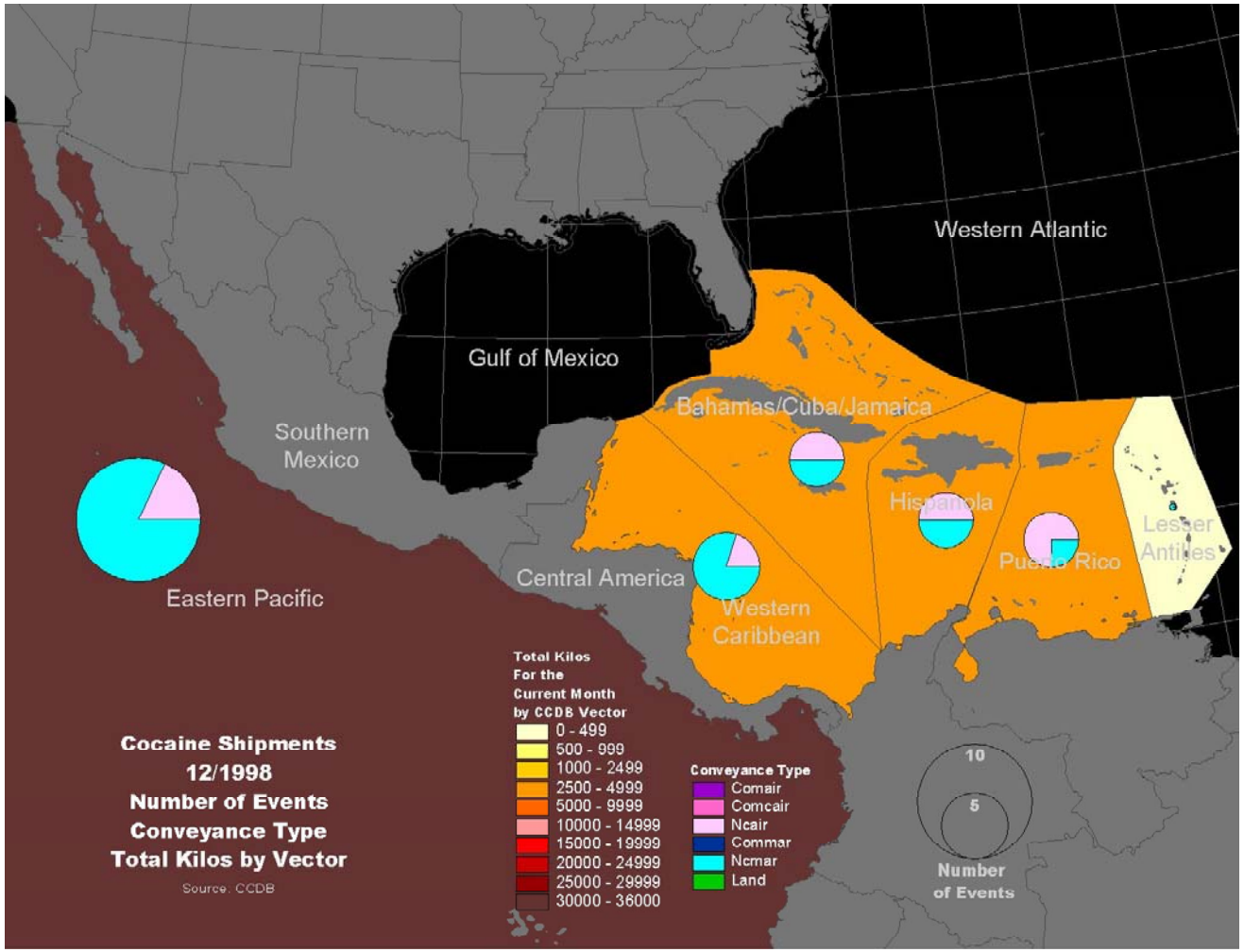


Figure 15 – CCDB Cocaine Events, December 1998



Limitations and Improvements

This report does not provide the final word on the effectiveness of counterdrug operations. Indeed, we were disappointed with and often perplexed about the lack of data available on the activities of interdiction assets. This was most notably the case with the interdiction activities of the Department of Defense. Ironically, better data was available on what drug traffickers were doing than on the activities of U.S. drug interdiction assets. Without the requisite data, no statistical procedures, no matter how sophisticated, can provide compelling arguments about the effectiveness of interdiction programs.

We have developed methods to evaluate program effectiveness, and this report makes recommendations for how those methods could be employed in future studies. However, the research could be improved in various ways.

Smuggler Interviews

Our smuggler sample over-represented smugglers from Florida and does not include any high-level smugglers who operated on the southwest border. We made an effort to find high-level smugglers who operated in this region, but were unable to. Perhaps this is because most of the smugglers who get caught in this area are "mules", or low-level persons hired for small sums to simply carry the drugs across the border. In any case, it is a serious limitation and one that future research should address. We would suggest working with law enforcement officials to identify confidential informants who operate along the southwest border.

Statistical Analysis

Future analysis should consider the deterrent effect of large seizures. This could easily be incorporated into the current model. Additionally, follow-on work could consider all events in the CCDB, not just those used for ICPAWG purposes. We were constrained to the ICPAWG events for this study because of the time period under consideration (1990-1999). Using all cocaine movement events would provide more richness to the analysis.

Better interdiction asset data is critical for the modeling. Fluctuations in assets affects the ability to detect smugglers and hence the quality of data in the CCDB. Significant interdiction assets that contribute at each stage of the interdiction process (detection, pursuit, and capture), as well as area in which it operates and date of operation, must be collected.

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Appendix A: Cocaine Flow Assessment

Introduction

Cocaine hydrochloride (HCl) is the final product derived from the leaves of the coca plant, commonly grown along the Andean Ridge in Colombia, Peru and Bolivia. The leaves of the plant, which are harvested approximately four times a year, must be dried in order to enter the initial processing stage within seven days or they will be vulnerable to spoilage and a decline in alkalinity. The production of cocaine is a two-stage process performed at separate facilities, beginning with the conversion to cocaine base and ending with the production of HCl. Because of the leaf's shelf life, most cocaine base laboratories are either co-located or within a short distance of the cultivation areas. Because the processing of cocaine base and cocaine hydrochloride requires a large amount of water and precursor chemicals, most laboratories are located adjacent to -- or within one kilometer of -- a waterway. In addition to the ready water supply, the waterway facilitates the delivery of precursor chemicals, which are normally transported in 30-55 gallon containers/drums. (Moving such drums through dense forestation is impossible) Cocaine base has a shelf life of approximately 30 days and can be moved great distances before being processed into HCl. Once processed into cocaine HCl, it degrades at a rate of less than 1 percent a year.

Andean Production

Bolivia

In 1996 the government of Bolivia, in concert with the national police and the military, mounted an aggressive program to eradicate illicit coca cultivation by the year 2002. Five successive years of decreases in potential production suggest that Bolivia is well on its way toward achieving that goal. In addition to the eradication program, the government adopted an aggressive precursor chemical program[15]. The majority of cocaine HCl produced in Bolivia is transported to Brazil for consumption and further transfer to world markets, primarily Europe. Some Bolivian HCl is transported to Chile, Paraguay and Argentina.

Peru

During the early 1990's Peru was the largest cultivator of coca. Aircraft shipped the majority of the cocaine base to southern Colombia over the common border between the two countries. In 1995 the Peruvian government instituted a shoot-down policy directed against aircraft suspected of trafficking. In that same year the U.S. conducted Operation Laser Strike, an operation designed to detect and deter movements within the air bridge between Peru and Colombia. The combination of the two operations resulted in an extremely depressed coca leaf and cocaine base market in Peru, causing some coca farmers to simply abandon their fields. The market stayed depressed until mid-1998. By then, traffickers moving cocaine base to Colombia had successfully established alternate routes and methods of transportation. Although Colombia does not import as much cocaine base as it did in the early 1990's, most of the base

[15] All precursor chemicals used in the production of cocaine base and HCl are imported to Bolivia.

in Peru presumably moves to Colombia. Detected activity in 1999 indicates that HCl labs are located near Peru's eastern border, allowing drug trafficking aircraft to exit the country before encountering law enforcement actions. Additionally, some cocaine base is moved from East of the Andes, processed near the coast, and shipped from Peru through major ports.

Colombia

Colombian traffickers have always dominated the cocaine trade but Colombia has also become a primary cultivator of coca. Throughout the 1990's it was assumed that Colombia was cultivating the poorer yielding variety of cocaine, *E. coca var ipadu,* and using less efficient processing techniques. However, the U.S. Government began to detect (as early as 1995) that coca farmers in Colombia had started planting the Peruvian strain of coca plant, *E. coca coca,* an upland variety that is hardier, more plentiful, and has a higher degree of alkalinity.

There continues to be a connection between the Revolutionary Armed Forces of Colombia (FARC) and the drug trade. The Colombian government is responding to this challenge. Since the 1970s drug traffickers based in Colombia have forged temporary alliances of convenience with leftist guerillas or right wing groups to secure protection for the drug interests. Traffickers have also established and financed their own private armies to provide security services. Some insurgent and paramilitary groups have, in fact, become little more than bands of well-armed thugs selling their services to drug traffickers.

The insurgents' location in the eastern lowlands and southern rainforest, the country's primary coca cultivation and cocaine processing regions, hinders the Colombian government's ability to conduct counterdrug operations. The frequent ground fire sustained by Colombian National Police eradication aircraft operating in insurgent occupied areas shows the extent to which some insurgent units will go to protect the economic interests of their constituents (coca farmers and drug traffickers). Insurgent units raise funds through extortion or by offering to protect laboratory operations in return for cash payments, or possibly in exchange for weapons.

Some FARC and National Liberation Army (ELN) units are independently involved in limited cocaine laboratory operations. Recent reports indicate that some FARC units in southern Colombia are indeed directly involved in drug trafficking activities, such as controlling the local markets for cocaine base. Insurgent units have assisted drug trafficking groups in transporting and storing cocaine as well as protecting clandestine airstrips. No information suggest that FARC or ELN units have established international transportation, wholesale distribution or drug-money laundering networks in the U.S. or Europe.

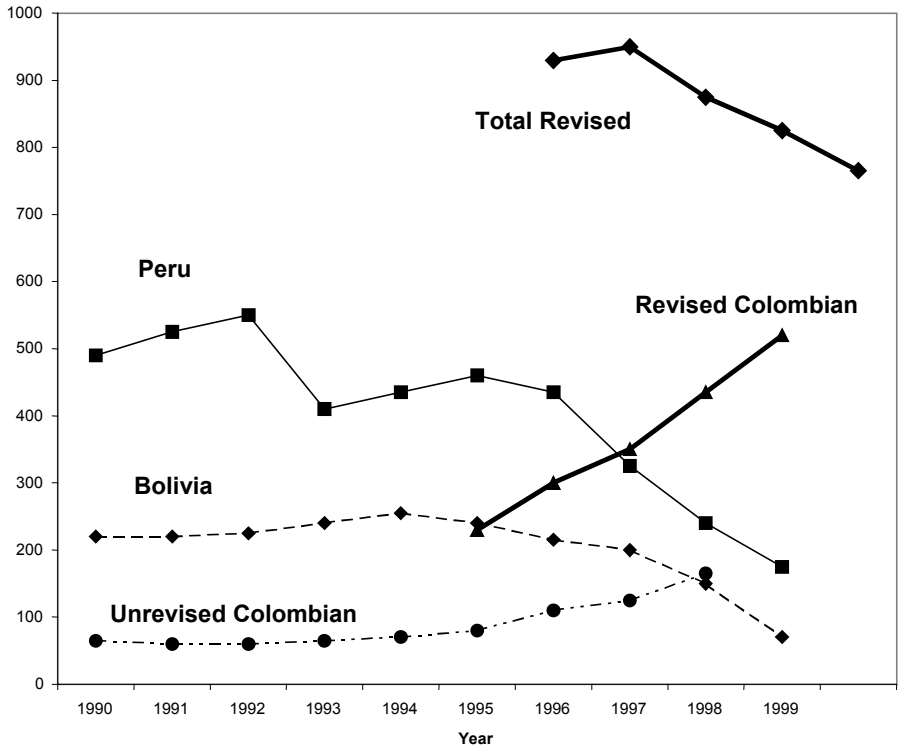
The primary base of operations for paramilitary groups continues to be northern and central Colombia although recent reports indicate an increase in activity in southern Colombia. Paramilitary leader Carlos Castano has recently admitted that his group receives payments, similar to the taxes levied by the FARC, from coca growers in southern Colombia to protect them from guerrillas. His organization -- and possibly others -- appear to be directly involved in processing cocaine. It is thought that at least one of these groups is involved in exporting cocaine from Colombia.

Potential Cocaine Production

Potential cocaine production is calculated by beginning with hectares under coca cultivation and multiplying by the leaf yield, alkaloid content, and base processing efficiency. The calculation measures the amount available for world consumption, assuming all coca hectares are converted to cocaine product. Figure A1 depicts changes in the distribution of Andean potential production. Note that the figure includes two lines for Colombia, the lower one representing earlier Colombian estimates and the higher one representing data as of March 2000.

Figure A1

Potential Cocaine Production, 1990-1999 (mt)



Source: DCI Crime and Narcotics Center (CNC)

Source Zone Flow

Detection of cocaine base and HCl movement within South America is very poor. Based on other information such as cultivation areas, suspected laboratory locations, and detected HCl South America to world markets, an assessment of flow begins to emerge.

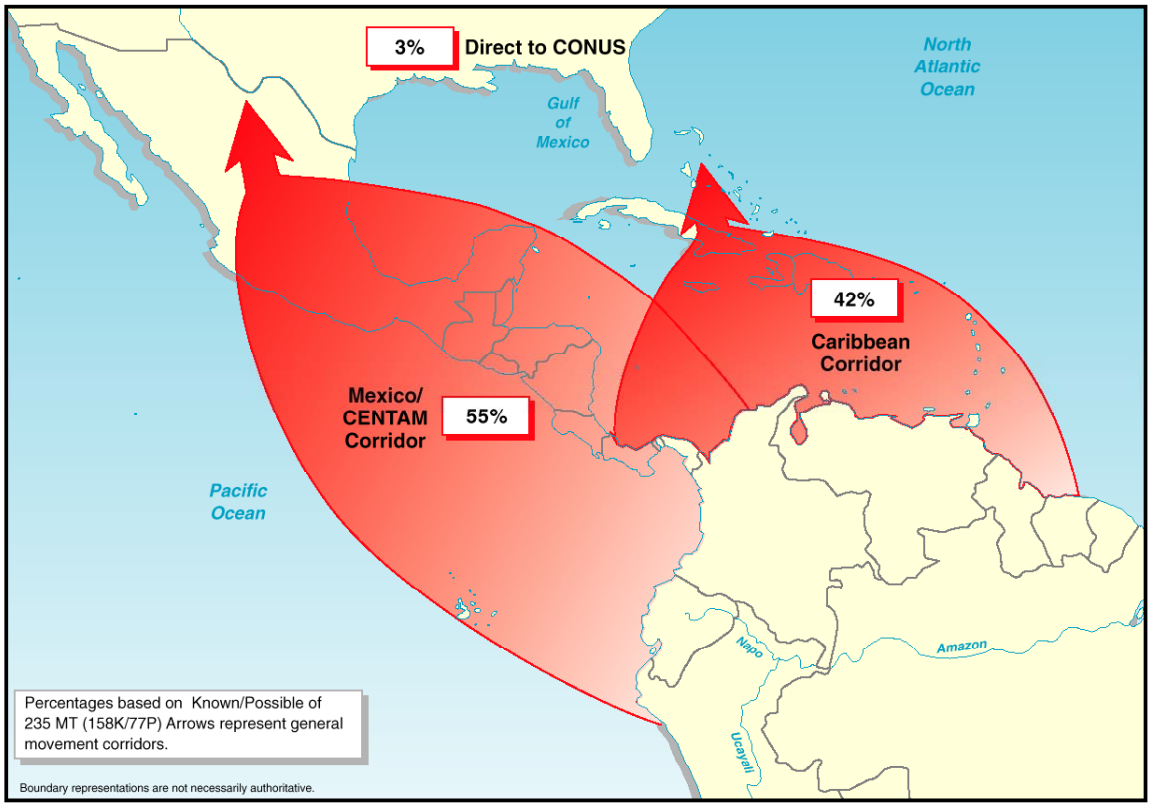
During the early 1990's the overwhelming majority of cocaine HCl was produced and exported by Colombian traffickers. In the late 1990's traffickers diversified points of departure and began moving cocaine through Venezuela and Ecuador to major ports to be loaded onto maritime vessels. Additionally, some HCl movement has recently been detected moving south into Brazil. This decentralization is attributed, in part, to the need to mask the origin of the vessels involved. Vessels originating in Colombia are more likely to be searched upon arrival in foreign ports than those from Venezuela or Ecuador. Another contributing factor is the expanding European market. Current demand in Europe is estimated at between 69-108 metric tons (Layne, Johnston, and Rhodes 2000), but if seizures are added, the flow rises to 88-150 metric tons. To supply this increasing and lucrative market (the street value for cocaine in Europe is approximately twice that of the U.S.), traffickers are establishing new routes; Colombian traffickers have begun using Venezuela and Ecuador, and are moving to Brazil to get their product to Guyana and Suriname, and Bolivia is moving cocaine through Paraguay and Argentina. This decentralization causes major problems in South America since traffickers do not pay for transportation in local currencies; instead, they pay with a percentage of the shipment generating consumption problems in the transit countries.

Transit Zone

The Interagency Assessment of Cocaine Movement (IACM) recognizes three corridors of cocaine movement: the Mexico/ Central American corridor, the Caribbean corridor, and direct to the Continental U.S. (CONUS). Figure A2 presents the percentage of cocaine shipments that flows through each corridors. Together these corridors constitute 6.5 million square miles or roughly twice the size of the lower 48 U.S. states. Figure A3 presents a perspective on the sheer size of the transit zone.

Figure A2

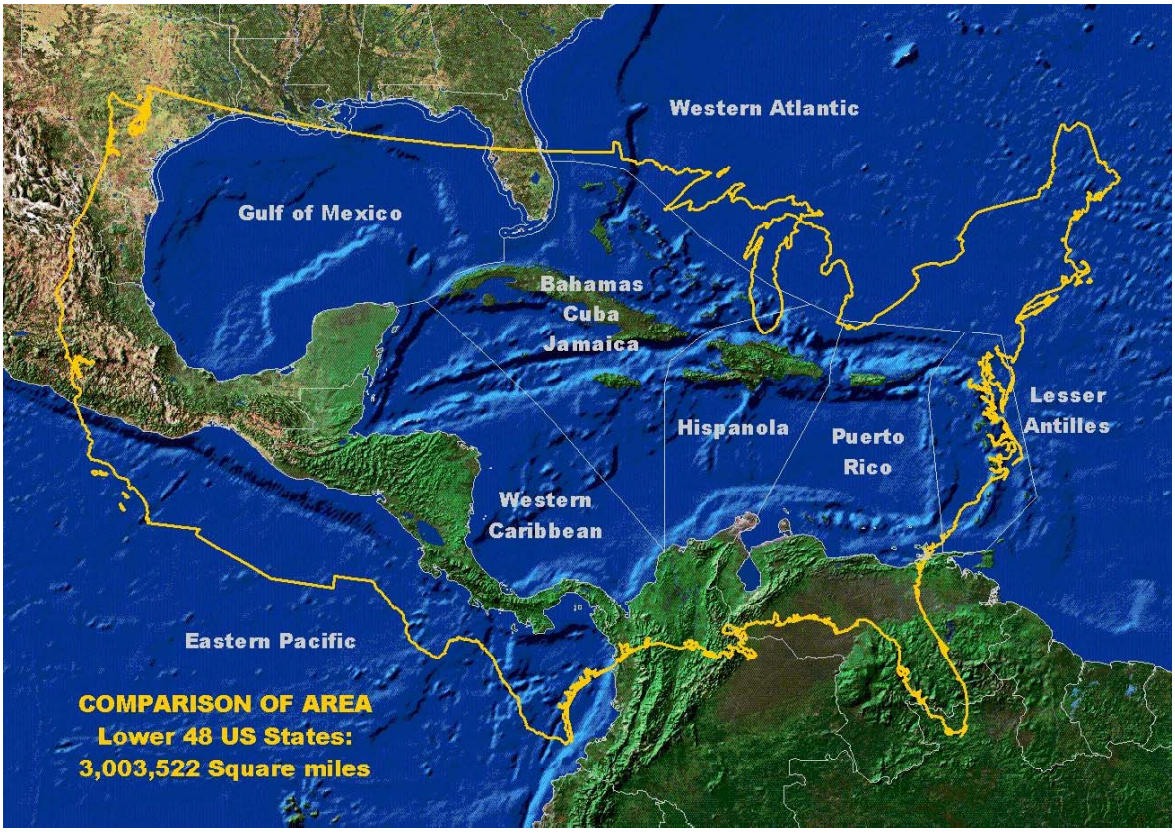
Cocaine Corridors



Sources: Interagency Assessment of Cocaine Movement, Eighteenth Edition. (August 1999; DI-2550-163A-99).

Figure A3

Cocaine Transit Area in Perspective



Moving cocaine through the transit zone to the U.S. is, for the most part, at least a two-stage operation. Maritime vessels account for the majority of primary movement (an estimated 85%), followed by planes (an estimated 15%). The overall flow of cocaine continues to reflect distribution patterns noted over the past several years.

Mexico/Central America Corridor

This corridor comprises the countries of Central America and Mexico (MX/CENTAM) and includes the waters of the eastern Pacific (EPAC) and western Caribbean. This corridor historically accounts for over 50% of the transit zone flow. The highest levels of cocaine flow are consistently detected transiting the EPAC despite the relative scarcity of detection and monitoring (D&M) assets. Colombian traffickers in the eastern Pacific use either fishing vessels or go-fast (small launches with powerful motors) vessels to move the bulk of their product toward MX/CENTAM. Commercial maritime vessels are also used to transship lesser amounts to world markets from the west coast of South America. Cocaine en route to Mexico from South America is normally transferred to Mexican vessels on the high seas of the eastern Pacific. Transfers from Colombian to Mexican vessels have been detected over 500 nautical miles off the

coast of Mexico. Recent seizures and intelligence indicate traffickers have returned to using fishing boats to ship multi-ton loads of cocaine to Mexico rather than long-range go-fast operations (which transport smaller loads). In the western Caribbean, go-fast vessels carry cocaine from South America to destinations in Central America and Mexico. Cocaine arriving in Central America subsequently moves overland along the Pan American Highway toward Mexico. The high volume of legitimate tractor-trailer commerce makes detection, interdiction, and apprehension difficult. Moreover, overland trafficking can begin anywhere in Central America as a subsequent segment of either air delivery to remote airfields or go-fast delivery along the Pacific and Caribbean littorals.

Caribbean Corridor

Maritime vessels, including go-fast boats, bulk cargo freighters, and containerized cargo vessels are the most common conveyances for moving large quantities of cocaine through the Caribbean to the U.S. Traffickers routinely transport cocaine from Colombia to clandestine landing strips in the Caribbean, using single or twin-engine aircraft. Traffickers also airdrop cocaine loads to waiting land vehicles and/or maritime vessels. Couriers handle smaller quantities on commercial flights to the U.S. on their person, in their baggage or by ingesting up to one kilogram of the product.

The island of Hispanola is just under 430 miles from Colombia's most northern point, and easily accessible by twin engine aircraft hauling payloads of 500-700 kilos of cocaine. The two countries on the island, Haiti and the Dominican Republic present an ideal location for the staging and transshipment of drugs. There is effectively no border control between the two countries, allowing essentially unimpeded traffic back and forth. In addition, Haiti has no effective law enforcement or judicial system, so there are few legal impediments to drug trafficking. Recent statistics released by the IACM indicate that approximately 15 % of the cocaine entering the U.S. transits either Haiti or the Dominican Republic. Spurred by the numerous uncontrolled points of entry, and encouraged by internal instability, vast amounts of narcotics from South America arrive in Haiti through the porous border with the Dominican Republic for further shipment to Puerto Rico.

Just 80 miles from the East coast of Hispanola, Puerto Rico is easily accessible by plane or boat. The key to the drug trade in Puerto Rico is the island's U.S. Commonwealth status. Once a shipment of cocaine reaches Puerto Rico, it is unlikely to be subjected to further U.S. Customs inspections. International drug trafficking organizations increasingly use the island as a major point of entry for smuggling multi-ton quantities of cocaine into the U.S., primarily as a gateway for cities on the East coast. Puerto Rico's 300-mile coastline, the vast number of isolated quays, and six million square miles of open water between the U.S. and Colombia make the region difficult to patrol and ideal for a variety of smuggling methods. Puerto Rico is an active Caribbean maritime and air transportation thoroughfare. The island has the third busiest seaport in North America and fourteenth busiest in the world as well as approximately 75 daily commercial airline flights to the continental U.S., an attractive logistical opportunity for drug trafficking organizations. Criminal organizations rely on their financial capabilities to corrupt mechanics, longshoremen, airline employees, and ticket agents, as well as government officials and others. Not only has corruption of legitimate business become a problem on the island but Colombian drug organizations routinely pay local organizations up to 20 percent of the load for their services. This form of payment has acted as a catalyst for the development of a very profitable, but competitive, market for local distribution. This "spill-over" has resulted in an increase in violence and bloodshed. It is estimated that about 80

percent of all documented homicides in Puerto Rico are drug related. Law enforcement efforts are further impeded by the close-knit relationships between the drug trafficking organizations that have developed over the years.

Puerto Rico, like Hispanola, is easily reachable by twin engine aircraft hauling payloads of 500 to 700 kilograms of cocaine. The go-fast boats make their round-trip cocaine runs to the southern coast of Puerto Rico in less than a day. Today, cocaine traffickers from Colombia have transformed Puerto Rico into the largest staging area in the Caribbean for illicit drugs destined for the U.S. market. Once the illicit narcotics are smuggled into Puerto Rico, they are routinely stored in secluded, mountainous areas of the island until transportation to the continental U.S. can be arranged. The contraband is then repackaged into smaller shipments in preparation for the move.

U.S. Arrival Zone

Cocaine is smuggled into the U.S. at various border entry regions (see Figure A4). The 2,400-mile southwest border with Mexico, poses a particularly vexing challenge. Figure A5 details the amount of cocaine that arrives at each entry region prior to seizures at the border[16]. Most cocaine enters the U.S. via Florida and the southwest border. Once the eight-year period, quantities arriving at the southwest border have increased at the expense of quantities arriving at Florida. Other regions have remained fairly constant except for Puerto Rico/Virgin Islands, which recorded an increase from 11 metric tons in 1996 to 42 metric tons in 1997.

[16] This is based on Abt's Border Allocation Model. See Layne, 2000 for details.

Figure A4

U.S. Border Entry Regions

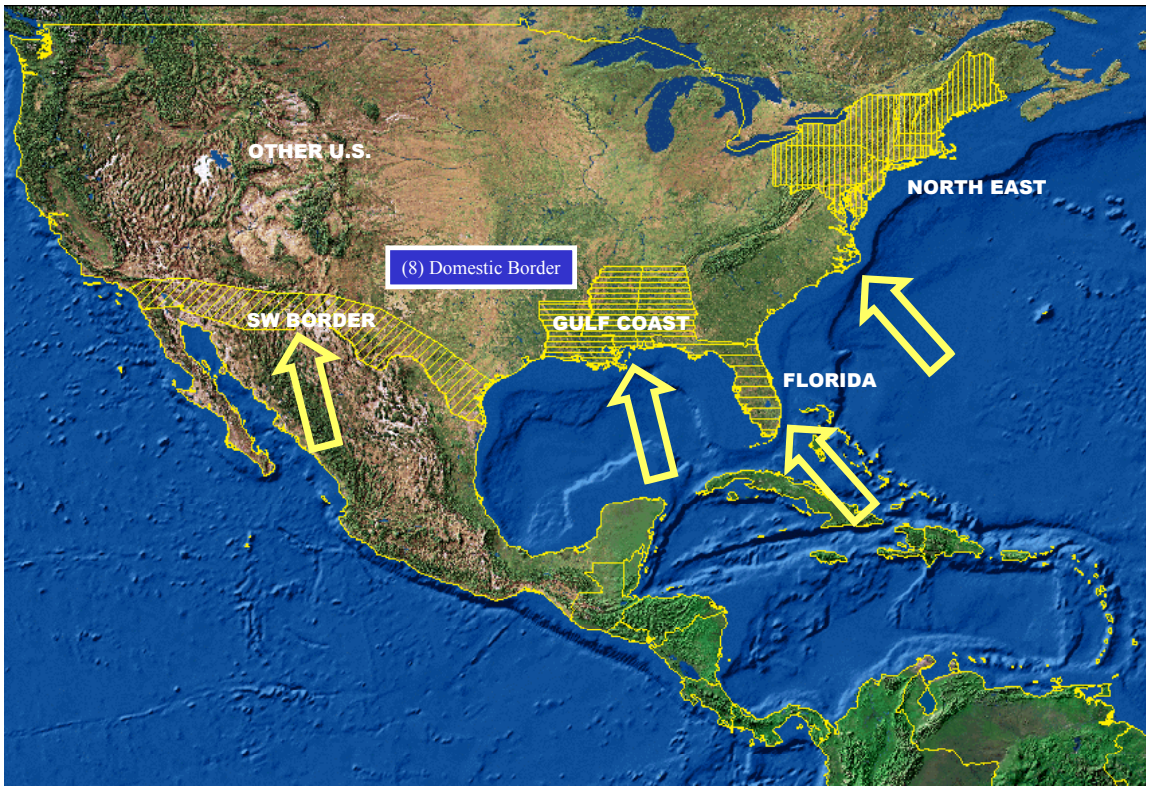
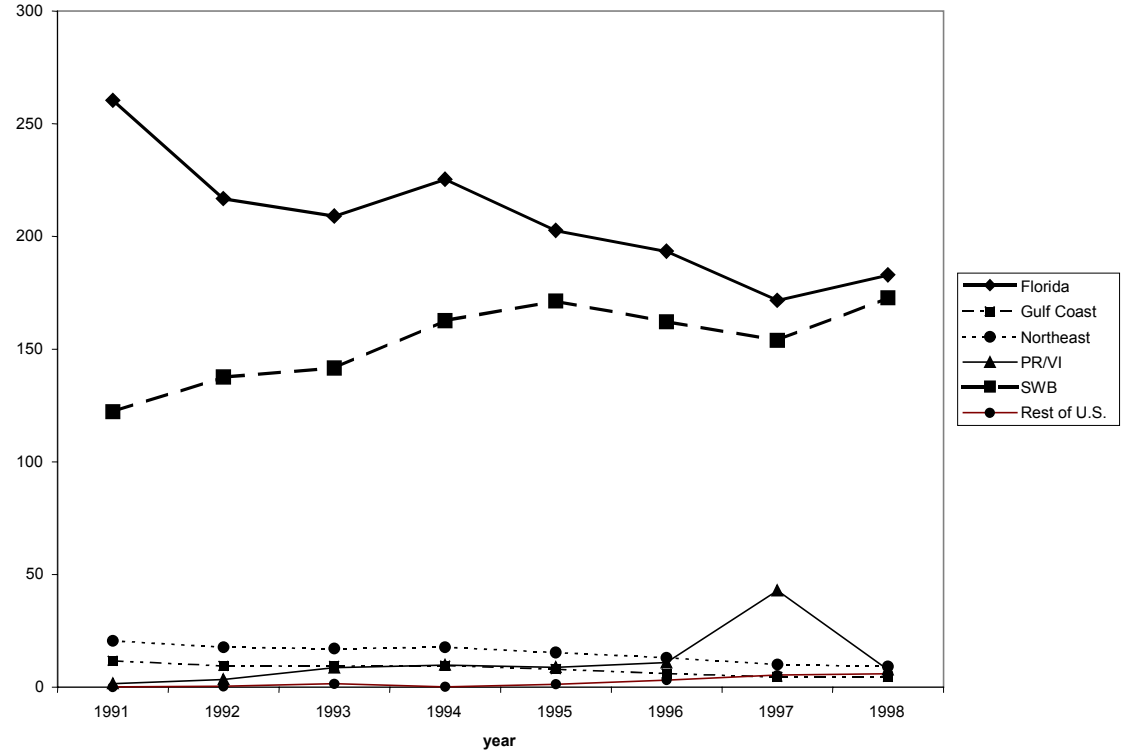


Figure A5

Cocaine Arriving to Border Entry Regions (pure metric tons)



Trafficker Adaptability

Traffickers change routes, conveyances, concealment methods, processing locations, and even coca growing areas in response to effective counterdrug operations, adapting in both the sources and transit zones. At the source, traffickers practice better communications security than in the past. Land and river routes from Peru to Colombia were developed in response to the air-bridge denial program. Conveyances have continually improved in the transit zone. The low profile vessel (hard to see but easy to interdict) evolved to the go-fast (hard to interdict, but detectable) to a go-fast version that uses blue tarps (hard to detect and very difficult to interdict). The go-fast vessels have changed as well, with more powerful engines and larger fuel tanks. Cocaine packaging has improved in response to the detection capabilities of the ion scan[17]; some packaging no longer allows even minute trace amounts to escape. Hidden compartments are now almost standard on motherships.

Air routes have changed considerably. In the mid-1990's Boeing 727s and Caravelle jets were used for multi-ton shipments from Colombia to Mexico. Several successful seizures induced traffickers to use

[17] Ion scanners are able to detect microscopic levels of substances including cocaine, heroin, methamphetamine and even bomb material.

smaller planes and change the destination to Guatemala. Traffickers have the resources and have continually demonstrated the ability to respond to effective sustained counter-drug operations.

Appendix B: The Evolving Nature of Drug Smuggling Organizations

Introduction

Trafficking patterns and relationships among drug syndicates have become increasingly dynamic and multinational over the past decade. The incarceration of several high-ranking Cali drug lords in 1995 and 1996[18] has enabled less established Colombian trafficking groups to assume a greater role. What's more, non-Colombian entities are beginning to challenge the stranglehold the region once had on the industry. While Colombian smugglers continue to dominate the drug trade at the source, major Mexican cartels such as the Amado-Carrillo Fuentes and Arellano-Felix organizations have emerged not only as valuable transporters of Colombian cocaine but also as legitimate wholesale distributors in their own right.

The Original Colombian Cartels

Medellin

Throughout much of the 1980's, the regional drug mafia known as the Medellin Cartel maintained control of the cocaine trade by way of political influence and violence. Medellin drug lords were brash and publicly flaunted their extreme wealth and power.[19] While aggressively challenging the Colombian government's authority with brazen terrorist activity, the cartel garnered support from the lower classes by funding numerous public works projects.[20] Due to U.S. and Colombian law enforcement efforts and the violent deaths of its highest ranking leaders,[21] the organization gave way to the Cali cartel. Although a number of former Medellin drug lords remain active,[22] the organization has effectively relinquished its hold on Colombian cocaine.

Cali

Gilberto Jose and Miguel Angel Rodriguez-Orejuela and Jose Santacruz-Londono founded the original Cali cartel in the early 1970's. The organization focused primarily on trafficking cocaine to U.S. and European markets. In its heyday, it was responsible for importing multi-ton quantities of cocaine and

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[18] Jose Santacruz-Londono and the Orejuela brothers were arrested in 1996 and 1995, respectively.

[19] By 1983, Medellin drug lord Pablo Escobar's personal wealth was estimated at 2 billion dollars, giving him the dubious distinction of being the world's richest criminal.

[20] For financing the construction of a housing project for 200 poor families in Medellin, Pablo Escobar became known as 'Robin Hood Paisa'.

[21] Medellin drug lords Jose Rodriguez Gacha and Pablo Escobar were murdered in December 1989 and December 1993, respectively.

[22] According to DEA intelligence reports, in October 1999, "Don Felipe" (real name unknown) and Vicente Rivera Gonzales were involved in negotiations concerning the exportation of 2 tons of cocaine out of Peru.

laundering billions of dollars on an annual basis. The old-line Cali cartel was comprised of a loose association of five major drug syndicates, each responsible for distinct aspects of the business. In the late 1980's, Cali leaders were able to augment their enterprise while the Colombian government focused their resources on disrupting the Medellin cartel. The enterprise became the new king of cocaine by integrating itself into Colombian politics, economics, and society. Bribes and death threats kept Colombia's political leaders in check as Cali drug lords operated under virtual immunity from the criminal justice system.

Often laboring under the guise of legitimacy, Cali drug lords were more discreet than their predecessors. Cali's licit business operations included ownership in agribusiness, poultry, soccer teams, radio stations, restaurants, and a chain of drug stores. Members of the organization avoided violent confrontations with government officials if possible, and hired high-profile attorneys to manage their legal disputes. The cartel's ability to corrupt local and national security forces often enabled them to effectively undermine potential law enforcement interference without resorting to overt acts of violence. Many of today's most influential drug smuggling cartels (most notably Mexico's Juarez cartel) have modeled their counter law enforcement strategies after this philosophy.

Within the organization itself, a strict "top-down" command and control structure was the norm. Stringent operational security prevailed and members functioned under a "need to know only" basis. Although the group maintained an elaborate consortium of members (ranging from technologically savvy businessmen to street thugs), principals were responsible for exercising direct control over each of their subordinates – often through fear and intimidation. This degree of operational control was particularly evident during the actual transportation of narcotics to U.S. markets. When transshipment countries were used to disguise the origin of narcotics loads, Cali principals dispatched on-site representatives to manage the export. Once shipments arrived safely in the U.S., additional Colombian representatives would work with local overseers to complete the smuggling venture. By the mid-1990's, Colombian traffickers began to ease this degree of micro-management and relinquish a measure of operational control to surrogate groups in Mexico and the Caribbean.

Street-level product dissemination was coordinated through family-based distribution channels consisting of independent cells in various geographic areas. These cells operated independently in order to minimize organization-wide damage in the event of a single cell take down. Front import and export companies usually managed by well-established owners of legitimate Colombian business operations were also used to conceal illicit smuggling ventures.

Using twin engine, general aviation aircraft, the Cali organization typically imported coca paste and cocaine base from Peru and Bolivia for subsequent movement to cocaine HCl-processing labs in Colombia. Colombia's immediate accessibility to both the Atlantic and Pacific oceans made maritime drug transport popular among Cali-based traffickers. Narcotics shipments were typically co-mingled with containerized licit produce aboard legitimate cargo vessels. Loads originating in staging areas in the Northern Valle Del Cauca region of Colombia were sent to Central American countries such as Paraguay for subsequent transshipment to the U.S. and Europe. The Pacific Coast port city of Buenaventura also funneled containerized drug shipments directly to U.S. port cities like San Diego, Miami, NY, and Tampa.

Traffickers often hid contraband aboard outbound cargo ships in false bottoms and walls of containers. Other popular concealment methods included lining the stems of flowers with cocaine and heroin, and encasing contraband in concrete fence posts and ceramic tiles. Smugglers also favored shipping narcotics along with perishable items like fruit and coffee beans because these items require rapid handling by customs officials.

The group was also effective in moving drugs to the arrival zone aboard commercial airlines. The Cali syndicate actually owned an airline, Colombian Air Transport, which made this mode very convenient. They used the north coast of Colombia as the staging point for aircraft bound for locations in the Caribbean, Ecuador, Mexico; U.S. Couriers were employed to body-carry narcotics to the airports within the arrival zone.

In an effort to thwart anti-drug interdiction efforts, the organization often made use of transshipment countries to conceal the origin of their product. Popular transshipment points included Mexico, the Caribbean, and Brazil. Investigative reports reveal the repeated use of private aircraft carrying multi-ton loads of cocaine from clandestine airstrips in the Colombian regions of Cesar, Guayjira, and Magdalena, to Brazil and Argentina, for subsequent movement to the U.S. and Europe. Cali-based organizations occasionally employed multinational pilots to fly to clandestine airstrips but were careful to use Colombian representatives to supervise transportation.

Smuggling ventures were conducted using the most up to date counter-surveillance and communications equipment, including GPS navigation systems, satellite pagers, and fax machines. DEA operation 'Foxhunt Zorro' (concluded Sept., 1994) revealed that Cali cartel bosses inside the U.S. avoided phone tap detection by utilizing a complicated array of fax lines and cellular communications. Computer hackers also used "cloning" software to mask the origin of members' phone calls.

The old-line Cali cartel remained prominent until the mid-1990's when Orejuela and Londono incarcerations left the organization disjointed. While Colombia remained the stronghold for cocaine production, multinational and non-Cali based groups began to emerge as major players. The absence of a dominant cartel in the source zone would fundamentally change the structure of the world's illicit drug business.

The New Colombian Regime

This power vacuum gave birth to a more diverse group of Colombian drug syndicates. Independent groups that formerly specialized exclusively in base supply and transportation have expanded their roles. Autonomous Colombian traffickers emerged with flexible operations. Former DEA director Thomas A. Constantine recently remarked:

"The methods [smuggling groups use] are as varied as one can imagine and traffickers frequently vary their routes and modus operandi to thwart interdiction efforts. Colombian transportation groups have honed their skills to the point that law enforcement has little chance of interdicting shipments of cocaine, unless intelligence is developed pin-pointing specific shipments or methods." (DEA Congressional Testimony, 1998).

Expert traffickers formerly working in the background of the Cali enterprise have now stepped to the forefront of the drug trade. New Cali leaders in the northern Valle del Cauca region include Arcangel de Jesus and Jose Orlando Henao-Montoya, and Diego Montoya Sanchez. Members of these groups have continued the use of freighters, fishing vessels, and 'go-fast' boats to transport cocaine from the Port of

Buenaventura along eastern Pacific routes and on to transshipment points in Mexico and Central America. From there, contraband is loaded onto smaller vessels and smuggled to points off the coast of southern California. Secondary transporters, frequently members of Mexican syndicates, often purchase and take control of the entire shipment at this stage. Transporters correctly view Los Angeles and San Diego as prime smuggling locations because of their high density of pleasure-craft traffic.

On the northern coast of Colombia, cargo boats, go-fasts, and sailing vessels are loaded with cocaine at the Atlantic port of Barrabquilla, the Gulf of Uraba, and the Guajera peninsula. Frequently using falsified U.S. Customs seals, loads are then shipped by way of commercial vessel northwest to the Mexican region of Yucatan. Once shipments are safely offloaded in Yucatan, they are typically transferred to private vessels for transportation to the U.S. Recent intelligence reports indicate that fishing vessels increasingly are being used to smuggle narcotics into the arrival zone, primarily because tight-knit fishing communities inhibit the development of intelligence. Also popular are maneuverable, flat bottomed "pangas" boats and jet skis in the San Diego area, and powerful shark boats in the Gulf of Mexico's underdeveloped coastal areas.

Colombian groups continue to use both commercial and private aircraft to penetrate the U.S. border. Although the use of large cargo planes laden with cocaine has have virtually disappeared, traffickers continue to employ ground crews to facilitate smuggling at major U.S. airports; especially in Miami and Puerto Rico. Private airplanes departing Colombia are used to air-drop loads of cocaine into Caribbean waters for subsequent pickup by Florida-bound motor vessels. The steady occurrence of short lands and fades along the southwest border also suggests the continued use of private aircraft to deliver drugs for later movement across the border. Colombian, Mexican, and Caribbean based pilots are aided by secure communications equipment, terrain-masking techniques, and night flying.

In the near future, we can expect Colombian groups to increase their use of Brazil as a transshipment point to the U.S. and European markets. Brazil is conveniently situated next to the producing countries of Peru and Bolivia, and Colombian groups have been successful in manipulating the country's numerous sea ports, uncontrolled airspace and lands, and free-trade zones.

Colombian smuggling organizations are still in position to direct the world's illegal drug market for at least two major reasons. First and foremost, their prime geographic location enables them to firmly control the source of the world's cocaine supply. Second, Colombian traffickers possess the experience and overseas transportation networks to effectively conduct business on an international level. However, the recent decline of the old-line Colombian cartels and the expansion in international drug markets have gradually begun to weaken the region's rigid monopoly.

The Emergence of Mexican Cartels

During the late 1980's sustained U.S. law enforcement operations in South Florida and the Caribbean forced Colombian drug cartels to significantly alter their traditional smuggling patterns. Cartel leaders saw the U.S./Mexican border as a viable transportation corridor for a number of reasons. Geographically, the southwest border is susceptible to incursions by air, land, and sea. The need to patrol 2,000 miles of desert and mountains was and continues to be a daunting proposition for U.S. and Mexican law enforcement agencies. Furthermore, the Colombians were able to capitalize on long-standing marijuana

trade routes and distribution networks already established by Mexican groups along the border. By the early 1990's the Colombians successfully used surrogate Mexican traffickers to smuggle cocaine through these channels.

Moreover, the region appealed to the cartels for various social and political reasons. First, public officials could be bought with relative ease. As Mexican President Ernesto Zedillo recently acknowledged, "Drug-related corruption is probably the single greatest obstacle the law enforcement faces in its global battle against international drug trafficking." (DEA Congressional Testimony, 1998).

Another factor may have been an unintended consequence the North America Free Trade Agreement (NAFTA) agreement, signed November 13, 1993, which expanded the Mexican market for illicit as well as legitimate trade. Table B1 reports the increase in traffic along the southwest border. As NAFTA-induced commercial traffic increased, so too did smugglers' abilities to move their product undetected. In 1998 alone, 84.1 million private vehicles and 3.9 million trucks were processed along the border. To cope with this volume, U.S. Customs officials have had to expedite their searches and interrogations. As a result, officials have been unable to inspect a reasonable proportion of goods entering the U.S. Colombian and Mexican traffickers are fully aware of this debilitation and have exploited it.

Table B1

Commercial Traffic Trends along the U.S./Mexican Border, 1992-1998 (Millions)

1992	1992	1993	1994	1995	1996	1997	1998
Commercial Trucks	1.9	2.4	2.7	3.1	3.0	3.7	3.9
Railcars	.2	.2	.2	.3	.4	.3.	.4
Privately Owned Vehicles	73.6	78.5	82.3	76.9	76.2	83.5	84.1

Source: Interagency Assessment of Cocaine Movement, Eighteenth Edition, Mid-Year Review. (August 1999; DI-2550-163A-99).

During the late 1980's Colombian cartels began their assault on the southwest border by flying large cocaine shipments to staging areas in northern Mexico. The shipments were subsequently broken down into smaller loads for import into the U.S. Small Mexican transportation groups moved the cocaine across the border using couriers (or "mules"), private vehicles, and commercial trucks. Shipments were often co-mingled with legitimate tractor-trailer cargo at busy ports of entry or smuggled across the vast land border between established ports of entry. Making use of terrain-masking techniques, private airplanes delivered larger shipments across the more mountainous regions of the border. Successfully smuggled loads were handed off to Colombian representatives just across the border for subsequent storage and distribution.

Although the use of non-Colombian transportation groups deviated somewhat from the Colombian protocol, solid partnerships with Mexican syndicates would prove mutually beneficial. At first, Mexican traffickers primarily served as middlemen to deliver the product to Colombian distributors in the U.S. Mexican traffickers soon realized their well-defined distribution and transportation networks put them in position to make the smooth transition to the wholesale cocaine market. By the early 1990's the role of Mexican-based traffickers had grown exponentially.

As the drug trade along the southwest border expanded, Colombian cartels became willing to relinquish some control of their shipments to avoid the potential hazards of large cash transactions. And fearing the criminal implications of street-level dealing in the U.S., the Colombians conceded some of their wholesale operations to Mexican syndicates. Consequently, Mexican groups began to command a substantial share of the distribution market, especially on the West coast and in the Midwest.

In 1989 U.S. law enforcement agencies made seizures totaling close to 40 metric tons linked to Mexican trafficking groups in California, Texas, and Louisiana. In an effort to minimize the damage that seizures of this magnitude might have, the Colombians began to vary the way they paid their Mexican surrogates; payment in kind became standard procedure by the early 1990's.

Since that time, Mexican traffickers have been receiving up to 50 percent of cocaine shipments as payment for their services, enabling them to secure a substantial portion of the wholesale market in the U.S. Current estimates find that Mexican-based groups control up to a third of the U.S. cocaine market. Dual ownership of the U.S. distribution market has lead to a relatively low number of violent confrontations between the two groups, while armed mêlées between the cartels and border patrol agents have continued.

Three major drug operations in 1996, "Limelight", "Reciprocity", and "Zorro II", [23] demonstrated the emerging influence of Mexican cocaine distribution in the U.S. These operations also revealed the flexible and highly sophisticated level of communications equipment used by Mexican syndicates; particularly their use of encrypted telephone devices. Also apparent was their proficiency in state-of- the-art counter surveillance equipment, including high-powered video cameras along the border and computer-controlled radio frequencies to avoid detection.

Mexican smugglers may be increasing their use of tunnels to move drugs across the southwest border. Three major tunnels were discovered last year in Nogales, AZ alone. A recent report (Customs, 1999) suggests that transportation groups are building "sophisticated tunnels along the border", and that many are capable of accommodating "vehicles as large as cars…[and able to handle] as much as a ton of drugs at a time."

Mexican smuggling groups now command a greater sphere of influence in the drug trade than did their predecessors. There is recent evidence that Mexican syndicates are currently buying cocaine directly from groups in Colombia, Peru and Bolivia. Our intelligence indicates that the Mexican-based Juarez Cartel is even making inroads to the Colombian-dominated East Coast wholesale markets. This trend is likely to continue, for the bulk of drug proceeds are still to be made on the distribution level.

Mexican Cartel Structure

Approximately 50 major drug trafficking organizations are currently operating in Mexico, with hundreds of supporting syndicates along the border. While the configuration of Mexican cartels can be quite fluid,

[23] As a result of operations Limelight and Reciprocity, 11.5 metric tons of Mexican controlled cocaine were seized from various cells from California to eastern points including NY. Operation Zorro II exposed a major transportation and distribution organization co-managed by Mexican and Colombian cartel members.

most can be divided into 3 distinct levels: the Patrones (or drug lords), the division heads, and the gatekeepers. According to *Albuquerque Journal* writer and former professor at the University of New Mexico Peter Lupsha, the Mexican cartel structure can roughly be described as follows:

- As leader of the cartel, the patron is responsible for macro-level decision-making. The job requires the smooth transfer of narcotics through Mexico and into the U.S. by paying-off officials and supervising money-laundering operations. The patron also manages the division heads and coordinate large-scale drug smuggling ventures with international trafficking organizations.

- The division heads carry out operations as designated by the patrones. Division heads often possess unique geographical or functional responsibilities but may work in conjunction with more than one patron.

- Gatekeepers work at specific ports of entry along the southwest border and are responsible for coordinating the final details of a smuggling operation. Members of this group are considered very location-specific and will occasionally broker small deals outside the organization.

- Family syndicates are responsible for the actual transportation, offloading, and storage of the product. Family syndicates may demonstrate some loyalty to a specific patron or division head but generally act as freelancers. They often receive a small amount of drugs as payment, and redistribute it in local Mexican markets.

At every level of the cartel, family connections are important. Members of the cartels usually have family residing in the U.S., making it difficult for law enforcement agencies to penetrate the organizations. The use of family ties to coordinate drug trafficking efforts can be traced back decades to a period when stolen cars and illegal aliens posed the biggest smuggling threat along the border.

According to U.S. Customs Intelligence, one of the most significant trends involves the proliferation of "smaller, more tightly knit organizations which move 100-150 kilos at a time in rapid fashion." These transportation groups operate under the umbrella of larger, "..more established drug cartels operating in Mexico." Two of the most powerful and established Mexican cartels threatening our border today are the Juarez and Tijuana cartels.

Juarez Cartel

The Juarez cartel, formerly headed by Carrillo Amado-Fuentes, specializes in the transportation and distribution of cocaine and marijuana. Since his death in 1997, a struggle for control allegedly has led to a number of murders in the Juarez/ El Paso area. The Rafael Munoz-Talavera organization has attempted to seize control of the territory with limited success.

Much like his Cali counterparts, Amado frowned upon the flamboyant nature of his predecessors, and instead sought power by wedding himself to the political structure of Mexico. He and his cartel thrived on cultivating and maintaining long term relationships with public officials. His ties to the former

commissioner of Colombia's National Institute to Combat Drugs (INCD) Gutierrez Rebollo and General Alfredo Navarro-Lara are well documented.

Amado pioneered the use of Boeing 727's to carry as much as 15 tons between South America and staging points in Northern Mexico, earning himself the title "Lord of the Skies." The organization continues to use the Cuidad Juarez/ El Paso port of entry to smuggle cocaine and other drugs across the border, usually hiding contraband in commercial vehicles carrying legitimate cargo. Once Juarez-controlled shipments find their way into the U.S., they are loaded onto tractor-trailers for subsequent shipment to the West, Midwest, and more recently to the East Coast. At the time of Amado's death, the cartel was moving multi-ton loads of cocaine to McAllen, TX, for subsequent shipment to San Diego, Chicago, Atlanta, and New York.

Intelligence suggests that at the time of his death, Amado was seeking to expand markets into traditional Colombian strongholds in the U.S., particularly to eastern port cities. There is also evidence that he was circumventing Colombian suppliers altogether and negotiating directly with cocaine producers in Peru and Bolivia. According to DEA intelligence, the Juarez cartel recently purchased at least one multi-ton load directly from Bolivia, and in 1996 tried to establish a cocaine refinery in Chile.

Recent arrests by U.S. counter-drug operatives have shed some light on the organizational structure of the cartel. One of those arrested, Alcides Ramon-Magna, operated as shipment coordinator between Colombia and Mexico. He ensured safe delivery of the product from Cancun to Reynosa, Mexico. Gilberto Salinas-Doria managed all transportation and distribution operations from Reynosa to stash houses adjacent to the southwest border. From there, transportation coordinators oversaw cross-border shipments to U.S. distribution points via commercial trucks. One major coordinator along the border, Arturo Arredondo, supervised loading the cocaine onto tractor-trailers.

Vincente Carrillo Fuentes, Amado's younger brother, currently controls the enterprise. There is some evidence that the Tijuana Cartel may be rivaling the Juarez syndicate for control of Tamulipas, an optimal transshipment point to the southwest border. However, the Juarez organization still remains one of the two largest drug cartels in Mexico.

Tijuana Cartel

The Tijuana cartel is a multi-drug trafficking organization that uses the Baja California region to import narcotics into the U.S. When founder Miguel Angel Felix-Gallardo was incarcerated in 1989, he passed the cartel on to the Arellano-Felix brothers: Alberto Benjamin, Ramon, and Eduardo. Alberto Benjamin heads the business side of the operation and Ramon and Eduardo organize and coordinate security and trafficking logistics. The organization is considered paramilitary in nature and aggressively targets high-ranking military officials who are not already on their payroll. The group is technologically advanced, using radio scanners, cell phones, telephone interception equipment, and GPS, to conduct business. The organization also has listening posts to monitor the activities of rival organizations and suspected counter-drug efforts.

The Tijuana cartel controls trafficking operations in the California Baja Norte and Sur, Chiapas, Jalisco, Michoacan and Sinaloa. It is generally considered Mexico's most violent cartel. Their members consist of well-trained security guards recruited from street gangs in Mexico and San Diego. These former gang

members have a number of major assassinations to their credit ranging from drug rivals, to senior Mexican law officials.[24]

The organization has had the greatest influence in southern California, Chicago, Kentucky, New York, and Ohio. They have recently diversified to methamphetamine transportation and distribution. Front companies owned by members of the organization include aircraft companies, fishing cooperatives, and trucking companies.

While Colombian and Mexican drug cartels currently pose the greatest threat to the U.S., more specialized groups have emerged as significant players on the international drug scene. Currently the international cocaine industry is more collaborative effort rather than a cartel-controlled hegemony.

The Rise of Multi-National Syndicates

Interdiction successes, shifting international drug markets, and powerful crime syndicates outside Latin America have altered traditional smuggling patterns. Increasingly, multinational partnerships characterize an industry formerly dominated by a limited number of kingpins. Peru and Bolivia, once considered exclusively producers of cocaine base are exporting processed HCl to other South American countries, Western Europe, and possibly the U.S. Furthermore, the increased flow of cocaine through the Caribbean has created new wholesale drug markets there.

International organized crime syndicates have recently entered the South American-based cocaine trade, hoping to exploit the power vacuum left by the decentralization of the major cartels. Because these groups traditionally maintain secret networks that rely on corrupt officials, and possess the networks to facilitate trade, their transition to the cocaine industry has been relatively seamless. Over the last few years, drug syndicates from Italy, Nigeria, Russia, the Caribbean, Asia, and the Ukraine have developed dynamic partnerships with source organizations.

Dominican groups, which continue to dominate transportation functions in the Caribbean, especially around Puerto Rico, receive up to 20 percent of product in kind. According to DEA Intelligence Reports, Dominican groups are very active in distributing cocaine in the northeast, particularly in New York and New England. Other regional partnerships include the following:

- Jamaicans and Bahamians have demonstrated a great deal of cooperation surrounding the Bahamas, primarily using airdrops from private planes to go-fasts into Miami.

- Russian and Ukrainian syndicates are currently active in Argentina, Belize, Colombia, Ecuador, and Panama. Russian groups dominate most of South American cocaine exports to Europe. In 1999 the Moscow-based *Izmaylovo* organization planned to move narcotics from Colombia, Belize, and Panama to the US, Russia, and Poland.

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[24] In 1996, Ernesto Ibarra-Santes, Commandante of the Mexican Federal Judicial Police was gunned down in Tijuana by members of the Arellano-Felix cartel after he public denounced his police force for corruption.

- Italian drug smugglers have been active in many transshipment states, including Argentina and Brazil. They have also been involved in trafficking from Venezuela and Canada to Italy.

- Asian criminal organizations are not new to the scene. Since the 1980's they have been involved in smuggling heroin, illegal aliens, and arms through Argentina, Paraguay and Brazil.

- Nigerian syndicates are moving cocaine via Brazil to South and West Africa. Air and seaports in South America represent attractive gateways to the European market. Nigerian groups frequently send "armies" of couriers aboard commercial flights.

While the Colombian cartels of the 1980's and 1990's operated mostly within ethic and family constraints, today's syndicates have viewed necessity and greed as good reasons to cross these lines. The disadvantages facing multinational drug syndicates include greater transport distances, the need for long-range communication networks and technology, language barriers, and the need to trust members of outside groups. However, the potential advantages appear to outweigh these problems. Expanded global markets for Latin American cocaine and decentralization make the industry less susceptible to disruption. The range of transportation groups also gives Latin American traffickers more options when confronted with law enforcement obstacles.

Multinational partnerships and communication among drug syndicates enable groups to rely on flexible transportation methods. For example, a recent DEA intelligence report noted that because of accurate communication between Colombian and Haitian groups, "when US interdiction forces targeted boats used by the Coneo Rios trafficking family from the North Coast of Colombia to Haiti and the Dominican Republic, the Colombians quickly increased their use of air routes to Hispanola." (U.S. Department of Justice, 1994). Similarly, in a recent seizure off the coast of Spain, 7.6 metric tons of Turkish heroin were seized by Mexican authorities with high-level Mexican, Colombian, and Spanish smugglers aboard. The remainder of the crew was from a Russian drug syndicate.

As smuggling syndicates develop operations across ethnic and national lines, they are better able to adapt to interdiction efforts. In order to effectively combat the new multinational composition of the illicit drug trade, the U.S. must continue to generate cooperative information-sharing partnerships with foreign law enforcement agencies.

Appendix C: Prior Research

In 1987 Reuter and Haaga (1989) conducted the first notable study of high-level drug markets by interviewing 94 prison inmates randomly selected from five federal correctional facilities. Four of the five federal correctional facilities were classified as Level I, the lowest level of security, and the other was a Level II facility. It appears that the sampling strategy was focused on institutions rather than individuals. They note that because the sample was limited to low-security level institutions, potential bias was introduced into the sample because of the lack of access to higher-level drug dealers. Although forty-one (42%) of those who were approached agreed to be interviewed, thirty-two of the respondents were actual drug dealers (three were classified as heroin dealers, 20 were classified cocaine dealers and nine were marijuana dealers). Of the cocaine dealers, only two had purchased more than 10 kilograms, and four of the 20 were identified as importers. Among the marijuana dealers, five were importers (two had purchased more than 1 ton of marijuana). [25]

Reuter and Haaga describe a variety of reasons for refusing to be interviewed, including a reluctance to discuss the past, ongoing legal challenges to incarceration, concerns over the confidentiality of the interview, and anger at the government's treatment in the past. Despite these concerns, Reuter and Haaga (1989: 28) conclude, "With a few exceptions, the information from the interviews was plausible, internally consistent, and consistent with the Pre-Sentencing Report information."
The study examined four substantive areas of interest. The authors were particularly interested in learning about the ease, or difficulty, of penetrating drug markets and moving up the ranks. The second research question focussed on the nature of the organization behind high-level drug dealing. The third examined the need for violence in drug dealing at high levels, and the fourth examined the extent to which wholesale drug markets exist as regional, rather than national, markets.

The drug markets described by the smugglers indicate that entry and succession in these markets is less formal, less structured and has fewer barriers than might be suspected. Individuals were able to enter high-level drug smuggling with few obstacles and progress up the ranks with relative ease. This was true of individuals who had positions of trust within organizations, responsible for handling large sums of money, drugs or both. Most subjects reported that willingness to tolerate risk was a key to being successful, and while many had involvement in other forms of crime, roughly the same number worked in legitimate forms of employment. The ability to speak Spanish and having family members involved in "the business" also afforded introduction and escalation in the sales of drugs at these higher levels. In sum, there appeared to be little in the way of technical requirements, specific skills, or apprenticeship periods to be served prior to ascending to higher levels of drug sales.

The second issue was the extent to which high-level drug smuggling involved the use of an organization. Reuter reports that many subjects used the term to describe their operations. Despite this, little evidence was found that the groups of individuals involved in drug smuggling represented formal organizations

[25] The interviews were conducted exclusively with English-speaking inmates, as no translator was available. In addition, interviews took notes during the interviews rather than recording and transcribing the results of interviews.

that could be compared to corporations or more organized forms of "organized crime". Some evidence was found for "hierarchical organizations" but they were not universal nor did they seem necessary to achieve success or profit at the high level of drug dealing. Few special skills were found among the dealers interviewed for this study and there was little evidence of information sharing or coordination of efforts across the loosely federated individuals involved in drug markets. Reuter and Haaga concluded that there was importing or distributing drugs at the highest levels did not require a well-coordinated organization. Rather, high-level drug importation and distribution was a series of transactions between otherwise unconnected, independent groups with little structure or permanence. These groups are described as "chains" that link one task in the importation or distribution without corresponding sharing of information between links in the chain that are not physically connected. Most chains appear to be rather short, and are formed around specific functions. The asymmetric nature of information flow across these chains works to prevent the formation of formal organizations of an enduring or effective nature. These distribution chains lack exclusivity as individuals at one level contract with different individuals at other levels.

There was little evidence that violence was necessary to succeed. Indeed, Reuter and Braga argue that violence is not a key feature of dealing at the high levels of drug markets, unlike much street-level drug dealing. Few of their subjects reported being threatened by violence, though it is worth noting that most of their subjects were recruited from low security prison institutions, and involvement in violence could disqualify an individual from being sent to such institutions.

Finally, they assessed the geographic bounds of the illegal drug market. They concluded that the market was national in scope rather than regional. This was based on prisoner reports about the lack of barriers to selling in different geographic markets than they traditionally operated in and the experiences of a small number of dealers who managed to deal drugs at a high level in different regions of the country.

Although this study includes too few importers, too many low-level drug dealers, and excludes Spanish-speaking inmates, it is best viewed as a first step in the research process, particularly as it concerns our study.

Reuter and Haaga record several conclusions that are important for our own work. First they note that while the refusal rate was a concern, conducting future interviews at higher level security prisons was likely to yield valuable information. They argued for the use of prison populations to understand high-level drug markets. Second they found that even at the top of these markets there was little evidence of formal organization. This finding was viewed as problematic for enforcement against such high-level groups, since increasing the risk of arrest and imprisonment was made more difficult by this form of "organization". Reuter and Haaga conclude that enforcement efforts that increase the "price" of high level drug selling are likely to produce better results.

Rockwell International (1989) conducted the second major study of drug selling and smuggling that relied on interviews with prison inmates. Two hundred and fifty-four inmates from ten prisons, nine federal institutions and one state prison were approached to participate in a study examining the effect of deterrence strategies on drug smuggling; half agreed to participate For the purposes of the study "…deterrence is defined as that level of risk created when interdiction efforts are successful" (Rockwell International, 1989: 3). The premise behind this approach is that when risks are increased, those

responsible for smuggling drugs will be affected and thus will be more likely to change their behavior. The study assumed that increasing the smugglers' perceptions of the probability of apprehension and imprisonment was a key to deterrence; increased risks would lead to increased costs and ultimately would halt drug smuggling efforts.

Just over half of the inmates were U.S. citizens, 14% were from Mexico, 17% were from Colombia, and 14% were from other nations. The modal age group was in the forties, accounting for two-fifths of the total. As a group, the smugglers had relatively few years of experience, 31% had smuggled less than a year prior to their arrest, 38% had smuggled between one and five years, and 25% had smuggled between six and 10 years. Interviewers collected data both about the inmate's perceptions of risk as well as any associates known to the inmate. Questions were posed about the potential impact of varying levels of the certainty of interdiction, imprisonment, gain, and risk. The study concluded initially that the concept of deterrence itself could be measured in valid ways.

The average perceived risk of interdiction among individuals in this sample was 30% chance of being caught although they reported that the chance of associates being caught was 13.5%. The "tipping point" for the decision not to smuggle drugs occurred at the 40% cutoff level. However, caution should be used in interpreting these data, as the questionnaire allowed for only four data points. Thus an artificial set of decision criteria were offered to subjects, and their responses may simply "fit" into a truncated set of response alternatives rather than actually representing the variety or range of decisions made by smugglers. It is interesting to observe that in every case, inmates indicated that their associates were more likely to smuggle at a given level of risk and reward than they were themselves. The authors conclude that the responses for associates were likely to be more reliable, as individual offenders tend to underestimate their own probabilities and offer more realistic responses for their associates. Many of the response scenarios required subjects to calculate two sets of probabilities (risk versus reward) for themselves and their associates. This requires both a complicated set of decision-making criteria as well as requiring offenders to think in strict quantitative terms. Previous work with offenders (Wright and Decker, 1994; Wright and Decker 1996; Cromwell, Avery and Olson, 1996) has documented the difficulty most offenders have in thinking in strict quantitative terms. For example, the Rockwell study takes offenders through a four-sequence response scenario in which they are asked to determine whether they would smuggle drugs for a four-level reward scale versus a four-level risk scale. Functionally, this requires offenders to determine both for themselves and for their associates 16 different risk/reward combinations -- a difficult proposition.

The interviews provided some qualitative findings. First, larger-scale drug smugglers reported that the risk of apprehension was low if care and planning were adequate. Second, these high-level smugglers told interviewers that the interdiction efforts of the U.S. government were generally well publicized and did not require much in the way of intelligence. In addition, some said that they had not appreciated the consequences of cocaine use until after their imprisonment. Finally, the interviews described a typical smuggling operation. It consisted of one or two people who were responsible for setting up the deal, two to four people for transportation, and between four and six individuals to off-load the drugs. As the report notes, "Inmates were all to (sic) quick to put down the "Organized Crime" theory of large criminal families and stated almost all smuggler organizations contained 10 people or less." (Rockwell, 1989: 30).

The Institute for Defense Analysis (IDA) provided the next advance in understanding the effect of deterrence on drug smuggling. This 1999 study examined "the effectiveness of the Frontier Shield pulse operation to deter drug trafficking in and around Puerto Rico" (1). The study used data based on a deterrence model to determine the balance between threshold interdiction rates and drug smuggling deterrence and the Rockwell estimates of deterrence as a gauge of the success of interdiction efforts. The study notes that most of the cost associated with cocaine is a product of import costs, a major component of which is the cost of interdiction. This is an asset-based study that is dependent on official data for its conclusions, and proceeds on the belief that "…drug traffickers operate at the lowest cost for the perceived risk" (I-3). The conceptual focus of the study builds on the notion that seizures alone are not the best measure of deterrence but rather the behavior of traffickers is a key to understanding deterrence strategies.

The study identified four specific levels of apprehension rates: lethal apprehension, personal apprehension, apprehension of associates, and vehicle and drug loss with no apprehension. In addition, the study differentiated deterrence between a source zone, transit zone and a production zone. The IDA study concluded that initial interdiction efforts in major source zone or production sectors produce the greatest deterrent effects. Moreover, deterring air transport of drugs was between 10 and 100 times more effective in disrupting supply levels than previous studies had established.[26]

Perhaps the most important policy conclusion from the study was that a 2% interdiction rate was a key threshold for deterring drug interdiction. Any risk at or below that level was perceived to be part of the "cost of doing business" but that when risks exceeded that level they "got the attention" of smugglers. In contrast, the arrest of associates, loss of personal property, or loss of drugs required much higher thresholds of apprehension to produce deterrent effects. Thus merely seizing more drugs in the absence of arrest was unlikely to yield results in deterrence as smugglers regarded such losses as part of the cost of doing business. However, interdiction that resulted in arrest was likely to have a deterrent effect.

Griffith (1997) examines the role of drugs in the Caribbean and their relationship to political sovereignty in that region. It is his contention that drug smuggling and the economies that such activities create provide serious threats to the sovereignty of nations in that region. Griffith's work was designed to address three key questions, the nature and extent of drug dealing in the Caribbean, efforts to combat the problem, and the implications for security and sovereignty in the region.

Griffith provides extensive descriptions of the nature of drug smuggling operations in the Caribbean, based on his interviews with government officials, individuals charged with responding to shipments of illegal drugs and interviews with smugglers. He describes the organization of such shipping as a paradox; that is, many aspects of such groups include sophisticated planning, technology and communications; yet the groups themselves are not well-organized vertically and appear to exhibit few of the characteristics of formal organizations such as permanence, command structure, effective communication between ranks, and resource management. Griffith does report the use of GPS and tracking structures and notes that their utility is enhanced by the complicity of many actors in foreign governments. He characterizes traffickers as adaptive individuals who pay close attention to countermeasures taken by governments to interdict and deter drug shipments. Citing U.S. State Department reports (1991; 1992; 1993; 1994; and 1995) he

[26] However, the basis on which this was established is difficult to determine from the study.

documents a decline in the size (in kilos) of cocaine shipments of nine Caribbean countries, but notes that these declines may reflect the shift in transport strategies of smugglers rather than successful deterrence. Griffith concludes that many sources put the interdiction capture rate between fifteen and twenty-five percent for Caribbean drug shipments.

Few studies estimate the impact of interdiction and eradication efforts. This is a difficult enterprise as measures of changes in drug production, prices of drugs and changes in costs and transit routes are all difficult to develop. As a group, these studies conclude that government interdiction efforts produce little in the way of interdiction results.

Reuter, Crawford, and Cave (1988) measure the impact of increased military participation in interdiction efforts and conclude that increasing the resources available to the military for this purpose is not likely to reduce the availability of cocaine significantly. They argue that since 10% of the cost of cocaine comes from transportation costs, such interventions are not likely to pay dividends in increasing the costs of drugs and concomitantly drive smugglers out of the business or increase their costs significantly. The later work of Rydell and Everingham (1994) also find that interdiction efforts had little or no effect on reducing the level of smuggling or the cost of cocaine. Even herbicide spraying was found to have little success in reducing the availability of cocaine (GAO, 1999). Two years of far-ranging herbicide spraying of cocaine in Colombia did not result in declines in coca production; indeed, production increased 50% at the conclusion of this two year period.

Because these studies measure deterrence in terms of drug seizures, there is concern that the impact of interdiction may be underestimated. In an effort to address this concern, Caulkins, Crawford, and Reuter (1993) modeled a smuggler response to interdiction efforts. They concluded that in order to achieve any deterrent effect, all routes available to smugglers must be heavily interdicted. A similar study undertaken by Evidence Based Research (1995) found that increases in interdiction resources produced very small reductions in the success of interdiction efforts. These studies, however, suffer from relatively poor quality data.

A related approach has examined the effect of interdiction efforts on drug prices. The premise underlying such an approach is that measuring the direct response of drug producers and transporters is difficult and that such data are so fraught with measurement problems that they are unlikely to be valid indicators of the impact of interdiction. An alternative approach measures changes in the cost of drugs and argues that successful interdiction efforts will increase the cost of drugs as transporters are forced to take alternative steps, change routes, employ more lookouts, use more sophisticated technology, and tolerate more seized loads. Thus an increases in prices will result. Layne, Rhodes and Chester (2000) examined data provided by the U.S. Customs Service to determine the increase in the cost of transporting cocaine. Based on Reports of Investigations from Customs, they examined the impact of enforcement personnel, aircraft and technologies on the price of cocaine and found a direct link between enforcement activities and the costs of transportation. Specifically, they determined that every dollar spent on Customs enforcement produced a corresponding increase of 37 cents in the cost of transportation.

Riley (1993) summarized the general response to this line of research by expressing skepticism that interdiction efforts achieved their goal. He argued that the combination of low production costs, high

mobility within the cocaine industry, and the ability to respond quickly to changes in enforcement policy combine to frustrate the best efforts at interdiction.

Summary

This brief review shows several common themes. First, drug smugglers have a high-level of sophistication and competence. This enables them to change their routes, tactics and methods of smuggling drugs on relatively short notice. There is ample evidence that both sophisticated and unsophisticated surveillance strategies are employed.

Second, all the authors note the relative lack of organizational structure that characterizes drug smuggling efforts. The observation that crime, even at a very high-level, lacks a formal organizational structures, is common to the research on the criminal enterprises. In describing organized crime, Ianni (1974) indicates that many of the organizational ties between individuals in group enterprises are of short duration, involve transactions of an immediate or time-bound nature (and do not create lasting commitments to a larger organization) and may be a reasonably accurate way of understanding the nature of social organizations in the 21st Century.

Williams (1998) argues that much of the inability of interdiction efforts has resulted from "…the failure to understand fully the structure of these [organizational] networks and their capacity to counter or circumvent law enforcement and military interdiction" (154). The view that dominates the current conceptualization of drug organizations is one of vertically integrated structures that resemble corporate structures of the 1980's. However, as Burt and Williams have observed, there are many cells within formal organizations that have access to information and technology. These cells can operate independently of the larger organizational structure, often in ways that the organization's directors don't know about, don't understand and certainly can't control. Rather, Williams argues for the concept of networks or a series of connected nodes (individuals, organizations, firms, and information-sharing tools) that are linked across and within organizations. From this view, it is impossible to trace a straight vertical line from the bottom of an organization the top.

Networks can be linked within and across organizations, between and within functions, and can even include competitors. Many networks can be self-contained units in which no physical contact occurs with individuals in other networks. The insularity of these networks is a useful conceptual framework in considering the drug-smuggling process from point of production to final point of sale. Networks can cut across a variety of political, linguistic, legal, and geographic barriers. Because of their insular and self-contained nature, networks can be more difficult to penetrate and deter than large organizations. In a large organization it may be possible to "flip" one individual and move up the chain of command. In a series of interconnected networks, it may be impossible to move from one network to another because individuals may not know each other, may not have information about the identity of individuals in other networks, or may just reach a dead end. Networks are dynamic and capable of rapid change because they are based not on an existing structure but on the transfer of information (Abt, 1999). Thus, when one source for transportation of drugs is eliminated it is an easy matter to contract with another source outside the network of the first transporter. Williams notes that the information gathering done by the Cali cartel, the shift from smuggling drugs through the Caribbean to Mexico and the use of African locations for drug transshipment each represent the virtue of networks over organizations. Such loosely coupled

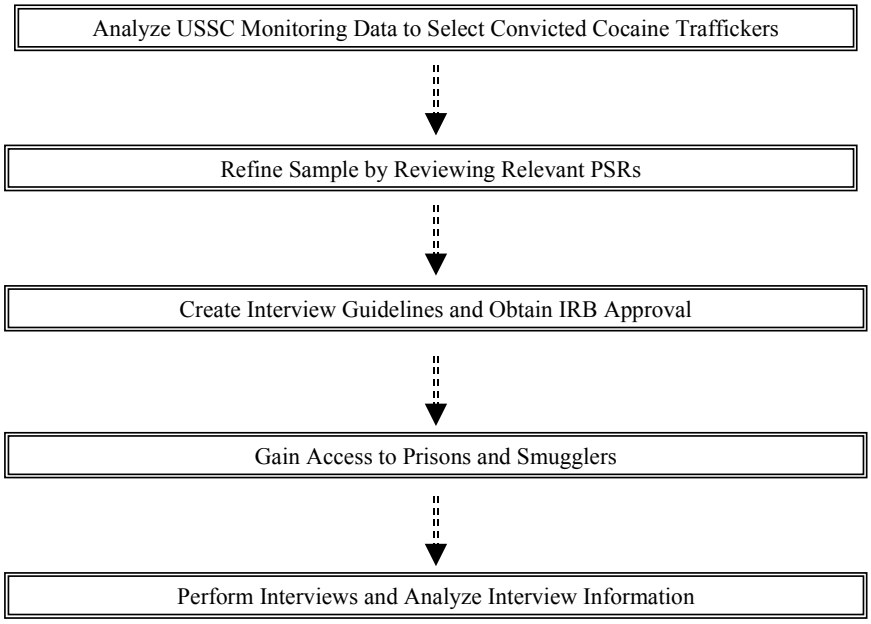
organizations reflect the dynamic nature of ties between networks that often come together to accomplish a single purpose, and may disband or conduct future business. Such networks are able to respond to losses or threats more quickly and efficiently than organizations which are more tightly coupled and must "re-grow" connections or functions that may be impaired by arrest, conviction or seizure of assets. Evidence of this can be seen in the transition from the dominance of the Medellin cartel to the Cali cartels, to the current offices that independently operate the drug trade in Colombia (DEA, 1997). From this view, in a drug smuggling operation it is likely that individuals involved in a particular function do not know individuals in another function, making the penetration of such networks and intelligence gathering about them all the more complicated. The report *The World Geopolitics of Drugs 1997/1998* observed that drug smuggling trends for 1997/1998 were consistent with those for previous years. The major trends included further decentralization of larger networks of drug smuggling organizations into smaller units and the increasing presence of "short networks", small self-contained groups linked only by function and need. It is not simply that organizations were getting smaller and more insular, they were linked only by function, information and immediate need with little permanent structure, durability of functional integration.

Appendix D: Smuggler Interview Methodology and Details

Figure D1 provides an overview of the steps undertaken to identify and interview a sample of high-level smugglers. We first obtained data from the U.S. Sentencing Commission (USSC), coordinated with the Bureau of Prisons (BOP), and most importantly, gained approval for the study from Abt's Internal Review Board (IRB)[27].

Figure D1

Steps To Interview High-Level Cocaine Smugglers



[27] When a research study involves human subjects, the IRB works with researchers to insure that the subjects are protected from possible harm.

Sample Selection

Sample selection procedures were developed to identify high-level drug smugglers who have experience smuggling large loads of illegal drugs into the United States. We focused on smugglers who were likely to have information on smuggling behavior patterns, perceptions of interdiction activities, and attitudes about the risks associated with smuggling drugs into the U.S. The goal was to identify at least 100 such prisoners and, predicting a 50% response rate, to obtain 50 interviews. It is important to note that the sample selection process was *purposive*, rather than random.

U.S. Sentencing Commission Data

Under Congressional directive, the Sentencing Commission receives official documents on each felony offender sentenced in the federal courts, including the judgment and commitment order, pre-sentence investigation report (PSR), written plea agreements, statement of reason for sentencing, and guideline application. From these documents, the Sentencing Commission codes approximately 300 variables into their database. These variables include such things as the amount of drugs involved, the offender's role in the offense, number of co-defendants, jurisdiction, sentence imposed, and demographics of the offender.

The PSRs provide an opportunity to incorporate in-depth information about offenses. The reports offer detailed descriptions of how the offense occurred, how the arrest/indictment occurred, the role federal officials played in securing an arrest or indictment, the number of participants, reasons for the offender's participation, amount and use of weapons, how much the offender knew about the offense, demographic information (e.g., marital status, health, education, drug use, employment, family relationships), and prior criminal record and prior drug involvement of the offender. The files also include copies of the indictment, plea agreement, objections by the prosecutor or the government, and the sentencing report.

Sample selection began with the identification of all those offenders sentenced between 1992 and 1998 and serving time for a violation of section 18 U.S.C. 2D1.1. This section refers to unlawful manufacturing, importing, exporting, or trafficking of illegal drugs (including possession with the intent to commit these offenses and attempt or conspiracy). The time frame was limited to offenders sentenced since 1992 because our interest is primarily on smuggling activities that occurred in the 1990s and because 1992 was the first year that the Bureau of Prisons began distinguishing between crack and powder cocaine. This distinction is important because prior to 1992 it is impossible to identify whether the primary drug related to the trafficking offense was crack or powder cocaine. Fiscal year 1998 was the cutoff because this was the most recent data available.

The U.S. Sentencing Commission provided their electronic database for all offenders sentenced from 1992 through 1998 for drug trafficking, as either the primary or one of the five most serious charges. Four hundred and fifteen (415) offenders were identified who met these criteria.

Of these 415, we wished to distinguish between high-level drug smugglers and those who operated at a lower level. Based on the literature, our interviews with undercover agents, and conversations with USSC staff, variables that distinguished between these two groups included:

- aggravated role in the offense
- criminal history points[28], as calculated from the defendant's prior criminal history
- offense level[29], the defendant's final adjusted offense level
- acceptance of responsibility
- defendants' departure status, including whether the defendant provided substantial assistance

We reviewed the majority (93%, or 51 of 55) of 1998 PSRs[30] to assess how each variable was related to the offender and the instant offense. Part of this sample (39) included all those who had either accepted responsibility or cooperated with the government, under the assumption that this would be the group that would be the most likely to agree to an interview. The reviewers paid particular attention to the differences between those that accepted responsibility or provided substantial assistance and those who did not, however, ultimately this difference didn't affect our decision.

Although the level of detail in each PSR varied across reports, a specific set of elements, when available, were coded for each report (see Appendix DI for the coding document developed for culling information from PSRs). The coded data included background information (age, place of birth, education, and ethnicity), prior arrests and sentences, and the specifics of the instant and other offenses (region of smuggling activity, role in the offense, size of the load, type of drug, method of conveyance, co-defendants and any other information provided). This information was used to make a determination of the offender's level of involvement in drug. Selection at this point was done through a case by case assessment of the decision-making authority the offender had in the instant offense, their past experience smuggling drugs, and their role in the instant offense.

The primary variable used to make this assessment was the role in the offense, where mules, couriers, off-loaders, and those who managed, led, or supervised activities that were unrelated to the transport were excluded from the pool of eligible interviews. The role of the defendant in the instant offense was typically well documented in the PSR. We also focused on the scope of the operation that the defendant was overseeing and the defendant's relationship to the actual importation of the drugs.

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[28] Criminal history points are based on the defendant's prior sentences of imprisonment, whether the instant offense was committed while the defendant was under an criminal justice sentence, and whether the instant offense was committed within two years after release from imprisonment or escape status on such a sentence.

[29] Offense levels are calculated, using prescribed guidelines, by the probation officer prior to sentencing. The probation officer makes a determination based upon the role the defendant played in committing the offense and is not based solely on the basis of elements in the count of conviction. The court may depart from the guidelines if the defendant has provided substantial assistance in the investigation or prosecution of another person who has committed an offense or for other reasons, including, aggravating or mitigating circumstances of a kind not already taken into consideration, death, use of a weapon or dangerous instrumentality, or for extreme conduct on behalf of the defendant. The offense level may be changed by the judge during sentencing or due to objections made by the government or the defendant.

[30] 1998 PSRs were housed at the USSC (as opposed to offsite storage) and this readily available for review.

The review indicated that U.S. citizens were more likely to have authority over picking-up the smuggled load and distributing the drugs within the U.S. and were less likely to have had any decision-making authority over the actual transport of the drugs into the U.S. We also found that females were more likely to have played a minor role in the offense, often acting as couriers, mules, or assistants to their male companion. Based on the review of the sample of 1998 PSRs, the following decisions were made to narrow the pool of eligible interviewees for offenders sentenced in all years:

- Women were excluded from the sample due to the expense associated with interviewing at both female and male correctional institutions.
- U.S. citizens with no prior convictions and who were not leaders or organizers of more than 5 people as part of a smuggling operation were excluded from the sample. Offenders who fit these criteria were more likely to be transporting drugs within the U.S. and, if involved in the actual transport, had reduced roles in the transportation activities, such as courier, mules, or off-loaders. Therefore, the U.S. citizens who remained were all those with a criminal history, regardless of their role, or who were leaders or organizers of a conspiracy involving 5 or more people. The reason these criteria could not be extended to non-U.S. citizens was because the non-U.S. criminal history is not systematically recorded.
- All offenders with an offense level below 32 were excluded from the sample. A base offense level of 32 indicates that one smuggled or conspired to smuggle at least 5 kilograms but less than 15 kilograms of cocaine into the U.S. This criteria would include the majority of cases where the offenders held leadership positions in a conspiracy to smuggle more than 15 kilograms of cocaine.

The following are examples of cases reviewed:

> **Case 1:** A 37 year-old Haitian who recruited body carriers to transport drugs from Haiti to the U.S. on commercial airlines.
>
> **Case 2:** A 52 year-old Cuban worked for an organization receiving drugs transported via a commercial vessel and distributed drugs within the U.S. His role was to hire people to transport the drugs to retailers in the U.S.
>
> **Case 3**: 47 year-old Cuban who worked with Colombian contacts to organize airdrops to private vessels in the Bahamian waters.
>
> **Case 4:** 53-year old U.S. citizen who was responsible for all aspects of the transportation of up to 600 kilos of cocaine through Puerto Rico and the Caribbean Islands into the U.S., using a variety of methods.

The first two cases were excluded because PSR information indicated that they worked for someone else who was the actual organizer of the operation. The defendants described in cases 3 and 4 were described as being more involved in the organization of the transportation operations and were included in the sample.

The BOP matched the selected inmates to prison data, identifying the prisons where the offenders were housed. As Figure D2 depicts, the 174 offenders were located in 50 separate prisons (with anywhere from 1 to 15 offenders per prison, indicated in the figure by the size of the pentagon), scattered across the U.S. It would have been cost prohibitive to go to all the prisons, so we limited ourselves to prisons where there were four or more offenders or there was someone that we were particularly interested in. Figure D3 summarizes the sample selection process.

Figure D2
Location of Prisoners

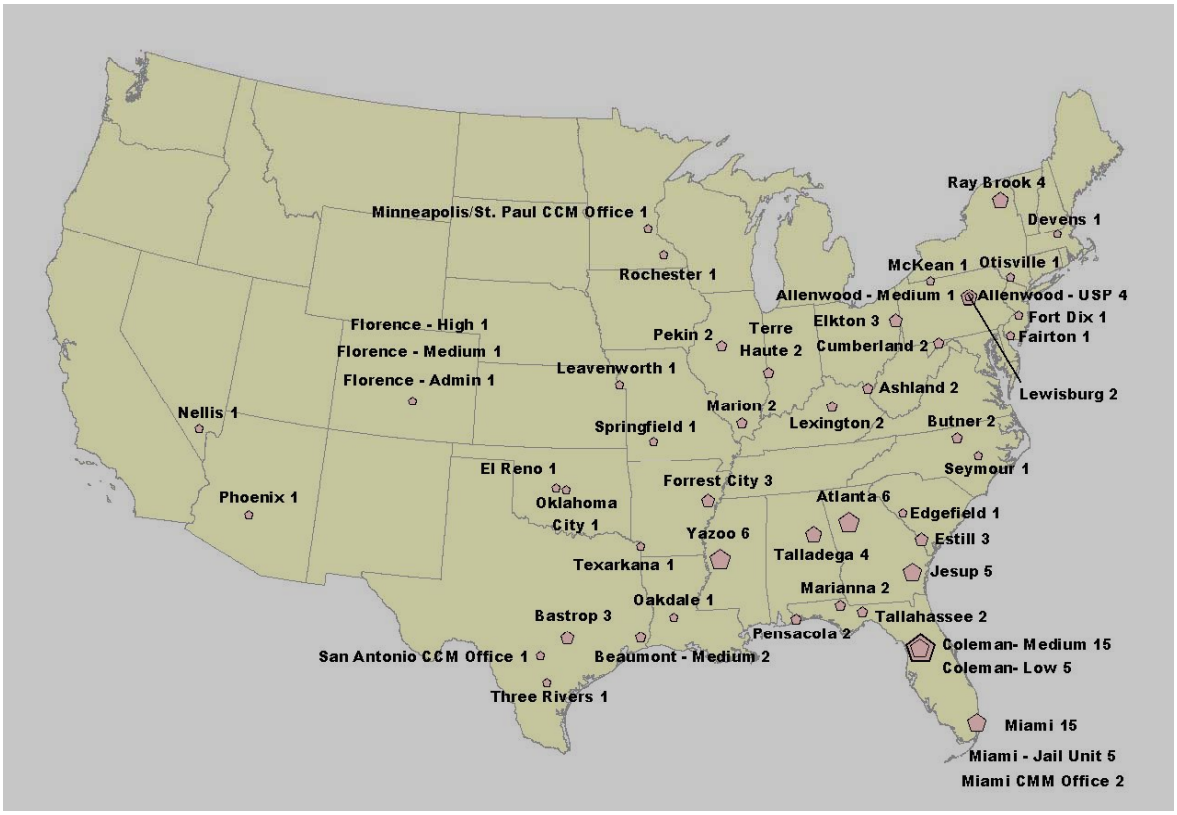
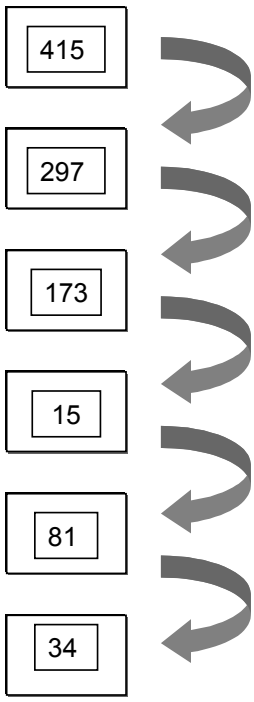


Figure D3

Sample Refinement Process



Excluded:

- Women
- U.S. citizens with no prior criminal history and reduced role in the conspiracy
- Offense level below 32

Excluded:

Those with no decision making authority with respect to transportation

Excluded:

Those not locatable in federal prisons

Excluded:

Prisons with less than 4 subjects

Included:

Those who agreed to be interviewed

Final Sample and Interview Process

Interview Process

Ultimately we went to ten different prison facilities. Because the warden has complete control over the facility, the interview procedure varied from prison to prison. In general, inmates were placed on "call out"[31] and were taken to a room in the institution for the interview. In some cases inmates were approached about the study by prison staff and in others interviewers approached inmates

Reasons for refusal included claims of innocence, mistrust of the confidentiality claim, not wanting to relive the past, attorney recommended non-participation, and hearing what the interview was about before hand and already decided on non-participation. One interview was not completed after signing the informed consent because language barriers became too difficult.

Subjects who agreed to participate seemed interested in sharing their experiences with the interviewers. A few subjects also mentioned that they were already cooperating with the government in some capacity so felt they had nothing to hide. The subjects did not request additional assurances of confidentiality during the interview and did not ask any questions or express any concerns after the interview. Additionally, no one refused to answer any questions during the interview. Interviewers obtained interviews from eleven inmates.

Although the approach used by the interviewers to gain participation was standard, the call out procedure and privacy level was different at each institution. For example, At Miami FCI, inmates were scheduled for a 30-minute call out to the Psychology Department. Those who agreed were then scheduled for a second call out for either that afternoon or the next morning and interviewed in either an empty office or a conference room. The facility had decided that call outs to the Psychology Department would raise the least number of questions among the inmates. Although the interviewers were initially concerned that the inmates who agreed to participate may change their mind once they returned to their cell, the interviewers did not find this to be a problem. In addition, the break gave two inmates the time to consult their attorneys before participating.

Overall, the inmates seemed willing to participate, regardless of the call out procedures or the level of privacy in the interviewing area. Appendix DII summarizes experiences at each of the ten facilities visited.

The Interview Guide

The interview guide was designed for conducting a semi-structured open-ended personal interview. Talking points developed based on a variety of methods. First, interviews were conducted with four U.S. Customs Agents who had worked undercover narcotics cases in the preceding 24 months in all four regions of the United States. Second, the interviews were supplemented by extensive input from Coast

[31] Call out is when prisoners are called from their cells to receive mail, visitors, or medication, meet with staff, and conduct other personal business.

Guard and Customs sponsors. The third basis for developing the guide was a review of the extant literature.

The interview guide (see Appendix DIII) examined a variety of topics, including prior arrest and convictions, the specifics of the inmate's first, most recent, and typical smuggling offense, and perceptions of the risk associated with smuggling drugs into the U.S. Questions were also included to measure the smuggler's reaction to various levels of risk of apprehension, conviction, and sentence. The wording, order, and follow-up questions were dependent on the inmate's responses. Interviews were tape recorded to insure accurate recording of the interviewees' responses. Validity checks were also made across responses and against official records and offense information contained in the pre-sentence report.

The instrument was translated into Spanish and was used in those cases (8) where the inmate was more comfortable discussing their smuggling activities in Spanish. When conducted in Spanish, a translator was used to translate the questions asked by the interviewer and the responses provided by the inmate and were tape recorded as well.

Sample Description

Interviewees varied in age from 32 to 70, with an average age of 48. Participants in the study were arrested for their current offense between 1988 and 1997, and 59% of the sample was arrested in 1993 or later. According to the PSRs, subjects' average period of incarceration was 305 months (about 25 years). Sentence lengths ranged from 10 months to 470 months. 15 out of 34 respondents (44%) had prior criminal history points (reflecting past U.S. convictions). Only 2 of those without U.S. criminal records admitted to any prior non-U.S. arrests.

Just under half (46%) of the reporting sample classified their ethnicity or background as being Cuban, a quarter (25%) Colombian, 11% Puerto Rican, 7% Venezuelan, 4% Haitian, 4% Peruvian, and 4% Bahamian. Six respondents did not specify their ethnicity. According to the PSRs, 31 respondents (94%) were classified as 'white' (both Hispanic and Anglo), 2 (6%) were classified as 'black', and 1 was not given an ethnicity or background classification.

The PSRs document that at the time of sentencing, 16 respondents (47%) were U.S. citizens, 11 respondents (32%) were U.S. residents or legal aliens, 5 respondents (15%) were illegal aliens, and 2 respondents (6%) were non-U.S. citizens. During the interviews, 43% of the reporting sample indicated having a U.S. citizenship, 23% Colombian, 13% Cuban, 10% U.S. resident alien, 3% Venezuelan, 3% Peruvian, and 3% Bahamian. Four respondents did not report their citizenship status.

During the interviews, 23% of the sample reported ending their studies in elementary school (before 9th grade), 29% reported having a high school diploma or GED (and no further formal education) or some high school experience, 29% indicated having some college experience, 16% claimed having a college degree, and 3% reported having some graduate school experience (one respondent). Three respondents did not indicate the level of education they completed. According to PSRs, 16 respondents (48%) did not continue their formal education past the high school level.

According to the respondents, 40% of the sample had engaged in occasional or social drug use (mostly marijuana and cocaine), 28% had used illicit drugs moderately (once or twice a week), 20% had never

used illicit drugs, and 12% had used illicit drugs heavily. Nine interviewees did not report their level of prior personal drug use.

The average age at which subjects first became involved in drug smuggling was 31. 32% of the sample reported that their first involvement with drug smuggling occurred between the ages of 16 and 25. Subjects indicated that their length of involvement in drug smuggling ranged from 1 year (instant offense representing their first involvement) to 24 years, with an average of 11 years.

Excluding those who said this was their first drug related offense (5 respondents), the average length of involvement in drug smuggling was 14 years. Results from the interviews indicate that the average number of career smuggling trips among interviewees was 30, ranging from 1 to 200. Excluding those who said that the instant offense represented their first time, respondents averaged 39 trips before apprehension. Thirty-two percent of these reported involvement in over 50 trips during their careers. According to the interviewees, the average load size for a typical smuggling operation was approximately 900 kilograms, although load size varied widely with transportation method. Although smugglers' exaggerations and limitations must be taken into account when interpreting load amounts, over half of the sample (59%) reported average load sizes of 500 kilograms or more.

Although all interviewees were informed that their responses would not affect their standing within the criminal justice system, answers relating to particularly sensitive and potentially incriminating acts should be viewed with some degree of discretion. Researchers had to take into account both hyperbole and the extent to which respondents might curtail potentially incriminating information. However, the vast majority of interviewees were forthcoming, and responses rarely contradicted information provided on the PSRs.

All participants in the study accurately identified the current offense for which they were imprisoned. Subjects probably assumed that we possessed at least this much of their file. Perhaps more surprising though was their high disclosure rate concerning past offenses. Fully 94% of subjects' criminal history responses were consistent with those indicated on the PSRs.

Most demographic information gleaned from the interviews was consistent with the PSRs. The majority of discrepancies dealt with educational background where 18% of the respondents provided responses to questions about their educational background that did not match the PSR. These participants indicated a level of education that exceeded the level reported on the PSR (possibly in an attempt to impress interviewers).

A slightly higher percentage (24%) of the respondents described their role in the offense as being less than what is indicated on their PSR. This result probably has more to do with the ambiguity of the PSR terms 'manager' and 'supervisor' than with respondents' possible misrepresentation of their roles. Most interviews produced detailed explanations of subjects' roles in the offense; discrepancies between reported roles and roles as indicated on the PSR seemed to be a matter of semantics.

Appendix DIV presents summary information for the sample. Appendix DV provides thumbnail sketches of the final sample interviewed.

Appendix DI: Form Used to Code PSR Information

Name: Co-Defendants:
USSCIDN:
DOB:
Citizenship:
Ethnicity:
Education:

Prior Criminal Justice Contact with US Law Enforcement Officers: (number of prior arrests/convictions; age first arrest/conviction; offense; region of arrest) Criminal History Points =

Current Charge: (date of arrest and charge; date of conviction and charge; number of years sentenced, pled guilty, cooperate) Offense Level= Amount of drugs responsible for=

Year of first smuggling operation/Number of years in smuggling business:

Number smuggling offenses involved in:

Number of times caught:

Link to drug organization/Approx. number of people worked with to complete offense:

Decision-making authority:

Typical role: (organizer/leader/manager, recruiter, off-loader, pick-up/transport, pilot, mule, swallower)

Method typically uses to transport drugs(commair-cargo; commair-on person; private air; commvessel; private vessel; private car; commtruck)

Region or route typically uses (source, transshipment, destination in US):

Experience/knowledge transporting to US or within US or both?

Related Issues (circle all that apply) Accept Responsibility; Cooperating Defendant; Deny Charges; Seeking an Appeal; Dangerous Felon; Pled Guilty; Pled Not Guilty

Should we interview him/her? (No, Yes (*), or definitely (**)) WHY?

Areas of Interest	Current Offense	Other/Typical Offenses
Year of smuggling operation/time period		repeat pg. 1
Region of Smuggling Operation		repeat pg. 1
Size of load		
Type of drug		
Packaging of load		
Value of load		
What they paid for it		
Profit		
Routes and methods from origin to destination (including drop-off, delivery, and stash locations)		
Planned Route and method he/she tasked with		
Recruitment and Experience with method		
His/Her role (circle all that	1 Importer/High-level supplier	1 Importer/High-level supplier

apply)	2 Organizer/Leader 3 Grower/Manufacturer 4 Financier/Money Launderer 5 Aircraft pilot/Vessel Captain 6 Manager 7 Bodyguard/Debt Collector 8 Chemists/Cooks/ Chemical Supplier 9 Supervisor 10 Recruiter 11 Street-level dealer 12 Courier 13 Mule 14 Swallower 15 Off-loader/loader 16 Gopher/lookout/deckhand/employee 17 swallower 18 Cargo crew 19 owner/source of drugs 20 other	2 Organizer/Leader 3 Grower/Manufacturer 4 Financier/Money Launderer 5 Aircraft pilot/Vessel Captain 6 Manager 7 Bodyguard/Debt Collector 8 Chemists/Cooks/ Chemical Supplier 9 Supervisor 10 Recruiter 11 Street-level dealer 12 Courier 13 Mule 14 Swallower 15 Off-loader/loader 16 Gopher/lookout/deckhand/employee 17 swallower 18 Cargo crew 19 owner/source of the drugs 20 other
He/She involved in a conspiracy? If so, size of crew		
Method specifics (type of vehicle/vessel/plane; how drugs were hidden; ownership)		
How gain intl. / try to avoid capture		

Ever caught? Consequences? Reaction (e.g. changed method)?		
Perceived Risk		
perceptions of Smuggling in US		

Appendix DII: Outcome at Each Prison Visited

Appendix DIII: Interview Guide

ID # _____

1. Age _____

2. In what country were you born? _____

Citizenship _____

Ethnicity _____

3. Education

Highest Grade Completed _____

4. Prior Criminal Justice Contact with US Law Enforcement Officials

Age At First Arrest _____ Offense at First Arrest_____

Number of Prior Arrests _____ Age at First Conviction _____

Offense at First Conviction _____

5. Prior criminal justice contact with non-US law enforcement officials

Age at first arrest _____ Offense at first arrest _____

Number of Prior Arrests _____ Age at First Conviction _____

Offense at First Conviction _____

6. Age at First Drug Smuggling Arrest _____

Offense at First Drug Smuggling Arrest _____

Number of Drug Smuggling Arrests _____

Country of Residence at First Drug Smuggling Arrest _____

Location of First Drug Smuggling Arrest _____

Age at First Drug Smuggling Conviction _____

Offense at First Drug Smuggling Conviction _____

Number of Drug Smuggling Convictions _____

Country of Residence at First Drug Smuggling Conviction _____

Location of First Drug Smuggling Conviction _____

[10 MINUTES]

II. Now, I would like you to describe the drug smuggling offense that resulted in your incarceration, in general terms. [Answer all questions with underlines.]

7. Current Offense

Date of Arrest _____ Charge at Arrest _____

Date of Conviction _____ Sentence Length _____

Conviction Offense _____

8. What type of drugs were you smuggling? _____

What was the size of the load (kilos)?_____

How was the load packaged? _____

What was its estimated value in the U.S.? _____

Did you pay for it? _____ If so, how much? _____

Where did the load originate? _____

What was the final destination point? _____

What were the routes and types of conveyances that were going to be used to get the drugs to the final destination point? (locations of pick-up points, transshipment points, stash points, delivery points, POE) _____

Who was the original owner of the load? (Specify whether an organization and/or single or multiple owners)_____

Did ownership of the load change at different points in the smuggling operation? ___ If so, when? _____

What part of the smuggling operation did you participate in? (Specify shipment points and method)_____

Therefore, which of the following would you say best describes your role in the offense for which you are currently serving federal time? Smuggler Source Financier Pilot Air Crew Boat Captain Sea Crew Lookout offloader longshoreman

Courier (Specify Route) Air Sea Land Other (Specify) _____

Lawyer CJS (employee) _____

How were you recruited for this role? _____

What payment and instructions were provided to you? _____

What were you told would happen if the load were stolen/lost/interdicted? _____

What was the nationality of the driver/boat captain/pilot? _____

Was s/he trained to counter law enforcement entities? _____

Were the drugs hidden in a compartment specifically manufactured for drug smuggling or were you using an existing void or space? _____

If modified, how? _____

By what type of person? _____ Where? _____

And how were the drugs going to be accessed from the compartment?_____

What was the level of confidence that law enforcement would not locate the hidden compartment? _____

Was the conveyance owned by someone or rented? _____

If rented, from what type of company or person? _____

If owned, by what type of person? _____

Did they know it was being used to smuggle drugs?_____

If applicable, did they know it had been modified to smuggle drugs?

How many runs were made with this vehicle/boat/plane?_____

What was the make of the vehicle/boat/plane? _____

How many times was it stopped by law enforcement? _____

How did you plan to avoid detection?_____

What techniques did you use to try to avoid detection (spot plane, lookout, and corrupt officials)? _____

Did law enforcement authorities inspect you before departing?_____

Ask the following questions pertaining to the appropriate method.

If transportation by air:

Did you have to refuel the plane before reaching your destination?_____

If so, where did you refuel? _____

Did you know the locations of drug enforcement radars? _____

How were you planning to avoid the radars?_____

If transportation by boat:

How was shipment of the load coordinated? (on-load, transit, and off-loads)_____

With what type of person did you communicate with and how often? _____

What was the alternate plan if communication broke down? _____

Did you travel directly to your destination or try to stay close to foreign countries?__ If so, which ones? _____

Where did you refuel and get your provisions? _____

How much were you going to be paid? _____ ($, pesos, contraband)

If contraband, what proportion of the load were you going to get to keep? ____

When were you going to receive your payment? _____

What were you going to do with the money or contraband? _____

Were you surprised when you were caught? _____

Did you think about getting caught? _____

Whose fault was it that you got caught? _____

What did you think your chances of getting caught were? _____

How did you figure those odds? _____

What did you tell yourself about the risk of being caught that allowed you to overcome any fears of being caught? _____

[30 MINUTES]

9. Now I want you to describe your first drug smuggling offense for me. Use as much detail as you can recall, and remember that what you tell me cannot be linked to you. [Answer all questions with underlines.]

How old were you when you first participated in such an activity? _____

What year was it? _____

How did you come to be involved in drug smuggling? Were you recruited, did you join in with friends, were family members or relatives involved in the activity, or did you initiate it on your own? _____

Why did you decide to get involved in smuggling drugs? _____

How long did you plan on being involved in drug smuggling? _____

What kind of drug was it? _____

What was the size of the load (kilos)? _____

How was the load packaged? _____

Where did the load originate? _____

What was the final destination point?_____

What routes and types of conveyance were used to get the drugs to the final destination point? (Specify locations for pick-up, transshipment, stash, delivery points, POE) _____

What type of person was the original owner of the load? (Specify whether organization and/or single or multiple

owners)_____

Did ownership of the load change at different points in the smuggling operation? _____

What part of the smuggling operation did you participate in? (Specify shipment points and method)_____

Therefore, which of the following would you say best describes your role in your first drug smuggling offense?

Smuggler Source Financier Pilot Air Crew Boat Captain Sea Crew Lookout offloader longshoreman Courier (Specify Route) Air Sea Land Other (Specify) _____ Lawyer CJS employee (Specify) _____

What payment and instructions were provided to you? _____

What were you told would happen if the load were stolen/lost/interdicted? _____

What was the nationality of the driver/boat captain/pilot? _____

Was s/he trained to counter law enforcement entities? _____

Were the drugs hidden in a compartment specifically manufactured for drug smuggling or were you using an existing void or space? _____

If modified, how? _____

By what type of person? _____ Where?_____

How were the drugs going to be accessed from the compartment?_____

What was the level of confidence that law enforcement would not locate the hidden compartment? _____

Was the conveyance owned or rented? _____

If rented, from what type of person or company?_____

If owned, by what type of person? _____

Did they know it was being used to smuggle drugs?_____

If applicable, did they know it had been modified to smuggle drugs?

What techniques did you use to try to avoid detection (spot planes, lookouts, corrupt officials, etc.)? _____

Did law enforcement authorities inspect you before departing?_____

Ask the following questions pertaining to the appropriate method.

If transportation by air:

Did you have to refuel the plane before reaching your destination? _____

If so, where did you refuel?_____

Did you know the locations of drug enforcement radars? _____

How did you plan to avoid them?_____

If transportation by boat:

How was shipment of the load coordinated? (on-load, transit, and off-loads) _____

What type of person did you communicate with and how often? _____ What was the alternate plan if communication broke down? _____

Did you travel directly to your destination or stay close to foreign countries? _____

If so, which ones? _____

Where did you refuel and get your provisions?_____

What were you paid? _____ ($, pesos, contraband)

If contraband, what proportion of the load did you keep? _____

When did you receive it? _____

What did you do with the money or contraband? _____

Did you think about getting caught? YES NO

What did you think your chances of getting caught were? _____

How did you figure those odds? _____

What did you tell yourself about the risk of being caught that allowed you to overcome any fears of being caught? _____

Was anyone caught in that drug smuggling activity? YES NO

How were they caught? _____

Why were they caught? _____

How did you avoid detection? _____

Why did you continue to smuggle drugs? _____

[45 MINUTES]

10. Now I want you to think about how many times you have been involved in smuggling drugs into the United States, or as part of a chain that smuggled drugs that ultimately were headed to the United States. How many times have you been involved in such activities? _____

Have you ever been arrested before? YES NO, IF YES, how many times? ____

Have you ever been convicted before? YESNO, IF YES, how many times? ____

11. Now I want you to think about a typical drug smuggling activity, the way you usually do it when you smuggled drugs into the United States. Again, we are not interested in information that may be linked to you. [Answer all questions with underline.]

How are you typically recruited to participate in an offense? _____

Do you typically work for one individual or organization? _____

How do they usually recruit you? _____

Are they the owners of the load? _____

How does this individual or organization assist you in smuggling drugs into the U.S.?

_____

What kind of drug do you typically smuggle into the U.S.? _____

Do you typically carry one type of drug or a variety of drugs?___ Why? ____

What is the typical size of the load (kilos)? _____

What is the typical method of conveyance? _____

What is the route typically used to smuggle drugs into the U.S.? (Describe where the operation originates from; pick-up, transshipment, stash, and drop-off points; and the final destination/POE) _____

What part of the smuggling operation do you typically participate in?

(Specify points and method)_____

Therefore, which of the following would you say best describes your typical role in the offense?

Smuggler Source Financier Pilot Air Crew Boat Captain Sea Crew

Lookout offloader longshoreman Courier (Specify Route) Air Sea Land Other (Specify) _____

CJS employee (Specify) _____

How many people do you typically work with to transport a load of drugs into the U.S.? _____

What are the roles of the other people you work with to transport a load of drugs into the U.S? _____

Does someone typically provide security?____ When? _____ Why?

Do you typically practice Santeria or voodoo to bless the load? _____

Have you ever attempted to retaliate or resist law enforcement efforts with force? _____

In what percentage of trafficking efforts of trafficking events were you able to use force to resist law enforcement efforts? _____

Do you typically carry a weapon? _____ Why? _____

What is the typical payment and instructions provided to you? _____

What are you typically told will happen if the load was stolen/lost/interdicted? _____

What is the typical nationality of the driver/boat captain/pilot? _____

Is s/he typically trained to counter law enforcement entities? _____

How is the load typically packaged? _____

Are the drugs typically hidden in a compartment specifically manufactured for drug smuggling or were you using an existing void or space? _____

If modified, how? _____

What type of person typically does this? _____ Where?_____

How are the drugs accessed from the compartment?_____

What is the level of confidence that law enforcement would not locate the hidden compartment? _____

Is the conveyance typically owned or rented? _____

Do you typically use the same route each time? _____

Is there a certain time of day that you prefer to run the smuggling operation?___

If so, when and why? _____

How many runs are typically made with a particular vehicle/boat/plane?_____

What is the typical make of the vehicle/boat/plane? _____

Is the same driver/pilot/captain used for each event? ___ Why? Why not?

How do you typically plan to avoid detection?_____

What techniques did you typically use to try to avoid detection (spot planes, lookouts, and corrupt officials)? _____

Do law enforcement authorities typically inspect you before departing?_____

Ask the following questions pertaining to the appropriate method identified above.

If transportation by air:

Do you typically know the locations of drug enforcement radars? _____

How do you plan to avoid the radars?_____

If transportation by boat:

How is shipment of the load typically coordinated? (on-load, transit, and off-loads) _____

What type of person do you typically communicate with and how often? _____

Do you communicate that planes are flying overhead? _____

Is there an alternate plan if communication breaks down? _____

Do you typically take a direct route to your destination or try to stay close to foreign countries? _____ If so, which ones? _____

What are you typically paid? _____ ($, pesos, contraband)

If contraband, what proportion of the load do you keep?

When do you receive it? _____

What do you do with the money or contraband? _____

Do you think about getting caught? YES NO

What do you think your chances of getting caught typically are? _____

How do you figure these odds? _____

What do you tell yourself about the risk of being caught that allows you to continue smuggling drugs? _____

III. Now, I am going to ask you a number of questions related to your assessment of the risks associated with smuggling drugs into the United States. [60 MINUTES. Answer all of the remaining questions.]

12. How many times did you think you could smuggle drugs into the US before getting arrested? _____ Convicted? _____

What factors do you use to determine this? (experience, role in offense, luck, mode of transport, etc.) _____

13. On any given attempt, what did you think your chances of being arrested while smuggling drugs into the US is? _____

What do you base this on? _____

What could increase your risk of being caught? _____

14. On any given attempt, what did you think your chances of being convicted for smuggling drugs into the US is? _____

What do you base this on? _____

15. If you had been convicted of smuggling drugs into the US what sentence did you believe you would receive? _____

16. I want you to think about the chances of being arrested for drug smuggling. If the chances were 1 out of 100, would that stop you from trying to smuggle drugs into the US? YES NO. What if the chances were 10 out of 100? YES NO. And if the chances were 50 out of 100, would that stop you from trying to smuggle drugs into the US? YES NO.

What would your chance of being arrested have to be to make you stop? _____

How many times would you have to be arrested before you would stop trying to smuggle drugs into the US? _____

17. Now I want you to think about the chances of being convicted for smuggling drugs. If the chances were 10 out of 100, would that stop you from trying to smuggle drugs into the US? What about 25 out of 100? YES NO.

What about 50 out of 100? YES NO. And finally, what about 90 out of 100? Would that be enough to stop you from smuggling drugs into the US? YES NO.

18. Now, let's turn our attention to sentence length. I want you to think about the kind of sentences you might receive for drug smuggling, and whether the threat of such a sentence would be enough to cause you to stop smuggling drugs. If you were arrested and sentenced for drug smuggling, would a sentence of five years be enough to stop you from trying to smuggle drugs into the US?

19. YES NO. What about a sentence of ten years, would that be long enough to cause you to stop trying to smuggle drugs into the US? YES NO. What about a sentence of twenty-five years, would that be long enough to cause you to stop smuggling drugs into the US? YES NO. Finally, what about a life sentence, would that be long enough to cause you to stop smuggling drugs? YES NO.

What percentage of your prison sentence do you expect to serve before being released?_____

Did someone in the drug smuggling business tell you that this is what to expect? _____

[90 MINUTES]

19. In general, what is the hardest way to smuggle drugs into the US? _____

What is the hardest part of the drug smuggling event? _____

Which of the following roles in drug smuggling has the greatest chance for being caught? The least? Why? _____ How do you get to choose one role over another? _____

Which of the roles is the best?

Smuggler Source Financier Pilot Air Crew Boat Captain Sea Crew Lookout offloader longshoreman Courier (Route) Air Sea Land Other (specify) _____ CJS employee (Specify) _____

Why? _____

Is there a chain of command within smuggling operations? That is, is someone in charge of the entire operation or are they a series of exchanges? _____

20. What is the easiest way (method) to smuggle drugs into the US? _____

What port of entry is the easiest to smuggle drugs into? _____

The hardest? _____

Why? _____

21. What was your single best score? That is, what drug did you choose, how did you obtain it, how large a load did you get, what

was your role, how did it come into the US, and how much money did you make? _____

What is the most important thing to focus on when smuggling drugs into the US? _____

22. I want you to think about the time(s) you were arrested for trying to smuggle drugs into the US. Why were you arrested? _____

Did you do anything different than you normally do? _____

What would you do to avoid detection in the future? _____

What is the biggest risk you ever took in trying to smuggle drugs into the country? _____

Why did you take that risk? _____

Do you think about getting caught? _____

What is the worst thing that could happen if you were apprehended by law enforcement?_____

23. What are the consequences for losing a load?_____ What proportion of the load is considered an acceptable loss? _____ Is the answer different if the load is seized, stolen, or lost? _____ What type of person do you answer to? _____ What type of threats would they make? _____ How do they determine that you didn't just sell it out from under them? _____

What do you have to do to pay them back? _____

Why do you think you been trusted with drugs? _____

Does the size of the load you are entrusted with increase with the number of successful runs or experience? _____

24. Do you have any knowledge about other seizures that have occurred? Do you think certain organizations are targeted?_____

25. How do you learn about US efforts to interdict drugs? _____

What forms of technology did you use to learn about or monitor the activities of the US government? _____

How quickly do you change your tactics for smuggling after learning about new interdiction strategies? _____

26. If you were put in charge of trying to stop the illegal smuggling of drugs into the US what steps would you take? _____ What would it take to make you stop smuggling drugs into the US? _____

27. What drugs have you ever used in your lifetime? Cocaine Heroin Marijuana Other (specify) _____ None

How regularly do you use drugs? Daily Weekly Monthly

How are you supporting your family while in prison? _____

What will happen to you after you finish your sentence? _____If deported?

Will you go back to smuggling drugs? _____

28. Is there any other thing I should know about interdicting drug smuggling that we have not mentioned during this conversation?

_____

_____

[120 MINUTES]

Date of Interview: _____

Location: _____

Interviewer: _____

Appendix DIV: Descriptive Information for Smuggler Sample

Variables	N = 415	N = 297	N = 174	N = 34
Gender				
Male	383 (92%)	297 (100%)	174 (100%)	34 (100%)
Female	32 (8%)	0 (0%)	0 (0%)	0 (0%)
Race				
White	296 (71%)	224 (75%)	144 (83%)	31 (91%)
Black	95 (23%)	55 (19%)	21 (12%)	2 (6%)
American Indian/Alaskan Native	1 (0%)	1 (0%)	0 (0%)	0 (0%)
Asian Pacific	3 (1%)	3 (1%)	1 (1%)	0 (0%)
Other and Missing	20 (5%)	14 (5%)	8 (5%)	1 (3%)
Hispanic Origin				
Non-Hispanic	186 (45%)	109 (37%)	52 (30%)	5 (15%)
Hispanic	229 (55%)	188 (63%)	122 (70%)	29 (85%)
Citizenship				
U.S. Citizen	194 (47%)	112 (38%)	76 (44%)	16 (47%)
Legal Alien/resident	115 (28%)	96 (32%)	48 (28%)	10 (29%)
Illegal Alien	52 (13%)	40 (14%)	21 (13%)	5 (15%)
Unknown Status/Missing	54 (14%)	49 (16%)	29 (15%)	3 (9%)
Accept Responsibility				
Three Level Reduction	158 (38%)	106 (36%)	60 (35%)	14 (41%)
Two Level Reduction	97 (23%)	74 (25%)	48 (28%)	8 (24%)
No Reduction	160 (39%)	117 (39%)	66 (38%)	12 (35%)
Offense Level				
<32	49 (12%)	0 (0%)	0 (0%)	0 (0%)
32- 34	47 (11%)	37 (12%)	7 (4%)	1 (3%)
35 – 37	66 (16%)	52 (18%)	24 (14%)	4 (12%)
38 – 40	127 (31%)	101 (34%)	66 (38%)	10 (29%)
41 – 43	104 (25%)	91 (31%)	61 (35%)	17 (50%)
44- 46	17 (4%)	12 (4%)	12 (7%)	1 (3%)
47- 49	4 (1%)	3 (1%)	3 (2%)	1 (3%)
>50	1 (0%)	1 (1%)	1 (1%)	0 (0%)
Role Offense				
Manager, Organizer, Supervisor, or Leader	155 (37%)	82 (28%)	34 (20%)	5 (15%)
Manager or Supervisor >5 participants	123 (30%)	83 (28%)	42 (24%)	10 (29%)
Leader or Organizer >5 participants	137 (33%)	132 (44%)	98 (56%)	19 (56%)
Departure Status				
None	250 (60%)	184 (62%)	114 (66%)	30 (88%)

Upward	1 (0%)	0 (0%)	0 (0%)	0 (0%)
Variables	**N = 415**	**N = 297**	**N = 174**	**N = 34**
Downward	19 (5%)	10 (3%)	7 (4%)	0 (0%)
Substantial Assistance	129 (31%)	92 (31%)	48 (28%)	4 (12%)
Missing	16 (4%)	11 (4%)	5 (3%)	0 (0%)
Criminal History Points				
0	253 (61%)	165 (56%)	98 (56%)	19 (56%)
1 through 3	86 (21%)	68 (23%)	46 (26%)	6 (18%)
4 through 6	54 (13%)	44 (15%)	21 (12%)	7 (21%)
7 through 10	16 (4%)	14 (5%)	4 (2%)	0 (0%)
> 10	6 (1%)	6 (2%)	5 (3%)	2 (2%)
Year Sentenced				
1992	78 (19%)	60 (20%)	35 (20%)	10 (29%)
1993	78 (19%)	57 (19%)	34 (20%)	3 (9%)
1994	58 (14%)	46 (15%)	26 (15%)	4 (12%)
1995	44 (11%)	33 (11%)	20 (12%)	4 (12%)
1996	53 (13%)	35 (12%)	17 (10%)	5 (15%)
1997	49 (12%)	31 (10%)	20 (12%)	4 (12%)
1998	55 (13%)	35 (12%)	22 (13%)	4 (12%)
Months Sentenced to Prison				
Less than 60 months	47 (11%)	19 (6%)	7 (4%)	1 (3%)
61 – 120 months	81 (20%)	41 (14%)	21 (12%)	2 (6%)
121 – 180 months	72 (17%)	55 (19%)	27 (16%)	3 (9%)
181 – 240 months	68 (16%)	56 (19%)	34 (20%)	9 (26%)
241 – 300 months	43 (10%)	35 (12%)	22 (13%)	2 (6%)
301 – 360 months	50 (12%)	44 (15%)	29 (17%)	5 (15%)
> 360 months	54 (13%)	47 (16%)	34 (22%)	12 (35%)

Appendix DV: Thumbnail Sketches of Smugglers Interviewed

SUBJECT 1.

Age: 40
Citizenship: Venezuela
Education: high school
Ethnicity: Venezuelan
Drug use: some marijuana and cocaine use
First year known smuggling: 1979
Last year known smuggling: 1988
Estimated number of trips: over 50
Number of times caught: 1
Preferred method, route, role: vessel, airplane; Colombia to Miami, FL, Tampa, FL; transportation manager
Typical load size: 400-500 kilos

Charge: Conspiracy to Import Cocaine, Distribution of Cocaine
How caught: undercover operation (DEA)
Sentence length: 30 years

Notes: Current charge - 1st U.S. arrest and conviction (age 28)

SUBJECT 2.

Age: 46
Citizenship: U.S. resident alien
Education: some college
Ethnicity: Cuban
Drug use: social cocaine use
First year known smuggling: 1972
Last year known smuggling: 1991
Estimated number of trips: 200
Number of times caught: 1
Preferred method, route, role: private airplane; Colombia to Miami, FL, Mexico City, Mexico; body-guard, transporter, financier, pilot
Typical load size: 5000 kilos

Charge: Conspiracy to Import Cocaine
How caught: cooperating defendant
Sentence length: 27 years

Notes: 6 prior U.S. indictments, 3 prior non-U.S. arrests (Nassau, Peru, Colombia), 1st U.S. arrest 1979 (marijuana possession), 1st U.S. conviction 1982 (marijuana possession – 3 years)

SUBJECT 3.

Age: 48
Citizenship: U.S.
Education: college
Ethnicity: Cuban
Drug use: unknown
First year known smuggling: 1980 (warehousing work), 1988 (1st heavy involvement in drug trafficking)
Last year known smuggling: 1995
Estimated number of trips: refused to say (more than 1)
Number times caught: 1
Preferred method, route, role: private vessel; Bahamas and Puerto Rico to Florida; transportation manager, oversaw boat captains
Typical load size: 700-800 kilos (Bahamas), 1000-1500 kilos (Puerto Rico)

Charge: Importation of Cocaine, Money Laundering
How caught: undercover operation
Sentence length: 30 years

Notes: 2 prior arrests (served time in 1988 for Fraud)

SUBJECT 4.

Age: 60
Citizenship: U.S.
Education: some college
Ethnicity: Cuban
Drug use: daily cocaine, marijuana, and mescaline use
First year known smuggling: 1988
Last year known smuggling: 1988
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: private vessel, private airplane; airdrops – private airplane to Bahamas, vessel to U.S.; oversaw smuggling operation
Typical load size: 630 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine, Possession, Intent to Distribute Cocaine
How caught: confidential informant, undercover operation
Sentence length: 31 years, 3 months

Notes: 4 U.S. arrests (3 drug related), 2 non-U.S. arrests in Cuba (political arrests), first drug related arrest: 1982 (criminal sale of narcotics)

SUBJECT 5.

Age: 43
Citizenship: Cuban
Education: high school
Ethnicity: Cuban
Drug use: unknown
First year known smuggling: 1976
Last year known smuggling: 1993
Estimated number of trips: more than 50
Number of times caught: 2
Preferred method, route, role: private vessel; Colombia to the Bahamas to Miami, FL; boat captain (tasked with constructing hidden compartments on boats)
Typical load size: 550 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: U.S. Coast Guard
Sentence length: 8 years

Notes: 2 prior U.S. arrests (1st was drug smuggling offense, 1984 – Conspiracy to Import Marijuana and Intent to Possess Marijuana), 1 prior non-U.S. arrest (non-drug related)

SUBJECT 6.

Age: 52
Citizenship: Cuban
Education: high school (GED)
Ethnicity: Cuban
Drug use: heavy, primarily cocaine use
First year known smuggling: 1973
Last year known smuggling: 1996
Estimated number of trips: 15-20
Number of times caught: 2
Preferred method, route, role: private vessels (fishing vessels and sailboats); transport from the Bahamas to Miami, FL; boat captain, transporter
Typical load size: 700-1000 kilos

Charge: Conspiracy to Import Cocaine
How caught: DEA investigation, confidential informant

Sentence length: 17 ½ years

Notes: 2 prior U.S. arrests (cocaine possession 1990 – no conviction), 1 non-U.S. arrest (Colombia, non-drug related)

SUBJECT 7.

Age: 64
Citizenship: U.S.
Education: 6th grade
Ethnicity: Cuban
Drug use: unknown
First year known smuggling: 1977 (money laundering)
Last year known smuggling: 1991
Estimated number of trips: more than 1
Number of times caught: 1
Preferred method, route, role: commercial (containerized) vessel, commercial (passenger) airplane; vessel from Venezuela to Puerto Rico, airplane from Puerto Rico to Miami, FL; money launderer
Typical load size: 8,000 kilos

Charge: Conspiracy to Import Cocaine
How caught: arrested in Uruguay, extradited to U.S. on a money laundering charge
Sentence length: 30 years, 5 months

Notes: first arrest, worked for high ranking members of the Cali Cartel (Santacruz Londono)

SUBJECT 8.

Age: 50
Citizenship: Colombian
Education: high school
Ethnicity: Colombian
Drug use: heavy, primarily cocaine use
First year known smuggling: 1978
Last year known smuggling: 1996
Estimated number of trips: unknown (more than 1)
Number of times caught: 1
Preferred method, route, role: private vessel (banana boat); transport from Turbo, Colombia to Bridgeport, CT; transporter, scuba-diver
Typical load size: approximately 40 kilos

Charge: Conspiracy to Import Cocaine
How caught: Connecticut police department
Sentence length: 17 ½ years

Notes: Current charge – only arrest, no non-U.S. arrests.

SUBJECT 9.

Age: 33
Citizenship: Colombian
Education: some college
Ethnicity: Colombian
Drug use: unknown
First year known smuggling: 1993
Last year known smuggling: 1993
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: private vessel (sailboat); Colombia to Tampa, FL; transporter, broker
Typical load size: 176 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine, Conspiracy to Possess with Intent to Distribute Cocaine
How caught: confidential informant, cooperating defendant
Sentence length: 17 years, 5 months

Notes: No prior arrests, claims he was unaware of the narcotics he was transporting

SUBJECT 10.

Age: 34
Citizenship: US resident alien
Education: high school
Ethnicity: Cuban
Drug use: unknown
First year known smuggling: late 1980's
Last year known smuggling: 1993
Estimated number of trips: 4
Number of times caught: 1
Preferred method, route, role: private vessel (sailboat); Caribbean to Tampa, FL; oversaw transportation arrangements
Typical load size: 300 kilos the first trip, 5000 kilos the last trip (instant offense)

Charge: Conspiracy to Import Cocaine
How caught: undercover U.S. Customs agent
Sentence length: 17 ½ years

Notes: 2 U.S. arrests (1st arrest – 1985, carrying a concealed weapon), no non-U.S. arrests

SUBJECT 11.

Age: 41
Citizenship: U.S.
Education: high school
Ethnicity: Haitian
Drug use: social cocaine and marijuana use
First year known smuggling: 1993
Last year known smuggling: 1997
Estimated number of trips: 10
Number of times caught: 1
Preferred method, route, role: commercial air; Haiti to Miami, FL and New York, NY; managed passenger-carry operations
Typical load size: approximately 20 kilos (20 kilos per suitcase, most ever: 6 suitcases), approximately 800 kilos total

Charge: Importation and Distribution of Cocaine
How caught: unknown
Sentence length: 19½ years (departure to 48 months)

SUBJECT 12.

Age: 38
Citizenship: unknown
Education: some college
Ethnicity: Venezuelan
Drug use: unknown
First year known smuggling: 1991
Last year known smuggling: 1991
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: private air; liquid bottles of cocaine transported from Venezuela to Florida; supervisor
Typical load size: 5.5 kilos (conspiracy charge involved over 600 kilos of cocaine)

Charge: Conspiracy to Import Cocaine
How caught: undercover operation (DEA)
Sentence length: 27 years, 3 months

Notes: No arrests outside the U.S., 2 concurrent charges of Conspiracy to Import Cocaine and International Smuggling of Cocaine

SUBJECT 13.

Age: 48
Citizenship: unknown
Education: unknown
Ethnicity: Cuban
Drug use: unknown
First year known smuggling: unknown
Last year known smuggling: unknown
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: unknown method; Panama to Miami; unknown role
Typical load size: 59 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: undercover operation (DEA)
Sentence length: 19 years, 6 months

Notes: No non-U.S. arrests, current charge only drug trafficking charge, claims to have had no involvement in the smuggling event

SUBJECT 14.

Age: 37
Citizenship: Cuban
Education: 11th
Ethnicity: Cuban
Drug use: occasional cocaine use
First year known smuggling: 1980
Last year known smuggling: 1994
Estimated number of trips: 50
Number of times caught: 1
Preferred method, route, role: private airplane, private vessel (go-fasts); airdrops in the Florida Keys; transporter
Typical load size: 800 kilos

Charge: Conspiracy to Import Cocaine and Conspiracy to Import Marijuana
How caught: cooperating defendant
Sentence length: 15 years (originally 30 years)

Notes: Current charge -- first arrest, no non-U.S. arrests

SUBJECT 15.

Age: 48
Citizenship: Peruvian
Education: high school
Ethnicity: Peruvian
Drug use: moderate cocaine use
First year known smuggling: 1996
Last year known smuggling: 1996
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: commercial airplane; body-carry on commercial airliner to Miami, FL; transportation supervisor
Typical load size: 2 kilos

Charge: Conspiracy to Import and Possess Cocaine
How caught: confidential informant
Sentence length: 16 years and 3 months

Notes: First U.S. arrest, no prior non-U.S. arrest history, possession of loaded firearm during instant offense

SUBJECT 16.

Age: 55
Citizenship: Cuban, U.S. resident alien
Education: 6th grade
Drug use: moderate cocaine and marijuana use
Ethnicity: Cuban
First year known smuggling: 1975
Last year known smuggling: 1991
Estimated number of trips: 40-50
Number of times caught: 1
Preferred method, route, role: commercial (containerized) vessel; shipments from Colombia to Miami, FL; broker, organizer
Typical load size: 500 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: undercover operation (DEA)
Sentence length: life (reduced to 20 years)

Notes: 3 prior arrests in U.S. (others were drug related, but not trafficking charges), no non-US arrests

SUBJECT 17.

Age: 42
Citizenship: Colombian, U.S. resident alien until 1990
Education: college
Drug use: social cocaine use
Ethnicity: Colombian
First year known smuggling: 1978
Last year known smuggling: 1990
Estimated number of trips: 85
Number of times caught: 1
Preferred method, route, role: private vessel (sailboat), private plane; Colombia to Caribbean (airdrop), then to Miami, FL; organizer
Typical load size: approximately 1000 kilos

Charge: Conspiracy to Import Cocaine
How caught: undercover operation (DEA)
Sentence length: life (reduce to 10 years)

Notes: No priors arrests

SUBJECT 18.

Age: 36
Citizenship: Colombian
Education: some college
Drug use: unknown
Ethnicity: Colombian
First year known smuggling: 1990
Last year known smuggling: 1991
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: commercial vessel; Colombia to Venezuela to Miami; operated as front man for import/ export business in Miami, FL
Typical load size: 500 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import and Possess Cocaine
How caught: U.S. law enforcement detected drugs on board vessel
Sentence length: 27 years

Notes: First U.S. arrest, no arrests outside the U.S., incomplete pre-sentencing report information

SUBJECT 19.

Age: 56
Citizenship: Colombian
Education: some college
Ethnicity: Colombian
Drug use: none
First year known smuggling: 1983
Last year known smuggling: 1991
Estimated number of trips: more than 16
Number of times caught: 1
Preferred method, route, role: commercial airplane (cargo plane), commercial vessel (containerized); airplane from Colombia to Honduras, vessel to Miami, FL; hired to receive drugs in Miami, FL and deliver them to distributors
Typical load size: 700 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: confidential informant
Sentence length: 15 years

Notes: No prior arrests

SUBJECT 20.

Age: 54
Citizenship: Cuban
Education: 5th grade
Ethnicity: Cuban
Drug use: some cocaine and marijuana use
First year known smuggling: 1979
Last year known smuggling: 1996
Estimated number of trips: 10 trips marijuana, 5 trips cocaine
Number of times caught: 3 (2 marijuana, 1 cocaine)
Preferred method, route, role: private vessel; Bahamas to Miami, FL; boat captain
Typical load size: 600-800 kilos

Charge: Conspiracy to Import Cocaine
How caught: U.S. Customs Services
Sentence length: 28 years, 9 months

SUBJECT 21.

Age: 56
Citizenship: U.S.
Education: 2 years of college
Ethnicity: American
Drug use: cocaine, marijuana, and acid use
First year known smuggling: 1983
Last year known smuggling: 1993
Estimated number of trips: 10
Number of times caught: 1
Preferred method, route, role: private vessel (23-foot Seabird); Bahamas to warehouse in Jupiter, FL; delivery person
Typical load size: 200-400 kilos

Charge: Conspiracy to Import Cocaine, Conspiracy to Possess Cocaine, Intent to Distribute Cocaine
How caught: confidential witness
Sentence length: 25½ years

Notes: No prior arrests

SUBJECT 22.

Age: 41
Citizenship: U.S.
Education: 5th grade
Ethnicity: Puerto Rican
Drug use: none
First year known smuggling: 1991
Last year known smuggling: 1991
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: unknown method; smuggling into Puerto Rico; unknown role
Typical load size: unknown

Charge: Possession of Cocaine, Intent to Distribute Cocaine
How caught: undercover operation (U.S. Customs Service)
Sentence length: 15 years

Notes: Claims he had no knowledge of any narcotics operation

SUBJECT 23.

Age: 70
Citizenship: U.S.
Education: 6th grade
Ethnicity: American
Drug use: none
First year known smuggling: 1995
Last year known smuggling: 1995
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: private vessel; Colombia to Key West, FL; off-loader, driver for principals
Typical load size: 2200 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: confidential informant, U.S. Customs Service
Sentence length: 27 years, 3 months

Notes: No prior U.S. arrests – former political prisoner in Cuba

SUBJECT 24.

Age: 32
Citizenship: U.S.
Education: some graduate school (medicine)
Ethnicity: American
Drug use: some marijuana use
First year known smuggling: 1992
Last year known smuggling: 1994
Estimated number of trips: 30-40
Number of times caught: 1
Preferred method, route, role: commercial airlines; Colombia to Miami, FL; money launderer
Typical load size: 5-6 kilos

Charge: Conspiracy to Import Cocaine, Conspiracy to Possess and Intent to Distribute Cocaine
How caught: controlled delivery
Sentence length: 18½ years

Notes: 3 prior arrests, 2 breaking and entering charges (no convictions)

SUBJECT 25.

Age: 54
Citizenship: U.S.
Education: college
Ethnicity: Cuban
Drug use: some cocaine use
First year known smuggling: 1976
Last year known smuggling: 1995
Estimated number of trips: 15-20
Number of times caught: 1
Preferred method, route, role: commercial vessel (freighter); through Caribbean (Aruba) to Holland; oversaw shipments, owned vessels, transportation manager
Typical load size: 300 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine, Intent to Distribute
How caught: U.S. Coast Guard
Sentence length: 27 years

Notes: 1 arrest other than the instant offense, transporting illegal immigrants from Cuba to the U.S. (1981)

SUBJECT 26.

Age: 35
Citizenship: U.S.
Education: high school
Ethnicity: Cuban
Drug use: cocaine and marijuana use
First year known smuggling: 1981
Last year known smuggling: 1994
Estimated number of trips: 60
Number of times caught: 1; 3 later indictments in connection with separate smuggling ventures
Preferred method, route, role: private vessel; Bahamas to Florida; owned 30 foot open fishermen's boat, transporter
Typical load size: 700-1000 kilos

Charge: Conspiracy to Possess and Intent to Distribute Cocaine
How caught: undercover operation
Sentence length: 30 years

Notes: 1980 – failure to appear in court for a traffic ticket.

SUBJECT 27.

Age: 49
Citizenship: unknown
Education: unknown
Ethnicity: unknown
Drug use: none
First year known smuggling: 1996
Last year known smuggling: 1997
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: commercial vessel (freighter), carrying cocaine from Colombia to Florida; pick up and delivery man
Typical load size: 800-1000 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: confidential informant
Sentence length: life

Notes: No priors arrests - instant offense was 'dry conspiracy' (no narcotics recovered)

SUBJECT 28.

Age: 32
Citizenship: Bahamian
Education: high school
Ethnicity: Bahamian
Drug use: none
First year known smuggling: 1997
Last year known smuggling: 1997
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: private vessel (33 foot open fishing boat); Bahamas to West Palm Beach, FL; broker, organizer, boat captain
Typical load size: 480 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine, Possess with Intent to Distribute
How caught: confidential informant (DEA)
Sentence length: life

Notes: No prior arrests

SUBJECT 29.

Age: 69
Citizenship: U.S.
Education: some college
Ethnicity: unknown
Drug use: some cocaine and marijuana use
First year known smuggling: 1976 (marijuana), 1988 (first cocaine smuggling trip)
Last year known smuggling: 1990
Estimated number of trips: 10-20
Number of times caught: 2
Preferred method, route, role: private vessel (31 foot open fishing boat); from the Bahamas to Florida; organizer of operation
Typical load size: 500 kilos

Charge: Conspiracy to Import Cocaine
How caught: confidential informant
Sentence length: 30 years

Notes: 1 prior trafficking arrest, judge threw the case out, 4 indictments related to current charge

SUBJECT 30.

Age: 61
Citizenship: U.S.
Education: college
Ethnicity: unknown
Drug use: crack cocaine use
First year known smuggling: 1976
Last year known smuggling: 1991
Estimated number of trips: 10-15 times
Number of times caught: 1
Preferred method, route, role: private air; Colombia to Miami, FL; broker, transporter
Typical load size: 2159 kilos (amount involved in the instant arrest)

Charge: Conspiracy to Import Cocaine and Marijuana
How caught: confidential informant
Sentence length: life

Notes: 2 drug arrests, first was for sale of one kilo of cocaine

SUBJECT 31.

Age: 61
Citizenship: Colombian
Education: 8th grade
Ethnicity: Colombian
Drug use: some cocaine and heavy marijuana use
First year known smuggling: 1974
Last year known smuggling: 1995
Estimated number of trips: once every two months, approximately 80 times total
Number of times caught: 3
Preferred method, route, role: commercial vessel (cargo ship); from Colombia to New Jersey; transporter, moved drugs to/ within the US
Typical load size: 180 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine
How caught: confidential informant
Sentence length: 30 years

Notes: 2 prior drug smuggling arrests, ages 35, 37

SUBJECT 32.

Age: 40
Citizenship: Colombian
Education: unknown
Ethnicity: Colombian
Drug use: unknown
First year known smuggling: 1991
Last year known smuggling: 1991
Estimated number of trips: 1
Number of times caught: 1
Preferred method, route, role: commercial vessel (cargo ship); from Colombia to Philadelphia, PA; organizer of operation
Typical load size: 3000 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import Cocaine, Intent to Possess and Distribute Cocaine
How caught: undercover operation
Sentence length: life

Notes: No prior arrests

SUBJECT 33.

Age: 53
Citizenship: U.S.
Education: some college
Ethnicity: Puerto Rican
Drug use: some cocaine and marijuana use
First year known smuggling: 1970's
Last year known smuggling: 1994
Estimated number of trips: refused to say, more than 1
Number of times caught: 1
Preferred method, route, role: private vessels; airdrops in the Caribbean; broker, leader of operation
Typical load size: 500 pounds of marijuana

Charge: Conspiracy to Possess Cocaine; Intent to Distribute Cocaine
How caught: undercover operation
Sentence length: life

Notes: dry conspiracy

SUBJECT 34.

Age: 40
Citizenship: U.S.
Education: college
Ethnicity: Puerto Rican
Drug use: some cocaine and marijuana use
First year known smuggling: 1980s
Last year known smuggling: 1992
Estimated number of trips: 15-18
Number of times caught: 1
Preferred method, route, role: private vessel; Colombia to Puerto Rico; contact person for Colombian brokers
Typical load size: 200 kilos (amount involved in the instant offense)

Charge: Conspiracy to Import and Intent to Possess and Distribute Cocaine
How caught: confidential informant, law enforcement arrested subject after co-conspirators were arrested in Hong Kong
Sentence length: 20 years

Appendix E: Statistical Methodology

Analysis of Deterrent Events on Cocaine Prices

Methodology

Transfer Function Models: Technical Exposition

Our objective was to estimate the effect of interdictions on prices, controlling for confounding variables and correlation in the data. The effects of interdictions may be delayed or dynamic (or both), and the price series itself is a correlated time series. These possibilities were allowed for by transfer function models (Box et al. (1994), Mills (1990)) of the form

$$price_t = \alpha + \sum\gamma_i z_{it} + \ldots + \sum\beta_j R_j(L)x_{jt} + N(L)w_t$$

where $\sum\gamma_i z_{it}$ is the combined effect of control variables (time, weather, and Coast Guard and Department of Defense force laydown), $\sum\beta_j R_j(L)x_{jt}$ is the combined effect of interdictions, and $N(L)w_t$ represents a correlated noise series. Thus, aside from the control variables, the transfer function model containing *p* interdictions is

$$price_t = \alpha + \beta_1 R_1(L)x_{jt} + \ldots + \beta_j R_j(L)x_{jt} + \ldots + \beta_p R_p(L)x_{pt} + N(L)w_t$$

where $price_t$ is the price, x_{jt} is the value of the *j*th interdiction, and w_t is a white noise error term, all at month *t*. The effect of the *j*th interdiction is assumed to transfer its effect on price via the ratio of two polynomials in the lag operator L, where $Lx_t = x_{t-1}$, $L^2x_t = x_{t-2}$, $L^3x_t = x_{t-3}$, and so on,

$$R(L) = B(L)/A(L)L^k = (1 - b_1L - b_2L^2 - \ldots - b_nL^n)/(1 - a_1L - a_2L^2 - \ldots - a_mL^m)L^k$$

Thus, R(L) is a possibly infinite polynomial in L that can flexibly and parsimoniously model the dynamic relationship between $price_t$ and x_t, x_{t-1}, x_{t-2}, …. The factor L^k allows for the possibility of pure delay of *k* months, the time period before the dynamic effect of x_t on $price_t$ takes effect.

The correlated noise series $n_t = N(L)w_t$ is modeled in a similar fashion, by a transfer function of a white noise series

$$N(L) = Q(L)/P(L) = (1 - q_1L - q_2L^2 - \ldots - q_uL^u)/(1 - p_1L - p_2L^2 - \ldots - p_vL^v)$$

If $n_t = N(L)w_t$ then n_t is said to be generated by an autoregressive moving average process of order (u,v), a flexible and parsimonious way of accounting for the relationship between $price_t$ and $price_{t-1}$, $price_{t-2}$, $price_{t-3}$, …. In the above expression, n_t is assumed to be stationary, possibly after detrending or differencing.

Transfer Function Models: Our Approach

All of our price series were stationary, and ARMA representations were either AR(1) or the product of AR(1) and AR(12), and thus $n_t = w_t/(1 - pL)$ or $n_t = w_t/(1 - pL)(1 - PL^{12})$, respectively. The parameters were typically positive, representing positive month-to-month

correlation in the AR(1) case, and positive year-to-year correlation (seasonality) in the AR(12) case.

Our transfer functions for interdictions usually incorporated delays, $R(L) = L^k$, and occasionally incorporated simple geometric dynamic components, $R(L) = 1/(1 - aL)L^k$. "Dynamic" simply means that the total effect was distributed over time. If $R(L)x_t = \beta L^k x_t$ then an interdiction commencing operation at month t (a unit increase in x from (t-1) to t) changes prices at time ($t + k$). That is, there is a k-period delay. When the interdiction becomes inactive, prices return to their original level k months later. In the dynamic case, $R(L)x_t = \beta/(1 - aL)L^k x_t$, and an interdiction commencing at month t changes price by β at time ($t + k$), by $a\beta$ at time ($t + k + 1$), by $a^2\beta$ at time ($t + k + 2$), and so on. The total increase in price is $\beta(1 + a + a^2 + a^3 + \ldots.) = \beta/(1 - a)$, and the rate of adjustment is governed by the parameter a. Finally, k months after interdiction termination, prices begin an exponential decline to their original level.

For example, wholesale prices at the South West Border were influenced by three interdictions, x_1 = Orejuela Arrests, x_2 = Support Justice III, and x_3 = Support Justice IV. Orejuela Arrests had a dynamic effect with no delay, and the two source zone interdictions had non-dynamic effects each with a five month delay. In addition, the model contained a time trend, Coast Guard force laydown, and an AR(1) error term. The estimated model was

$$price_t = \alpha + \gamma_1 t + \gamma_2 CG_t + \beta_1/(1 - aL)L^{k1}x_{1t} + \beta_2 L^{k2}x_{2t} + \beta_3 L^{k3}x_{3t} + w_t/(1 - pL)$$

$$= 24.4 - 0.06t + 3.8CG_t + 3.8/(1 - 0.7L)x_{1t} + 5.5L^5 x_{2t} + 3.1L^5 x_{3t} + w_t/(1 - 0.14L)$$

Parameters associated with control variables are interpreted in the usual way. The positive effect for CG indicates that a unit increase in the Coast Guard force laydown (a doubling from the 1991 figure) would increase wholesale prices by $3.8 (actually this was not statistically significant). The trend parameter implies that, had the other variables in the model held constant, wholesale prices would have dropped by about $6 over the course of the 96 months study.

Turning to the time series components of the model, the AR(1) error term estimates a positive month-to-month correlation of 0.14, but the absence of an AR(12) term implies no seasonal effects. The effect of Support Justice III (November 1991 through April 1992) and Support Justice IV (January 1993 through March 1994) was to increase wholesale prices five months later by $5.5 and $3.1 respectively. The effect of the Orejuela Arrests (June 1995 through August 1995) was to increase wholesale prices by $3.8 in the month of the arrest, $3.8(0.7) = $2.66 the next month, and $3.8(0.7)^2 = $1.862 the following month. Conceptually, if a king pin figure equivalent to the Orejuela brothers could have been arrested every month, prices would have eventually increased by $3.8/(1 – 0.7) = $12.67,and 90% of this would have been attained by the sixth month after the first arrest. In fact, the last Orejuela arrest was in August 1995, so prices began an exponential decline to their original level starting in September 1995.

Model Selection

For all four price series (retail and wholesale, national and South West Border), we used a common baseline model containing a time trend (t), Weather (the proportion of hurricane days in the month t), Coast Guard and Department of Defense force laydown (CG_t and DoD_t) and the

product of an AR(1) and AR(12) term allowing month-to-month, and year-to-year correlation. Thus the baseline model was

$$price_t = \alpha + \gamma_1 t + \gamma_2 Weather_t + \gamma_3 CG_t + \gamma_4 DoD_t + w_t/(1 - pL)(1 - pL^{12})$$

All such models appeared to be suitably stationary; the Dickey-Fuller test rejected the unit root null hypothesis in favor of stationarity for all four price series ($p<0.006$).

For a given price series, model selection involved adding interdictions, with appropriate delays, to the baseline model. The motivation for a careful selection process arises because several interdictions occurred at, or around, the same time as other interdictions. Two interdictions that are active over exactly the same time period are impossible to untangle. They cannot both be entered into the model, and if one interdiction is chosen, it actually represents both. More generally, a set of interdictions with considerable overlap presents similar problems. Estimates are either extremely imprecise (if the entire set is included in the model), or the partial set is to some extent a surrogate for the entire set (if a partial set is included). Statisticians say that such effects are collinear, a problem that will plague all the analyses reported here.

Many of our 18 interdictions were either extended impulses (Gateway, Support Justice IV) or step functions (Laser Strike, Border Shield, River Sweep) with considerable overlap. One way of measuring the degree of overlap is by the R^2 obtained by regressing one interdiction on all the others (table xx). The variance inflation factor, $VIF = 1/(1 - R^2)$, then measures the resulting imprecision. For example, 96% of the variation in Laser Strike is explained by the other interdictions, and the inflation of the variance of Laser Strike's parameter estimate increases 27 fold as a result of including the other interdictions in the model. Although these remarks strictly apply to linear models, they are broadly applicable to transfer function models also. For this reason, we were cautious about including highly correlated interdictions in the same model, and in particular, we excluded Laser Strike when analyzing South West Border prices.

Interdiction R-squares and Variance Inflation Factors

Interdiction Type	Interdiction	R^2	VIF
Source Zone	Shoot-down	0.65	2.88
	Laser Strike	0.96	27.21
	Support Justice III	0.18	1.22
	Support Justice IV	0.34	1.52
	Stand Down	0.22	1.29
Arrests/Deaths	Orejuela Arrests	0.34	1.52
	Arrests/Deaths	0.22	1.28
	Columbus	0.11	1.12
Arrival/Transit Zone	Zorro II	0.67	3.03
	Border Shield	0.90	10.45
	Brass Ring	0.78	4.46
	Hard Line	0.87	7.49
	River Sweep	0.94	17.68
	Conjuntos I	0.41	1.69
	Conjuntos II	0.06	1.06
	Frontier Lance	0.67	3.04
	Frontier Shield	0.29	1.41
	Gateway	0.94	15.50

Model development involved the selection of an interdiction as well as the selection of its optimal delay. The ranges of delay that were considered were 4 to 6 for the five source zone interdictions, and 0 to 2 for all other interdiction types. Thus with 18 interdictions, there were (3)(18) = 54 candidate variables. Since the high correlation among interdictions favored a forward selection method, our approach was to add the best variable (interdiction-lag combination) to the baseline model. Given the large number of tests involved (about 50), we used a reasonably stringent entry criteria: at each iteration of the selection procedure, the best variable entered the model provided its p-value was less than 0.075. At the end of the selection procedure we then considered excluding insignificant variables, and explored dynamic specifications for the transfer functions. The following tables illustrate this procedure for retail prices at the South West Border.

SWB Retail Prices: (AIC=1015.07, Obs=96)
Model = Baseline +

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		131.02	56.89	0.0236
AR(1)		0.36	0.10	0.0005
AR(12)		0.03	0.11	0.8114
Time Trend		-0.76	0.91	0.4062
Coast Guard		140.42	96.35	0.1485
DoD		-16.56	86.32	0.8483
Weather		-38.11	55.56	0.4945

SWB Retail Prices: (AIC=961.74, Obs=92)
Model = Baseline + SJIII

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		153.69	42.33	0.0005
AR(1)		0.15	0.11	0.1772
AR(12)		-0.11	0.12	0.3530
Time Trend		-1.07	0.75	0.1583
Coast Guard		180.80	77.74	0.0224
DoD		-64.59	66.57	0.3348
Weather		-34.56	52.76	0.5143
Support Justice III	4	96.41	30.74	0.0024

SWB Retail Prices: (AIC=954.40, Obs=92)
Model = Baseline + SJIII + Arrests/Deaths

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		142.77	38.37	0.0004
AR(1)		0.08	0.11	0.4519
AR(12)		-0.16	0.12	0.1830
Time Trend		-0.89	0.68	0.1982
Coast Guard		158.79	70.47	0.0269
DoD		-47.10	60.60	0.4393
Weather		-27.33	49.88	0.5852
Support Justice III	4	101.81	28.18	0.0005
Arrests/Deaths	1	74.70	24.89	0.0036

SWB Retail Prices: (AIC=949.63, Obs=92)
Model = Baseline + SJIII + Arrests/Deaths + Hard Line

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		114.20	36.13	0.0022
AR(1)		-0.01	0.11	0.9207
AR(12)		-0.20	0.12	0.0808
Time Trend		-0.87	0.62	0.1658
Coast Guard		159.87	63.58	0.0139
DoD		-16.85	56.07	0.7645
Weather		-44.28	47.90	0.3579
Support Justice III	4	98.48	25.74	0.0003
Arrests/Deaths	1	64.56	24.52	0.0101
Hard Line	2	33.99	12.76	0.0093

SWB Retail Prices: (AIC=946.71, Obs=92)
Model = Baseline + SJIII + Arrests/Deaths + Hard Line + Conjuntos II

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		121.18	34.18	0.0007
AR(1)		-0.06	0.11	0.6291
AR(12)		-0.16	0.12	0.1781
Time Trend		-0.99	0.59	0.0933
Coast Guard		167.50	60.09	0.0066
DoD		-25.21	52.86	0.6347
Weather		-39.23	46.89	0.4052
Support Justice III	4	98.91	24.38	0.0001
Arrests/Deaths	1	66.35	24.20	0.0075
Hard Line	2	35.37	12.18	0.0048
Conjuntos II	1	86.48	41.68	0.0412

Thus the final iteration of the selection procedure chose Support Justice III with lag 4 ($p<0.0001$), Arrests/Deaths with lag 1 ($p=0.0075$), Hard Line with lag 2 ($p=0.0048$), and Conjuntos II with lag 1 ($p=0.0412$). The likelihood ratio test for the inclusion of all four variables was 29.9 on 4 degrees of freedom ($p<0.0001$) and the improvement in AIC was 21.9. Given these four interdictions, we were able to do an exhaustive search for the optimum delays.

Results

Having illustrated our approach, we proceed to apply the forward selection procedure to all four price series. The results follow.

National Wholesale Prices

The final iteration of the forward selection procedure for national wholesale prices added Support Justice III with lag 5 ($p=0.006$), Orejuela Arrests with no lag ($p=0.004$), Shoot-down with lag 6 ($p=0.001$), Border Shield with lag 2 ($p=0.002$), and Brass Ring with a lag of 2 ($p=0.020$) to the baseline model. The likelihood ratio test for the inclusion of all five variables was 28.1 on 5 degrees of freedom ($p<0.0001$), and the improvement in AIC was 18.1.

Fine-tuning the above model resulted in the removal of Brass Ring, DoD, Coast Guard, and AR(12), which had the effect of slightly reducing the AIC from 471.2 to 466.5. The final model is shown in the following table

Final Model for National Wholesale Prices (AIC=466.5, Obs=102)

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		38.96	0.84	<.0001
AR(1)		0.22	0.11	0.0384
Time Trend		-0.17	0.02	<.0001
Weather		4.03	1.30	0.0026
Support Justice III	5	3.53	1.24	0.0055
Orejuela Arrests	0	4.71	1.60	0.0042
Shoot-down	6	3.58	1.09	0.0014
Border Shield	2	4.52	1.15	0.0002

The effects of all four interdictions were highly statistically significant ($p<0.006$). The effect of the two source zone interdictions, Support Justice III (November 1991 through April 1992) and Shoot Down (March 1995 through November 1995) was to increase wholesale prices by about $3.5 five to six months later ($p<0.006$). The effect of Orejuela Arrests (June 1995 through August 1995) was to increase wholesale prices by $4.7 in the month of the arrest ($p=0.004$), and the effect of long active Border Shield (March 1997 onwards) was to increase wholesale prices by $4.5 with a delay of two months.

Both national wholesale and national retail prices (presented below) estimated a positive month-to-month correlation [0.22 ($p=0.038$) for wholesale, and 0.37 ($p=0.0002$) for retail], but no seasonal effect could be detected in the final models. In addition, both wholesale and retail prices were affected by weather, $4.0 ($p=0.003$) for wholesale and $17.2 ($p=0.134$) for retail. Thus wholesale prices in months with hurricanes every day (e.g. April, May and June 1997) are expected to be $4 higher than months with no hurricanes (e.g. the four months preceding April 1997). Similarly, retail prices are expected to be $17 higher in hurricane-saturated months than in hurricane-free months. The effects of weather and month-to-month correlation are evident from the figure depicting the final models for national wholesale and national retail prices. In particular, high prices in the spring of 1997 appear to be largely attributable to the high frequency of hurricanes during that period.

National Retail Prices

The first four interdictions added to the baseline model for national retail prices by the forward selection procedure were the same for national wholesale prices: Support Justice III, Orejuela Arrests, Shoot Down, and Border Shield. In the case of retail prices, the optimal lags were Support Justice III with lag 4 ($p=0.006$), Orejuela Arrests with lag 1 ($p=0.004$), Shoot-down with lag 6 ($p=0.001$), and Border Shield with lag 1 ($p=0.002$). The likelihood ratio test for the inclusion of all four variables was 19.3 on 4 degrees of freedom ($p=0.0007$), and the improvement in AIC was 11.3

Fine-tuning the above model resulted in the removal of Weather, DoD, Coast Guard, and AR(12), which had the effect of slightly reducing the AIC from 907.3 to 903.9. The final model is shown in the following table.

Final Model for National Retail Prices (AIC=903.9, Obs=102)

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		131.34	8.66	<.0001
AR(1)		0.37	0.10	0.0002
Time Trend		-0.43	0.19	0.0229

Weather		17.15	11.35	0.1341
Support Justice III	4	29.81	12.01	0.0149
Orejuela Arrests	1	33.12	14.61	0.0257
Shoot-down	6	25.83	10.54	0.0161
Border Shield	1	29.73	11.67	0.0125

The effects of all four interdictions were statistically significant ($p<0.026$). The effect of the two source zone interdictions, Support Justice III (November 1991 through April 1992) and Shoot Down (March 1995 through November 1995) was to increase wholesale prices four and six months later by $30 and $26 respectively ($p<0.017$). The effect of the Orejuela Arrests (June 1995 through August 1995) was to increase wholesale prices by $33 ($p=0.026$), and the effect of long active Border Shield (March 1997 onward) was to increase wholesale prices by $30 ($p=0.013$). In both cases the delay was by one month.

For wholesale prices, the effects of Shoot Down and Orejuela Arrests were strictly adjacent, giving rise to two plateaus of elevated prices lasting 12 months. For retail prices, in contrast, the two interdictions were additive for the month of September 1995, and this combined effect appears to largely account for the unusually large spike in retail prices that month. The final model predicts a still higher price because of the high hurricane percentage in August (48% or 15 days) and September (32% or 10 days), the effect of hurricanes in August on prices in September being explained by the positive month-to-month correlation.

South West Border Wholesale Prices

The data for the South West Border prices differed from that for the National prices in two ways. First, to avoid collinearity problems with interdictions less relevant to the South West Border, we excluded Frontier Lance, Frontier Shield, Gateway and Laser Strike. Second, in order to obtain stationarity (the mean and variance of the series were unusually high during this period), we did not use the first year of data. Based on the resulting 1992 through 1999 series, the Dickey-Fuller test easily rejected the unit root null hypothesis in favor of stationarity for both wholesale prices ($p=0.0001$) and retail prices ($p= 0.0061$).

The final iteration of the forward selection procedure for South West Border wholesale prices added the following interdictions to the baseline model: Orejuela Arrests with lag 1 ($p=0.0004$), Support Justice III with lag 5 ($p=0.007$), and Support Justice IV with lag 5 ($p=0.024$). The likelihood ratio test for the inclusion of all four variables was 19.7 on 3 degrees of freedom ($p<0.0001$), and the improvement in AIC was 13.7. A subsequent exhaustive search for the optimum delays for these three interdictions showed that the forward selection model was actually the optimal model. The top ten of the $3^3 = 27$ models (delay choices) are listed below. As expected, similar models produced similar estimates.

Top delay choices for the three selected interdictions: SWB Wholesale

Delay								Improvement	Model	Baseline	Diff
d1	d2	d3	Or/A	SJIII	SJIV	p-LRT	LRT	in AIC	AIC	AIC	param
1	5	5	6.77	5.57	2.48	.0002	19.7	13.7	450.7	464.4	3
1	5	4	6.82	5.69	2.29	.0003	18.8	12.8	451.6	464.4	3
2	5	5	6.87	5.64	2.51	.0003	18.5	12.5	451.9	464.4	3
2	5	4	6.84	5.72	2.25	.0006	17.4	11.4	453.0	464.4	3
1	4	5	6.90	4.29	2.25	.0013	15.7	9.7	454.7	464.4	3
1	4	4	6.92	4.25	2.04	.0019	14.9	8.9	459.5	468.4	3
1	5	6	6.79	4.32	1.53	.0021	14.7	8.7	449.5	458.2	3
0	5	5	5.02	5.69	2.51	.0023	14.5	8.5	455.9	464.4	3
2	4	5	6.92	4.16	2.27	.0025	14.3	8.3	456.1	464.4	3

1	6	5	6.99	2.17	2.29	.0029	14.0	8.0	450.2	458.2	3

Fine-tuning the above model resulted in the removal of Weather, DoD, and AR(12), and the addition of a geometric lag for Orejuela Arrests starting at lag 0 (table xx). As a result, the AIC was reduced from 450.7 to 443.8.

Final Model for South West Border Wholesale Prices (AIC=443.8, Obs=91)

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		24.42	1.48	<.0001
AR(1)		0.14	0.11	0.1958
Time Trend		-0.06	0.03	0.0268
Coast Guard		3.81	3.04	0.2136
Orejuela Arrests	0	3.84	1.11	0.0009
Orej/Arr: Geom Lag	0	0.73	0.11	<.0001
Support Justice III	5	5.47	1.90	0.0051
Support Justice IV	5	3.14	1.09	0.0052

The estimates in the table correspond to the parameters of the transfer function model represented by

$$price_t = 24.4 - 0.06t + 3.8CG_t + 3.8/(1 - 0.7L)x_{1t} + 5.5L^5x_{2t} + 3.1L^5x_{3t} + w_t/(1 - 0.14L)$$

where x_1 = Orejuela Arrests, x_2 = Support Justice III, and x_3 = Support Justice IV. The model indicates that wholesale prices at the South West Border were influenced by the three interdictions with Orejuela Arrests having a dynamic effect with no delay, and the two source zone interdictions having non-dynamic effects each with a five month delay.

The effect of Support Justice III (November 1991 through April 1992) and Support Justice IV (January 1993 through March 1994) was to increase wholesale prices five months later by $5.5 and $3.1 respectively. The effect of the Orejuela Arrests (June 1995 through August 1995) was to increase wholesale prices by $3.8 in the month of the arrest, $3.8(0.7) = $2.66 the next month, and $3.8(0.7)^2 = $1.862 the following month. Since the last Orejuela arrest was in August 1995, prices began an exponential decline towards their original level starting in September 1995.

The other parameters in the model are unremarkable. The AR(1) error term is suggestive of a positive month-to-month correlation of 0.14, but this result is not statistically significant. The positive effect for CG indicates that a unit increase in the Coast Guard force laydown (a doubling from the 1991 figure) would increase wholesale prices by $3.8, but again, this was not statistically significant. The trend parameter implies that, had the other variables in the model held constant, wholesale prices would have dropped by about $6 over the course of the 96 months study.

South West Border Retail Prices

The final iteration of the forward selection for South West Border retail prices procedure added Support Justice III with lag 4 ($p<0.0001$), Hard Line with lag 2 ($p=0.005$), Arrests/Deaths with lag 1 ($p=0.008$), and Conjuntos II with lag 1 ($p=0.041$) to the baseline model. The likelihood ratio test for the inclusion of all four variables was 29.9 on 4 degrees of freedom ($p<0.0001$), and the

improvement in AIC was 21.9. Given the four interdictions, an exhaustive search for the optimum delays again showed that the optimal model coincided with that chosen by the forward selection method. The top ten of the $3^4 = 81$ models (delay choices) are listed below. Again, it is encouraging to find that similar models produced similar estimates.

Top delay choices for the three selected interdictions: SWB Retail

Delay d1	d2	d3	d4	SJIII	A/D	HL	CII	p-LRT	LRT	Improvement in AIC	Model AIC	Baseline AIC	Diff parm
4	1	2	1	98.91	66.35	35.37	86.48	.0000	29.9	21.9	946.7	968.6	4
4	1	1	1	98.41	67.90	33.82	84.35	.0000	28.9	20.9	947.8	968.6	4
4	1	2	0	98.72	67.34	36.25	79.05	.0000	28.8	20.8	947.8	968.6	4
4	1	0	1	97.91	70.01	32.33	82.24	.0000	27.9	19.9	948.7	968.6	4
4	1	1	0	98.11	68.91	34.84	76.26	.0000	27.8	19.8	948.9	968.6	4
4	1	0	0	97.53	71.06	33.46	73.34	.0000	26.8	18.8	949.8	968.6	4
5	1	2	1	94.00	65.02	35.58	86.65	.0000	26.8	18.8	939.3	958.0	4
6	1	2	1	77.37	67.22	34.30	91.94	.0000	26.3	18.3	927.5	945.8	4
5	1	1	1	93.30	66.41	33.90	84.50	.0000	25.8	17.8	940.3	958.0	4
5	1	2	0	93.29	65.92	36.40	76.06	.0000	25.4	17.4	940.6	958.0	4

Fine-tuning the outcome of the forward selection procedure resulted in the removal of Weather, DoD, and AR(12), and the addition of geometric lags for Support Justice III starting at lag 4 and Hard Line starting at lag 0 (table xx). As a result, the AIC was reduced from 946.7 to 930.3.

Final Model for South West Border Retail Prices (AIC=930.32, Obs=91)

Interdiction	Delay	Estimate	Std Error	p-value
Intercept		107.58	15.28	<.0001
AR(1)		0.00	0.12	0.9699
Time Trend		-0.37	0.50	0.4682
Coast Guard		97.26	55.02	0.0809
Support Justice III	4	59.36	25.66	0.0232
SJIII Geom Lag	4	0.57	0.19	0.0043
Hard Line	0	5.72	4.19	0.1753
Hard Line: Geom Lag	0	0.87	0.13	<.0001
Arrests/Deaths	1	67.69	23.47	0.0050
Conjuntos II	1	95.46	40.30	0.0202

The estimates in the table correspond to the parameters of the transfer function model

$$price_t = 108 - 0.37t + 97CG_t + 59/(1-0.57L)L^4x_{1t} + 6/(1-0.87L)x_{2t} + 68Lx_{3t} + 95Lx_{4t} + w_t$$

where x_1 = Support Justice III, x_2 = Hard Line, x_3 = Arrests/Deaths of Mexican traffickers, and x_4 = Conjuntos II. Thus the changes in South West Border retail prices were dynamic for Support Justice and Hard Line, and were non-dynamic for Arrests/Deaths and Conjuntos II.

The effect of Arrests/Deaths (January 1996, February 1997, and July 1997) and Conjuntos II (December 1998) was to increase South West Border retail prices one month later by $68 and $95 respectively.

The effect of Support Justice III (November 1991 through April 1992) was to increase wholesale prices by $59 four months after initiation of the operation, $59(0.57) = $34 in the next month, and $59(0.57)^2 = $19 in the following month, up to an asymptote of $59/(1 – 0.57) = $137. However,

what is more evident from the figure is the subsequent exponential decline starting in September 1992.

Operation Hard Line (February 1995 through July 1997) had a similar dynamic effect while it was in full operation from January 1996 through August 1996. The initial increase in prices was about $6 approaching a total increase of $6/(1 – 0.87) = $46, half of which would be achieved by the fifth month. This effect was attenuated as Hard Line ramped up (February 1995 through December 1995) and ramped down (September 1996 through July 1997). These effects induced an S-shape to the modeled curve from February 1995 through July 1997.

The other parameter in the model that was close to statistically significance was Coast Guard force laydown (p=0.081). The magnitude of this parameter suggests that a unit increase in the Coast Guard force laydown (a doubling from the 1991 figure) would increase wholesale prices by $97, other factors held constant.

Analysis of Deterrent Events on Cocaine Movement

Characterizing Trafficker Behavior

Data from the interagency Consolidated Counterdrug Database (CCDB) was used as the indicator of trafficker behavior in the Transit Zone. This database contains drug smuggling event data dating back to 1991 and supports two primary types of analyses: (1) evaluations of drug flow from areas of production to consumption countries, and (2) assessments of the performance of counterdrug forces against that movement[32].

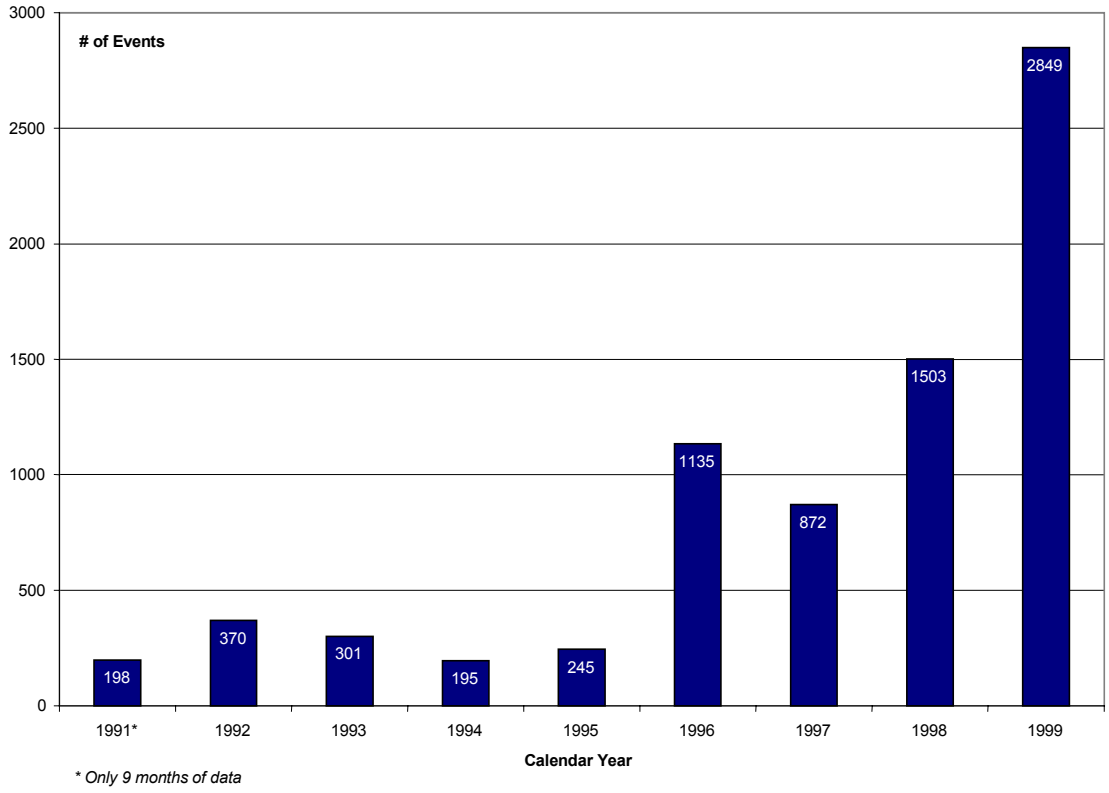
The CCDB was founded by the Interagency Counterdrug Performance Assessment Working Group (ICPAWG). The ICPAWG -- established in 1992 to measure the performance of counterdrug forces -- maintained a database of *known* drug shipments in the transit zone whose final destination was either the U.S. or Canada. *Known events* are distinguished by (1) seizure or observation of drugs; (2) observation of activity that could not be reasonably attributed to anything other than drug smuggling; (3) highly reliable intelligence. In 1996, the CCDB was expanded to include events that would support Interagency Assessment of Cocaine Movement (IACM) evaluations. In order to allow a wide spectrum of cocaine flow information, ICPAWG accepted a higher degree of uncertainty for events' inclusion in the database. This concern for drug flow data resulted in a dramatic increase in the total number of CCDB events from 1995 to 1996 (see Figure 1). For our purposes, this modification disrupted what otherwise would be a consistently measured time-series.

Fortunately, during the transformation, ICPAWG added a field to distinguish ICPAWG events from flow events. By examining only those events with an ICPAWG application, we constructed a consistently defined 1991-1999 event data set (see Figure 2). Although there is a large loss in the number of data points that entered the flow data, the value gained by expanding the time span of the study to 1991 outweighs this loss. We felt it was particularly important to ensure the model covered the 1994/1995 reductions in drug interdiction funding.

[32] CCDB Users Guide

Figure 1

CCDB Event Data - 1991 to 1999
All Purposes (ICPAWG and Flow)

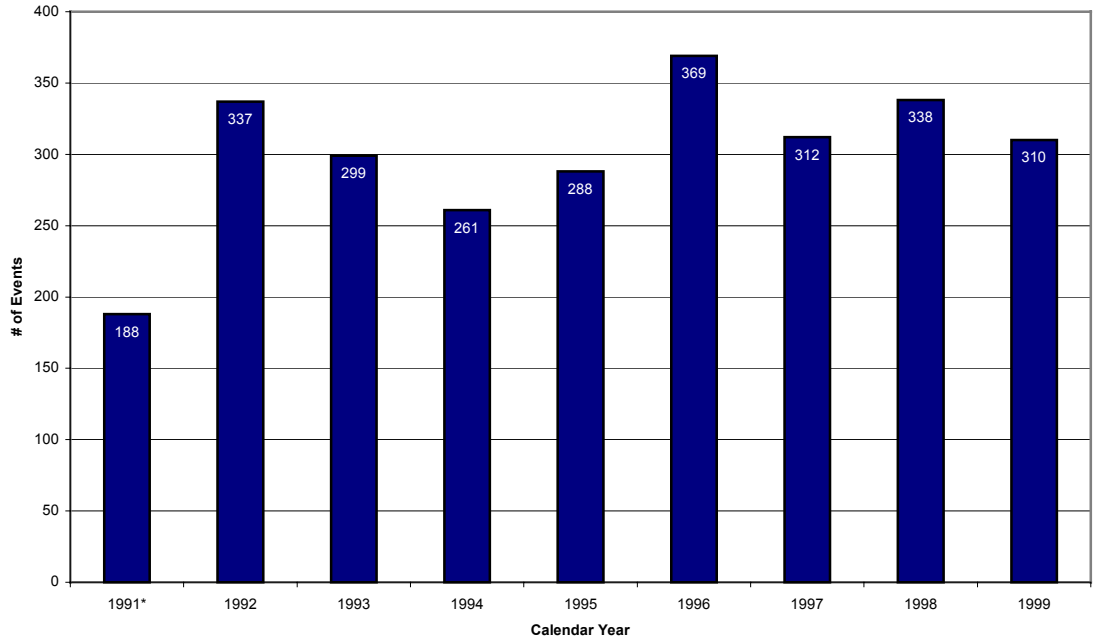


The ability to reach back to 1991, however, is limited to non-commercial air and maritime events. Land, commercial air events and commercial maritime events are non-existent or, at best, sparse prior to 1996 – whether ICPAWG, flow or otherwise. Excluding them from the Transit Zone data set, nevertheless, does not seem to be problematic. The CCDB Users Guide defines commercial events as port-to-port movements. As such, they are neither targeted nor impacted by interdiction efforts in the transit zone, but rather, by U.S. Customs operations in the Arrival Zone. As far as land events are concerned, the data set of events would not be large enough to conduct any meaningful analysis of how trafficking via land conveyance in the Transit Zone has been influenced by enforcement operations.

Events identified as ‘subsequent’ or ‘other’ movements were also excluded from our data set. ‘Subsequent’ movements are defined as events that originate from locations in the transit zone. ‘Other’ movements include shipments of any drug other than cocaine. For consistency and integrity of the data set, we felt it appropriate to exclude these types of events.

Figure 2

ICPAWG Only Event Data - 1991 to 1999



* *Includes only 9 months of data*

Methodology

This section is divided into three parts. In E1.0, the dependent variable is shipments confirmed by intelligence data. In E2.0, the dependent variable is all shipments. A short section, E3.0, reports results when the dependent variable is the total amount shipped.

Regardless of the definition of the dependent variable, the independent variables are the same:

CYCLE1 **CYCLE2**	**cosine(2πMONTH/12)** **sine(2πMONTH/12)**	**Where MONTH is the month of the year, coded 1 through 12. Taken together, the cosine and sine functions account for seasonality, at least so far as seasonality is approximated by a cosine function.**
VM1-VM17	**A series of seventeen dummy variables coded one when the observation came from a specific vector/mode combination and coded zero otherwise.**	
TVM1-TVM17	**A series of seventeen variable created by multiplying the VM1-VM17 dummy variables by time. For this purpose, time was coded as zero (the earliest month) to one (the last month).**	
INT1 **NINT1** **INT2** **NINT2**	**As explained earlier, for each vector/mode targeted by a specified interdiction program, we coded an indicator variable as one when the interdiction was on and zero when it was off. For the period when the interdiction was on, we created a complement variable that was one in those vector/mode combinations that were not the target of that interdiction. INT1 is the sum of all indicator variables pertaining to border interdictions for each vector/mode combination during each month; and NINT1 is the sum of the complement variables for border interdiction programs. INT2 and NINT2 are the counterparts for transit zone interdiction programs.**	

E1.0 Analysis based on Shipments Corroborated by Intelligence

This section reports analysis that is based on shipments corroborated by intelligence. There are three subsections. In subsection E1.1, we report a baseline model. In section E1.2, we add specific interdiction programs (and their complements) one at a time to the baseline model. A Wald test identifies programs that had statistically significant effects on trafficker behavior. Section E1.3 includes the baseline variables and the significant effects from section E1.2 in a final regression model.

There are disadvantages to incremental development of a regression model.[33] Those disadvantages notwithstanding, we adopted this incremental approach to overcome serious

[33] A discussion of those disadvantages are technical and beyond the scope of this report. A useful discussion appears in G. Judge, R. Hill, W. Griffiths, H. Lutkepohl, and T. Lee (1985) The Theory and Practice of Econometrics, 2nd Edition, New York, John Wiley & Sons.

collinearity problems. In short, we found it impossible to include all interdictions programs in a single model, so we adopted a search procedure to identify the most important candidate programs.

We adopted a liberal test of statistical significance. First, because we could predict the direction for these interventions, we used a one-tailed test of statistical significance. Second, we adopted a critical value of P=0.10. Of course, readers who prefer a more conservative test can use their judgment, and we provide P-values for those so inclined.

E1.1 Baseline Model: Shipments Corroborated by Intelligence

Table E1 reports regression results for the baseline model. The dependent variable is the number of shipments by vector/mode for each month in the study. The independent variables were identified above. The estimation procedure was a Poisson regression.

We are not much interested in the parameter estimates from this baseline model, so little discussion is necessary. Based on the coefficients associated with the variables CYCLE1 and CYCLE2, shipments do seem to follow a seasonal pattern. Based on the variables TVM1 through TVM17, there appear to be linear trends, and the directions of those trends vary by vector and mode. The parameters associated with the variables VM1 through VM17 imply that some vector/mode combinations support more traffic than other vector/mode combinations.

The parameters associated with the remaining independent variables are of substantive interest. If border interdiction were effective, we would expect the difference between the parameters associated with NINT1 and INT1 to be positive and statistically significant. We use similar tests throughout this study, so the reasoning behind this inference needs to be explained. If interdiction were effective, and if we had controlled for all other factors that affect shipping decisions, then the parameter associated with INT1 should be negative. This implies that traffickers ship less frequently through vector/mode combinations that are interdiction targets. If traffickers transferred their loads to vector/modes that were not targeted by interdiction, then the parameters associated with NINT1 should be positive. Thus, the value of the parameter associated with NINT1 *minus* the value of the parameter associated with INT1 should be positive. We adopt a less demanding test, however. Quite possibly, we have not controlled sufficiently for underlying trends, so the parameter associated with INT1 could be positive, or the parameter associated with NINT2 could be negative, even though interdiction was effective. The more lenient test is that the difference between the two parameter estimates be positive, because this implies a *relative* shift from vector/modes that are targeted by interdiction to vector/modes that are not targeted by interdiction. This is the test used throughout this report.

The difference between the parameter estimates for NINT1 and INT1 is negative, but it does not approach statistical significance. If transit area interdiction were effective, we would expect the difference between the parameters associated with NINT2 and INT2 to be positive and statistically significant. That difference is positive but not statistically significant (P=0.17). If this were the only evidence at our disposal, we would probably conclude that neither border interdiction programs nor transit zone interdiction programs disrupted traffickers. In fact, however, we can look at individual interdiction programs using this baseline model as background. We do this in the next section dealing with the enhanced baseline model.

Table E1: Baseline Model based on Shipments Confirmed by Intelligence

Poisson Regression	
Maximum Likelihood Estimates	
Dependent variable	N_SHIP_I
Weighting variable	ONE
Number of observations	1836
Iterations completed	10
Log likelihood function	-2094.570
Restricted log likelihood	-2867.591
Chi-squared	1546.041
Degrees of freedom	39
Significance level	.0000000
Chi- squared = 2781.93922	RsqP= .4479
G - squared = 2294.76503	RsqD= .4025

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
CYCLE1	-.1500526630	.35806385E-01	-4.191	.0000	.64376427E-13
CYCLE2	-.9939249148E-01	.35873467E-01	-2.771	.0056	.17360728E-13
TVM1	1.000027673	.64202907	1.558	.1193	.29684096E-01
TVM2	-1.441172945	.35993054	-4.004	.0001	.29684096E-01
TVM3	-.5795320633	.41818764	-1.386	.1658	.29684096E-01
TVM4	-2.090834448	.34680529	-6.029	.0000	.29684096E-01
TVM5	-.8925335561	.49700812	-1.796	.0725	.29684096E-01
TVM6	-2.690843073	.40155541	-6.701	.0000	.29684096E-01
TVM7	1.192119176	1.0580415	1.127	.2599	.29684096E-01
TVM10	2.495930061	1.2142762	2.055	.0398	.29684096E-01
TVM11	3.176922259	.43801073	7.253	.0000	.29684096E-01
TVM12	3.251232916	.51429727	6.322	.0000	.29684096E-01
TVM13	1.360851818	.38985939	3.491	.0005	.29684096E-01
TVM14	3.962670355	.41942376	9.448	.0000	.29684096E-01
TVM15	3.081394984	.38719632	7.958	.0000	.29684096E-01
TVM16	2.804221258	.35091487	7.991	.0000	.29684096E-01
TVM17	2.039931377	.48421925	4.213	.0000	.29684096E-01
TVM18	.5890692988	1.4837441	.397	.6914	.29684096E-01
TVM19	2.711534100	1.9247698	1.409	.1589	.29684096E-01
VM1	-1.378330194	.35657943	-3.865	.0001	.58823529E-01
VM2	1.204863240	.13503590	8.923	.0000	.58823529E-01
VM3	.4172125587	.18021664	2.315	.0206	.58823529E-01
VM4	1.595449154	.11891265	13.417	.0000	.58823529E-01
VM5	.2099930851	.20662410	1.016	.3095	.58823529E-01
VM6	1.511223572	.13047791	11.582	.0000	.58823529E-01
VM7	-2.549738868	.61983533	-4.114	.0000	.58823529E-01
VM10	-3.487084848	.81259772	-4.291	.0000	.58823529E-01
VM11	-1.473230381	.27422004	-5.372	.0000	.58823529E-01
VM12	-1.968400011	.33827139	-5.819	.0000	.58823529E-01
VM13	-.3229995088	.20402925	-1.583	.1134	.58823529E-01
VM14	-1.766712630	.27230011	-6.488	.0000	.58823529E-01
VM15	-1.110548906	.23232914	-4.780	.0000	.58823529E-01
VM16	-.6640140747	.19674777	-3.375	.0007	.58823529E-01
VM17	-.8061104337	.24480057	-3.293	.0010	.58823529E-01
VM18	-2.942762471	.81782887	-3.598	.0003	.58823529E-01
VM19	-4.534233549	1.3210413	-3.432	.0006	.58823529E-01
INT1	-.2370591623	.11025857	-2.150	.0316	.12908497
NINT1	-.2541116115	.50608554E-01	-5.021	.0000	1.2690632
INT2	.1522977365	.12019474	1.267	.2051	.39215686E-01
NINT2	.2756067348	.62320496E-01	4.422	.0000	.26851852

E1.2 Enhanced Baseline Model based on Shipments Confirmed by Intelligence

In this section, we begin with the baseline model, add individual interdictions, and test whether or not those individual interdictions seem to affect traffickers. For example, to test whether Operation Gateway caused shippers to alter their shipping procedures, we added variables GATEWAY (turned on when and where Operation Gateway was operational) and NGATEWAY (the complement of GATEWAY) to the baseline model.[34] If Gateway were effective, we would expect the parameter associated with GATEWAY to be negative (fewer shipments) and the parameter associated with NGATEWAY to be positive (more shipments). In fact, we infer the presence of deterrence when the parameter associated with NGATEWAY *minus* the parameter associated with GATEWAY is positive and statistically significant. This difference implies a relative shift in trafficking from where Operation Gateway was operational to where it was not. We used a standard Wald test to determine statistical significance. Because we could predict direction, we employed one-tailed test and an α value of 0.10. Table E2 summarizes our findings.

Table E2: Adding Interdictions Programs to the Baseline Model – Shipments Confirmed with Intelligence

	Contrast from Adding Variables	P Value	Contrast from Regression	P-Value
Hard Line	0.35	0.08	0.27	0.14
Two Dozen	1.43	0.08	1.01	0.17
Zorro II	0.43	0.02		
Gateway	0.29	0.06	0.28	0.07
White Shark I	-0.60	0.02	0.09	0.39
White Shark II	-0.95	0.14		
Frontier Shield	-0.53	0.09	-0.70	0.12
Border Shield	***	***	1.21	0.00
Gulf Shield	1.26	0.00	1.21	0.00
White Shark III	***	***		
Brass Ring	-0.27	0.53		
River Sweep	0.72	0.00	0.62	0.01
Frontier Lance	0.21	0.61		
Conjuntos I and II	-0.26	0.58		

Column 1 identifies the interdiction programs considered in this study. The second column reports the contrast (e.g. the difference between the NGATEWAY parameter and the GATEWAY parameter), and the third column reports the P-value from the Wald test. We will discuss columns four and five in section E1.3.

For two programs (marked with ***), we could not compute the Wald statistic, presumably because the data were too sparse to provide estimates. For six of the interventions, the contrast was in the expected direction (positive) and was significant at $p<0.10$. These tests suggest that interdiction has caused traffickers to shift vectors and modes. However, the parameters for White Shark I and Frontier Shield are negative and might be judged to be statistically significant if we had not employed a one-tailed test. Although the evidence would seem to be on the side of

[34] Before these individual programs were added to the model, we subtracted the program and its complement from the construction of INT1, NINT1, INT2, and NINT2.

interdictions effectiveness at disrupting trafficker behaviors, the evidence is equivocal. A regression analysis may be more convincing.

E1.3 Enhanced Regression Model based on Shipments Confirmed by Intelligence

Building on the results reported in section AE1.2, we identified interdiction programs that were significant (from Table AE2) and added them as a group to the baseline regression. As before, we tested for the statistical significance of the contrast using a Wald test. The regression results appear as Table E3.

The values and statistical significance of the contrasts are most important to this study. They are summarized in table E2. Column four reports the value of the contrast. Column five reports the P-value of the Wald test.

Four of the interdiction programs seem to have caused traffickers to change their shipment methods. (We combined Border Shield and Gulf Shield into single variables. Otherwise, when included treated separately in the same regression, they were collinear.) Two programs still have unexpected negative signs, but neither is statistically significant. We might accept this as modest evidence in favor of a finding that interdiction has disrupted trafficking behavior. Next, we repeat the analysis with a different dependent variable, all known shipments regardless of whether or not they had intelligence verification.

Table E3: Adding Interdiction Programs to the Baseline Regressions – Shipments Confirmed with Intelligence

```
+-------------------------------------------+
| Poisson Regression                        |
| Maximum Likelihood Estimates              |
| Dependent variable            N_SHIP_I    |
| Weighting variable                 ONE    |
| Number of observations            1836    |
| Iterations completed                10    |
| Log likelihood function       -2004.052   |
| Restricted log likelihood     -2867.591   |
| Chi-squared                    1727.077   |
| Degrees of freedom                   53   |
| Significance level             .0000000   |
| Chi- squared =  2489.64066  RsqP=   .5059 |
| G  - squared =  2113.72905  RsqD=   .4497 |
+-------------------------------------------+
```

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
CYCLE1	-.1467272238	.37023890E-01	-3.963	.0001	.64376427E-13
CYCLE2	-.1128102009	.36935424E-01	-3.054	.0023	.17360728E-13
TVM1	2.317709869	.72780797	3.185	.0015	.29684096E-01
TVM2	-.6710934168	.40582667	-1.654	.0982	.29684096E-01
TVM3	.2851088598	.47691572	.598	.5500	.29684096E-01
TVM4	-1.306475995	.40511684	-3.225	.0013	.29684096E-01
TVM5	.1599118158E-02	.56243747	.003	.9977	.29684096E-01
TVM6	-2.013531988	.45728761	-4.403	.0000	.29684096E-01
TVM7	2.576579200	1.1860748	2.172	.0298	.29684096E-01
TVM10	4.084014116	1.3130657	3.110	.0019	.29684096E-01
TVM11	5.972371563	.67191322	8.889	.0000	.29684096E-01
TVM12	5.069425468	.60073563	8.439	.0000	.29684096E-01

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
TVM13	2.706757319	.46348191	5.840	.0000	.29684096E-01
TVM14	5.900911540	.50641212	11.652	.0000	.29684096E-01
TVM15	4.853254423	.46951719	10.337	.0000	.29684096E-01
TVM16	4.517353018	.43423327	10.403	.0000	.29684096E-01
TVM17	6.425450913	.97502496	6.590	.0000	.29684096E-01
TVM18	3.172937606	1.9466202	1.630	.1031	.29684096E-01
TVM19	4.400938468	2.1151093	2.081	.0375	.29684096E-01
VM1	-1.789159972	.39040177	-4.583	.0000	.58823529E-01
VM2	1.026773521	.14573128	7.046	.0000	.58823529E-01
VM3	.1874096669	.19629061	.955	.3397	.58823529E-01
VM4	1.441687835	.12805624	11.258	.0000	.58823529E-01
VM5	-.1022476886E-01	.22403601	-.046	.9636	.58823529E-01
VM6	1.387924735	.13901570	9.984	.0000	.58823529E-01
VM7	-2.991682453	.67654087	-4.422	.0000	.58823529E-01
VM10	-4.000411548	.86420724	-4.629	.0000	.58823529E-01
VM11	-2.628244836	.37570632	-6.995	.0000	.58823529E-01
VM12	-2.672704838	.37636039	-7.101	.0000	.58823529E-01
VM13	-.7768329996	.23028723	-3.373	.0007	.58823529E-01
VM14	-2.570984579	.31038373	-8.283	.0000	.58823529E-01
VM15	-1.775501144	.26428070	-6.718	.0000	.58823529E-01
VM16	-1.317490937	.22926556	-5.747	.0000	.58823529E-01
VM17	-2.500443009	.43726432	-5.718	.0000	.58823529E-01
VM18	-3.754525590	1.0067593	-3.729	.0002	.58823529E-01
VM19	-5.158771869	1.4304390	-3.606	.0003	.58823529E-01
INT1	.3110889125	.14734896	2.111	.0348	.28867102E-01
NINT1	.1734423999	.86683244E-01	2.001	.0454	.12854031
INT2	.1931763316	.30654103	.630	.5286	.10893246E-01
NINT2	.2468156891	.17713148	1.393	.1635	.63180828E-01
TWODOZ	-.5689010411	1.0085545	-.564	.5727	.21786492E-02
NTWODOZ	.4371016851	.25636325	1.705	.0882	.92592593E-02
HARDLNE	-.4138179349	.24365322	-1.698	.0894	.31045752E-01
WHITESI	-.1499855917E-01	.40493803	-.037	.9705	.70806100E-02
BORGLF	-1.570947893	.46641634	-3.368	.0008	.37037037E-01
RIVSWP	-1.754805825	.39191370	-4.478	.0000	.25054466E-01
NHARDLNE	-.1457431178	.95320297E-01	-1.529	.1263	.24673203
NWHI	.7087233715E-01	.29071813	.244	.8074	.11328976
NBORGLF	-.3593930368	.14713832	-2.443	.0146	.59259259
NRIVSWP	-1.135668465	.31593503	-3.595	.0003	.18790850
GATEWAY	-.7474104510	.33763610	-2.214	.0269	.26143791E-01
NGATEWAY	-.4683676083	.29670468	-1.579	.1144	.19607843
SHIELD	.5499718757E-01	.40743396	.135	.8926	.65359477E-02
NSHIELD	-.6453586667	.27373697	-2.358	.0184	.21241830E-01

E2.0 Analysis Based on All Known Shipments

Section E1 was based on an analysis of movements for which there were corroborating intelligence reports. In this section, we use data based on all sources. Otherwise, this section has the same structure as the last one.

E2.1 Baseline Model: All Shipments

The first step is to develop a baseline model. The regression results are reported in Table E4.

The baseline model requires little discussion, because it raises few new issues that were not discussed in section E1.1. However, in this model, the summary interdiction variable have the expected sign and both are statistically significant – at P = 0.025 for transit zone interdictions and at 0.01 for border interdictions.

Statistical modeling based on all movement events gives a different picture of how interdiction disrupts traffickers. We are uncertain about the reasons for these differences. Both have unique biases, but the biases associated with "all known movements" would seem to work against the findings reported here. At any rate, we now ask what happens as we add individual interdiction programs (and their complements) to the baseline model.

Table E4: Baseline Model based on All Shipments

Poisson Regression	
Maximum Likelihood Estimates	
Dependent variable	N_SHIP
Weighting variable	ONE
Number of observations	1836
Iterations completed	9
Log likelihood function	-2705.301
Restricted log likelihood	-3769.244
Chi-squared	2127.886
Degrees of freedom	39
Significance level	.0000000
Chi- squared = 3101.22822	RsqP= .4916
G - squared = 2798.30398	RsqD= .4320

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
CYCLE1	-.7314810134E-01	.28468042E-01	-2.569	.0102	.64376427E-13
CYCLE2	-.8670401309E-01	.28334912E-01	-3.060	.0022	.17360728E-13
TVM1	3.627079071	.42099198	8.616	.0000	.29684096E-01
TVM2	-.5451966037	.26527633	-2.055	.0399	.29684096E-01
TVM3	-.4391948251	.31534570	-1.393	.1637	.29684096E-01
TVM4	-2.151267528	.26936526	-7.986	.0000	.29684096E-01
TVM5	-.6553497859	.37048270	-1.769	.0769	.29684096E-01
TVM6	-2.259043312	.28231601	-8.002	.0000	.29684096E-01
TVM7	.3734234213	.65712883	.568	.5699	.29684096E-01
TVM10	2.275626220	.95894578	2.373	.0176	.29684096E-01
TVM11	2.967443231	.39907456	7.436	.0000	.29684096E-01
TVM12	3.135859298	.42692994	7.345	.0000	.29684096E-01
TVM13	.3681322160	.31031886	1.186	.2355	.29684096E-01
TVM14	2.894876567	.33906906	8.538	.0000	.29684096E-01
TVM15	2.955244816	.31407062	9.409	.0000	.29684096E-01
TVM16	2.392078334	.27723297	8.628	.0000	.29684096E-01

TVM17	1.925173109	.37624410	5.117	.0000	.29684096E-01
TVM18	.7304181048	.92093838	.793	.4277	.29684096E-01
TVM19	.8143265570	1.4687860	.554	.5793	.29684096E-01
VM1	-1.940373885	.29745830	-6.523	.0000	.58823529E-01
VM2	1.255213076	.11661263	10.764	.0000	.58823529E-01
VM3	.7314593647	.14783769	4.948	.0000	.58823529E-01
VM4	1.977469640	.96742995E-01	20.440	.0000	.58823529E-01
VM5	.4933610021	.17023955	2.898	.0038	.58823529E-01
VM6	1.908320234	.10094571	18.904	.0000	.58823529E-01
VM7	-1.359187413	.37306002	-3.643	.0003	.58823529E-01
VM10	-3.064293462	.66556793	-4.604	.0000	.58823529E-01
VM11	-1.361807101	.26034184	-5.231	.0000	.58823529E-01
VM12	-1.732672415	.29415610	-5.890	.0000	.58823529E-01
VM13	.3930657130	.15841300	2.481	.0131	.58823529E-01
VM14	-1.025271643	.21884004	-4.685	.0000	.58823529E-01
VM15	-.8483104009	.20040433	-4.233	.0000	.58823529E-01
VM16	-.1972843768	.16042235	-1.230	.2188	.58823529E-01
VM17	-.1920736328	.18523863	-1.037	.2998	.58823529E-01
VM18	-2.137837711	.53128271	-4.024	.0001	.58823529E-01
VM19	-3.233501541	.89457981	-3.615	.0003	.58823529E-01
INT1	-.3307793842	.88126654E-01	-3.753	.0002	.12908497
NINT1	-.1173706063	.38560643E-01	-3.044	.0023	1.2690632
INT2	.5948420239E-01	.94865464E-01	.627	.5306	.39215686E-01
NINT2	.2529261888	.46650226E-01	5.422	.0000	.26851852

E2.2 Enhanced Baseline Model based on All Shipments

The next step is now familiar. We start with the baseline model, add individual interdiction programs to that model, and test for the statistical significance of these added programs. Findings are summarized in Table E5, which is the counterpart to Table E2. Differences arise because of the change in the dependent variables, from shipments with intelligence in Table E2 to all shipments in Table E5.

Eight individual programs now pass the test for statistical significance. That is, for those eight, the contrast is positive and statistically significant at better than P=0.10. We find a perverse negative contrast (statistically significant) in two other programs.

E2.3 Enhanced Regression Model based on All Shipments

As a final step, we estimated a regression model that included all the variables from the baseline model and all the variables that resulted in statistically significant contrast as reported in table E6. Table E5 summarizes the Wald tests in columns four and five.

Seven of the eight contrasts that were positive and significant in section E2.2 remain positive and significant in these regressions. The eight remains positive but does not quite reach statistical significance. Although two of the contrasts are negative, neither is statistically significant. These regression results seem to lend weight to a conclusions that interdiction has caused traffickers to shift activity away from vectors/modes that are the focus of interdiction to vectors/modes that are not targets.

Table E5: Adding Interdictions Programs to the Baseline Model – All Shipments

	Contrast from Adding Variables	P Value	Contrast from Regression	P-Value
Hard Line	0.69	0.00	0.67	0.00
Two Dozen	2.08	0.02	1.69	0.05
Zorro II	-0.24	0.15		
Gateway	0.21	0.07	0.20	0.09
White Shark I	-0.44	0.02	0.08	0.36
White Shark II	-0.97	0.04	-0.32	0.50
Frontier Shield	-0.34	0.15	-0.57	0.20
Border Shield*	3.01	0.01	0.93	0.00
Gulf Shield*	1.33	0.00	0.93	0.00
White Shark III	1.14	0.03	0.97	0.06
Brass Ring	-0.08	0.80		
River Sweep	1.03	0.00	0.91	0.00
Frontier Lance	0.52	0.08	0.43	0.13
Conjuntos I and II	0.11	0.38		

Table E6: Adding Interdiction Programs to the Baseline Regressions – All Shipments

Poisson Regression	
Maximum Likelihood Estimates	
Dependent variable	N_SHIP
Weighting variable	ONE
Number of observations	1836
Iterations completed	9
Log likelihood function	-2612.317
Restricted log likelihood	-3769.244
Chi-squared	2313.854
Degrees of freedom	59
Significance level	.0000000
Chi- squared = 2845.29768	RsqP= .5335
G - squared = 2612.33601	RsqD= .4697

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
CYCLE1	-.5640615585E-01	.29706813E-01	-1.899	.0576	.64376427E-13
CYCLE2	-.1479483199	.31431251E-01	-4.707	.0000	.17360728E-13
TVM1	4.457587986	.46212290	9.646	.0000	.29684096E-01
TVM2	-.2748442050E-01	.29681085	-.093	.9262	.29684096E-01
TVM3	.9475163611E-02	.34780173	.027	.9783	.29684096E-01
TVM4	-1.704266089	.30105202	-5.661	.0000	.29684096E-01
TVM5	-.2329633852	.40466252	-.576	.5648	.29684096E-01
TVM6	-1.818364138	.31311502	-5.807	.0000	.29684096E-01
TVM7	.9845031877	.69885317	1.409	.1589	.29684096E-01
TVM10	2.868978150	.97679877	2.937	.0033	.29684096E-01
TVM11	4.857922644	.56777459	8.556	.0000	.29684096E-01
TVM12	4.013029303	.46922700	8.552	.0000	.29684096E-01
TVM13	.9047154776	.34623356	2.613	.0090	.29684096E-01
TVM14	3.732514166	.38557568	9.680	.0000	.29684096E-01
TVM15	3.751430735	.36147027	10.378	.0000	.29684096E-01
TVM16	3.175529131	.32569314	9.750	.0000	.29684096E-01
TVM17	4.573977668	.65624128	6.970	.0000	.29684096E-01
TVM18	2.215618002	1.1089964	1.998	.0457	.29684096E-01
TVM19	1.437452861	1.5385191	.934	.3501	.29684096E-01
VM1	-2.267235978	.31224141	-7.261	.0000	.58823529E-01
VM2	1.116537858	.12339469	9.049	.0000	.58823529E-01
VM3	.6012671359	.15548342	3.867	.0001	.58823529E-01
VM4	1.900828964	.10048114	18.917	.0000	.58823529E-01
VM5	.3755144049	.17821032	2.107	.0351	.58823529E-01
VM6	1.833650258	.10461724	17.527	.0000	.58823529E-01
VM7	-1.542086790	.38847407	-3.970	.0001	.58823529E-01
VM10	-3.204949585	.67094037	-4.777	.0000	.58823529E-01
VM11	-2.164431723	.33260189	-6.508	.0000	.58823529E-01
VM12	-2.067059149	.30915981	-6.686	.0000	.58823529E-01
VM13	.2209788722	.16793808	1.316	.1882	.58823529E-01
VM14	-1.380887350	.23640654	-5.841	.0000	.58823529E-01
VM15	-1.174544739	.21749955	-5.400	.0000	.58823529E-01
VM16	-.5175372470	.17670733	-2.929	.0034	.58823529E-01
VM17	-1.222098927	.28433774	-4.298	.0000	.58823529E-01
VM18	-2.609563540	.60044753	-4.346	.0000	.58823529E-01
VM19	-3.428420810	.92673218	-3.699	.0002	.58823529E-01
INT1	.3706183697	.13054511	2.839	.0045	.26143791E-01
NINT1	.1672939725	.86117880E-01	1.943	.0521	.84967320E-01
INT2	.3707689356E-01	.34592276	.107	.9146	.76252723E-02

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
NINT2	.1964373102	.15732225	1.249	.2118	.38671024E-01
TWODOZ	-1.434637652	1.0042811	-1.429	.1531	.21786492E-02
NTWODOZ	.2526764629	.21213183	1.191	.2336	.92592593E-02

HARDLNE	-.7165552386	.19485292	-3.677	.0002	.31045752E-01
WHITESI	.3906454009	.27508759	1.420	.1556	.70806100E-02
WHITEII	-.6283123549	.43500540	-1.444	.1486	.10893246E-02
WHITIII	-.7922272362	.61166226	-1.295	.1952	.16339869E-02
BORGLF	-.9902991675	.32608436	-3.037	.0024	.37037037E-01
RIVSWP	-1.617492723	.28849429	-5.607	.0000	.25054466E-01
NHARDLNE	-.4478952241E-01	.77432264E-01	-.578	.5630	.24673203
NWHI	.4749202867	.18289456	2.597	.0094	.11328976
NWHII	-.9528289574	.21420069	-4.448	.0000	.17429194E-01
NWHIII	.1799395180	.13952638	1.290	.1972	.26143791E-01
NBORGLF	-.6261011307E-01	.93145441E-01	-.672	.5015	.59259259
NRIVSWP	-.7097157269	.20893499	-3.397	.0007	.18790850
GATEWAY	-.6500331426	.22464778	-2.894	.0038	.26143791E-01
NGATEWAY	-.4505055424	.18734259	-2.405	.0162	.19607843
SHIELD	.3461122629	.41005949	.844	.3986	.65359477E-02
NSHIELD	-.2241198839	.22290290	-1.005	.3147	.21241830E-01
FTRLANC	-.1150491404	.38554620	-.298	.7654	.32679739E-02
NFTRLANC	.3173690780	.16936055	1.874	.0609	.24509804E-01

E3.0 The Amount of Drugs Transported

The final part of this analysis was to treat the amount shipped as the dependent variable. For this analysis, we excluded vectors/modes that had zero shipments. Here the question is whether or not shipments, measured as the bulk amount of cocaine transported, changed conditional on the number of shipments that were actually made.

We do not show details. Four of the interdiction events seemed to have reduced the bulk amount of cocaine moving through targeted vector/mode combinations. A Fifth program almost reached statistical significance (P=0.103). One program had a perverse negative effective. These findings reinforce the earlier findings that were based on the number of movements.

Appendix F: Weather Events

Weather Event	Begin	End
Tropical Storm Fabian	14-Oct-91	15-Oct-91
Hurricane Andrew	23-Aug-92	26-Aug-92
Tropical Storm Bret	7-Aug-93	8-Aug-93
Tropical Storm Bret	8-Aug-93	9-Aug-93
Tropical Storm Bret	9-Aug-93	11-Aug-93
Tropical Storm Cindy	14-Aug-93	15-Aug-93
Tropical Storm Cindy	16-Aug-93	17-Aug-93
Hurricane Gert	14-Sep-93	21-Sep-93
Tropical Storm Debby	9-Sep-94	11-Sep-94
Hurricane Gordon	8-Nov-94	12-Nov-94
Hurricane Gordon	12-Nov-94	20-Nov-94
Tropical Storm Allison	3-Jun-95	4-Jun-95
Tropical Storm Allison	4-Jun-95	6-Jun-95
Tropical Storm Dean	28-Jul-95	2-Aug-95
Hurricane Erin	31-Jul-95	4-Aug-95
Tropical Storm Gabrielle	9-Aug-95	12-Aug-95
Tropical Storm Jerry	22-Aug-95	26-Aug-95
Hurricane Iris	22-Aug-95	28-Aug-95
Hurricane Luis	5-Sep-95	6-Sep-95
Hurricane Marilyn	14-Sep-95	17-Sep-95
Hurricane Opal	27-Sep-95	3-Oct-95
Hurricane Opal	4-Oct-95	5-Oct-95
Hurricane Roxanne	7-Oct-95	21-Oct-95
Tropical Storm Sebastien	23-Oct-95	25-Oct-95
Tropical Storm Arthur	17-Jun-96	17-Jun-96
Tropical Storm Arthur	17-Jun-96	20-Jun-96
Hurricane Bertha	7-Jul-96	8-Jul-96
Hurricane Bertha	9-Jul-96	11-Jul-96
Hurricane Bertha	11-Jul-96	13-Jul-96
Hurricane Bertha	13-Jul-96	14-Jul-96

Hurricane Cesar	24-Jul-96	24-Jul-96
Hurricane Cesar	25-Jul-96	25-Jul-96
Hurricane Cesar	26-Jul-96	26-Jul-96
Hurricane Cesar	27-Jul-96	28-Jul-96
Hurricane Dolly	19-Aug-96	20-Aug-96
Hurricane Fran	5-Sep-96	6-Sep-96
Hurricane Hortense	7-Sep-96	9-Sep-96
Hurricane Hortense	9-Sep-96	11-Sep-96
Tropical Storm Josephine	5-Oct-96	8-Oct-96
Tropical Storm Kyl	11-Oct-96	12-Oct-96
Hurricane Lili	14-Oct-96	17-Oct-96
Hurricane Lili	17-Oct-96	19-Oct-96
Hurricane Marco	16-Nov-96	26-Nov-96
Severe El Nino effects	1-Apr-97	30-Jun-97
Hurricane Danny	16-Jul-97	21-Jul-97
Hurricane Charley	21-Aug-98	22-Aug-98
Hurricane Bonnie	26-Aug-98	28-Aug-98
Hurricane Earl	2-Sep-98	3-Sep-98
Tropical Storm Frances	8-Sep-98	9-Sep-98
Tropical Storm Hermine	19-Sep-98	20-Sep-98
Hurricane Georges	20-Sep-98	21-Sep-98
Hurricane Georges	22-Sep-98	22-Sep-98
Hurricane Georges	23-Sep-98	25-Sep-98
Hurricane Georges	26-Sep-98	28-Sep-98
Hurricane Mitch	22-Oct-98	4-Nov-98
Hurricane Dennis	25-Aug-99	29-Aug-99
Hurricane Dennis	29-Aug-99	5-Sep-99
Tropical Storm Harvey	20-Sep-99	22-Sep-99
Tropical Storm Harvey	22-Sep-99	22-Sep-99
Hurricane Irene	14-Oct-99	17-Oct-99
Hurricane Irene	16-Oct-99	18-Oct-99
Hurricane Jose	21-Oct-99	22-Oct-99
Tropical Depression Katrina	29-Oct-99	1-Nov-99

Hurricane Floyd	13-Nov-99	15-Nov-99
Hurricane Lenny	14-Nov-99	17-Nov-99
Hurricane Floyd	15-Nov-99	17-Nov-99
Hurricane Floyd	17-Nov-99	18-Nov-99
Hurricane Lenny	18-Nov-99	20-Nov-99