CBRN Terrorism Interdictions (1990–2016) and Areas for Future Inquiry

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Abstract

The pursuit and use of chemical, biological, radiological, and nuclear (CBRN) weapons has been examined by scholars for more than two decades. What has not been examined are the cases in which non-state actors were prevented from obtaining or using these weapons and agents and the corresponding reasons for successful interdiction. This article uses the Profiles of Incidents Involving CBRN and Non-State Actors (POICN) database to carry out an exploratory analysis of CBRN interdictions around the world from 1990–2016. Using basic descriptives and cross-tabulations, this study finds that successful interdictions often resulted from probable cause searches, surveillance operations, but also from other, unknown reasons. However, there is a tremendous amount of variation when it comes to modes of interdiction and actor motivation. The same goes for jurisdiction, whether international collaboration aided the interdiction, and weapon acquisition and delivery. This text is intended to serve as a foundation for the study of CBRN terrorism interdiction as it seeks to undercover why some law enforcement efforts fail while others succeed.

Keywords: CBRN, terrorism, interdiction, research, POICN

Introduction

The CBRN terrorism literature focuses almost exclusively on who is most likely to pursue or use chemical, biological, radiological, or nuclear (CBRN) weapons, and the factors associated with said pursuit or use. However, little is known about terrorism-related CBRN interdictions, or the process by which individuals or groups are prevented from obtaining or using these weapons and agents. This study seeks to add to this scant literature.

To evaluate how non-state actors were interdicted when pursuing or attempting to use CBRN weapons, this study uses a novel data set—POICN—to assess cases of successful interdiction of CBRN terrorism by law enforcement officials. This data set includes cases of both pursuit and use of CBRN weapons and agents as well as filtering criteria to more accurately assess the validity of said events. The purpose of this analysis is to set forth a foundation for the future study of CBRN terrorism interdiction to improve prevention efforts by law enforcement.

As such, this exploratory analysis is driven by four research questions:

1) what types of interdictions are the most common and where;

2) whether interdictions are more common for certain types of actors, or weapons or agents pursued;

3) whether international collaboration plays a role in local interdictions; and

4) whether interdictions are more common for specific modes of actual or intended agent/weapon acquisition or target selection.

The Difficulties of Interdiction

There are a number of challenges in combating CBRN terrorism that make it unique in comparison with "ordinary" terrorism. The first is the knowledge about actor intent to pursue or use CBRN weapons or agents. Many times, law enforcement is unaware that an actor desires such weapons until after the agent is deployed or used in some manner. Second, it is often difficult to discern which groups have the technical expertise to obtain various weapons or agents, as the time, skill, and resources needed to obtain and use certain weapons vary immensely. For example, it is much easier for actors to obtain and use chlorine or hydrogen cyanide than it is to create a more virulent strain of clostridium botulinum. Nevertheless, the more technical expertise, resources, and tactical skill that is needed may presuppose a more deadly weapon; such as the weaponization of smallpox or even constructing a small nuclear weapon. This makes cruder forms of CBRN weapons such as chemicals and toxins the more likely culprits—something the literature bears out.[1] As such, law enforcement's ability to overcome the defensive measures imposed by malevolent actors in order to learn their intent is extremely important.[2] However, information sharing can suffer when jurisdictions and missions overlap.[3] The same is true when there is a breakdown in international collaboration for investigating transnational actors. Interdiction efforts have increased since the 1960s, with additional international measures such as extradition treaties, criminalization of various acts, informal enforcement arrangements, and formal legal instruments that concern everything from the regulation of dual-use technologies to export-import controls.

CBRN Terrorism Interdiction

1. *International Interdiction Measures*

Some of the most prominent CBRN terrorism prevention and interdiction policies include the Cooperative Threat Reduction (CTR) Program, the Proliferation Security Initiative (PSI), United Nations Security Council Resolution 1540, and the Nuclear Security Summits initiated by the Obama administration.[4]

The CTR—known as the Nunn-Lugar Act—was instituted after the end of the Cold War to ensure the safe dismantling of former Soviet weapons of mass destruction and their corresponding infrastructures. It provided hundreds of millions in funding for the decommission of CBRN weapons throughout the former Soviet Union and served as a starting point for the PSI, which is a voluntary arrangement between states that was initiated by President Bush in concert with Poland in 2003. States that want to participate agree to the Statement of Interdiction Principles, although this is not a legally binding document or international treaty. There are also various nonproliferation programs that operate across the US Departments of Defense, State, and Energy that have had great success within the category of bilateral cooperatives.[5] There is also the International Convention for the Suppression of Acts of Nuclear Terrorism.[6] This binding treaty provides for the criminalization as well as prosecution and extradition of individuals who commit, or attempt to commit, acts of nuclear terrorism. This convention was signed by most states in 2005; it was ratified by the United States in 2015.

UN Security Council Resolution 1540 requires member states to perform many of the same duties enunciated under the PSI to prevent the proliferation of weapons of mass destruction (WMDs).[7] This resolution is binding and requires member states to introduce legislative and regulatory tools to combat and prevent the spread of WMDs by non-state actors. This resolution also bridges the gaps between the Nonproliferation Treaty (NPT), Chemical Weapons Convention (CWC), and Biological and Toxins Weapons Convention (BTWC) by focusing more on the threat posed by non-state actors, as prior legal instruments were focused more on the behavior of states, and because there is no enforcement mechanism for the BTWC, despite there being the International Atomic Energy Agency (for the NPT) and the Organization for the Prohibition of Chemical Weapons (for the CWC). Resolution 1540 requires enforcement by member states in terms of weapons and delivery systems as well as import-export controls. More importantly, it called for the creation and maintenance of "law enforcement efforts to detect, deter, prevent and combat, including through

international cooperation, when necessary, the illicit trafficking and brokering in such items in accordance with their national legal authorities and legislation and consistent with international law."[8]

The lack of an enforcement mechanism for the BTWC is an issue that has been covered elsewhere, with many calling for such a tool.[9] In fact, a recent UN resolution (2325) reaffirmed the obligations of Resolution 1540 while asking states to strengthen their efforts to implement Resolution 1540.[10] All of this is important because the United States' most recent national report (2016) to the UN on its progress in implementing these obligations mentioned nothing specific about the progress of biological weapon counter-measures; it was primarily focused on nuclear weapons and related materials.[11] The 2013 report, however, examined the myriad policies, measures, and laws enacted under Obama to prevent, interdict, and prosecute the spread of CBRN materials and delivery systems.[12] Thus, interdiction priorities can be varied over time, and it's clear that even when there are binding initiatives or agreements, there is not always a strong or viable enforcement mechanism. This inhibits international oversight and transparency efforts that are designed to ensure nonproliferation amongst state and non-state actors. It is also not clear from existing treaties what happens in terms of enforcement or reporting requirements when a CBRN weapon is used by a non-state actor within the territorial jurisdiction of a CWC or BTWC party, since these treaties again are primarily focused on state behavior and state prevention regimes.

The Convention on Physical Protection of Nuclear Material (CPPNM) is a legally binding treaty which was put into force in 1987 and was amended in 2005 to promote the safe transportation and regulation of nuclear materials and facilities as well as a criminalization of illegal trafficking of nuclear materials. The CPPNM was a seminal step toward the promotion of nuclear security as it is the only internationally legally binding regime for the physical protection of nuclear facilities and materials which are used for "peaceful" purposes. It also stewards international collaboration, information sharing, and training on nuclear security, vis-à-vis the International Atomic Energy Agency (IAEA).

Where treatises and resolutions are insufficient, there are bilateral and multilateral coalition agreements. The PSI has been instrumental in improving international communication, intelligence sharing, and collaboration interdiction efforts while fortifying international norms against WMD trafficking.[13] In fact, it played a role in the dissolution of Libya's nuclear weapons program after centrifuges were captured by Italian authorities with help from Germany, the US, and the UK.[14] Nevertheless, because it is nonbinding, it faces criticisms from nonparticipating states as being led by the US, considered not legally binding under international law, and too subjective. The Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (Global Partnership) was a G7-led collaboration initiated in the wake of 9/11 to provide vulnerable states with significant resources to engage in nonproliferation, and in weapons decommissioning activities, especially in states of the former Soviet Union. It has distributed tens of billions in funding for such efforts, although this is merely an international security partnership and not the result of a binding treaty.

Similarly, the Global Initiative to Combat Nuclear Terrorism was a voluntary partnership established between Russia and the US during the Bush administration, with almost 90 countries signing onto the Statement of Principles in an effort to prevent and interdict the proliferation of radiological and nuclear weapons. Central to this nonbinding agreement was the call for better cooperation and information sharing between governments. The Global Threat Reduction Initiative (GTRI) led by the Bush administration has shown some success in reducing the overall amount of Russian and US enriched uranium stockpiles. The Obama Security Summits built on this success through continued negotiations which, however, stagnated under the Trump and Biden administrations with regard to the new START treaty. However, these were informally extended in 2021.

Other regional cooperatives that focus specifically on export controls include the Nuclear Suppliers Group (NSG), the Australia Group, the Wassenaar Arrangement, and the Missile Technology Control Regime (MTCR). [15] These types of nonbinding agreements typically suffer from "inconsistent implementation, inadequate state-based capacity, a lack of universality, enforcement, and verification" mechanisms, however.

[16] For example, the NSG is an export control regime focused on preventing the spread of nuclear technologies and materials. It precludes the sharing of nuclear materials with non-NPT signatories; although a waiver was granted to India in 2008, allowing it to be a member of the group without having signed the NPT. The MTCR is similar but focuses on export control of missile technologies and unmanned aerial vehicles that can be used to deliver WMDs. This is a voluntary cooperative agreement that has no enforcement mechanism, and many countries (including some which are not members, but voluntarily adhere to the rule of the MTCR) have varied export control regimes (e.g., China) that have made admission to the group and oversight contentious. Nevertheless, there are some bigger unknowns that may undermine the efficacy of any of these prevention and interdiction instruments; especially those that are nonbinding and lack robust enforcement mechanisms.

2. Too Many Unknowns

Too many unknowns remain for there to be a concrete understanding of interdiction efficacy. One of these unknowns is the *why* behind actors' motivation to obtain CBRN weapons. A better grasp of these motivations and the push and pull factors behind them may shed light on which enforcement mechanism *will be* more effective in the future.[17] Furthermore, a stronger understanding of actor intent and motivation may elucidate better techniques law enforcement can use to interdict actors prior to agent obtainment or use. However, it is also unclear what prevention and interdiction efforts *have* worked thus far, as no empirical analysis has been provided in the extant open literature. There is some contemporary scholarship that suggests many of the foregoing cooperatives, treaties, and programs have produced viable interdictions—both locally and internationally—but much of this discourse is either anecdotal or lacks empirical rigor.[18] Put another way, the PSI and CTR may have produced substantial defense, strategic, and foreign policy gains for participating countries, but it is still impossible to determine the magnitude of the impact of these instruments in fostering more effective interdiction efforts without a more empirical assessment of actual interdictions. While the current study cannot measure the net impact of any of the foregoing interdiction instruments, it can provide an empirical foundation for the study of CBRN terrorism interdiction; which can hopefully influence future discussions on interdiction efforts.

Methods

This study draws on the Profiles of Incidents Involving CBRN and Non-State Actors (POICN) database.[19] This data set includes more than 500 cases involving the pursuit or use of CBRN weapons from 1990–2016. In the article discussing the rollout of the database, the authors provide basic descriptives of the "Interdiction" variable. They found that close to 69% of plots that did not progress were due to some form of interdiction.[20] While the categorical breakdowns (e.g., probable cause search, accidental discovery, and undercover investigation) for different types of interdictions are available in crosstab and graphical form, there is no underlying analysis as to geographic, motivational, tactical, or demographic variations across these forms of interdiction; hence the impetus for the present study.

As such, this article relies on descriptive statistics, frequency distributions, and cross-tabulations to address each of the foregoing research questions. Each of the analyses will be presented within the context of each of the respective research questions.

1. Case Selection

This study only includes cases with: 1) strong source validity (1+); 2) no more than "some" (<2) inherent uncertainty about the attack; 3) no more than "some" (<2) inherent uncertainty about the event; and 4) no doubt about whether the case involves "terrorism".[21] This is consistent with what others have done before when using POICN.[22] From there, only cases with a "4" for *No Progression* are used, as this denotes whether an actor was interdicted. Once the data set is constrained on these measures, 134 cases remain.

2. *Variables*

2.1. *Interdiction.*

Interdiction classifies the method of interdiction. There are six different options for this measure: chance discovery ("1"), routine search ("2"), probable cause search ("3"), surveillance investigation ("4"), undercover investigation ("5"), and sting operation ("6").[23] *CBRN Specific* denotes whether the method of interdiction is CBRN specific. *International Law* articulates whether international law enforcement aided in the interdiction process ("1"). This can include aid from another nation's law enforcement, military, intelligence, or intergovernmental institution. The same is true of interdiction, in that a law enforcement agency, intelligence agency, or military (or branch thereof) can be the principal agent involved in the interdiction. Given that most cases involve law enforcement (and law enforcement-oriented terminologies), the term "law enforcement" should be understood as an umbrella term to include these other types of agents throughout this article.

2.2. *Attack.*

Attack Sophistication denotes whether the planned attack was "1" low, "2" medium, or "3" high in terms of the level of sophistication. An example of a low sophistication attack is one that uses a "relatively simple delivery method" (e.g., raw sewage in water) whereas a plan with high sophistication uses a sophisticated agent or delivery method (e.g., materials for nuclear attack or complex explosives). This means that a "medium" level plan includes something akin to the acquisition of an established CBR weapon that is sophisticated but easy to use or involves the mass production of a simple agent.[24] *Target* constitutes the type of target (e.g., Government; Military; Police) that the actor intended or planned to attack. The various types of targets are provided below. *Biological*, *Chemical*, *Nuclear*, and *Radiological* all denote whether the case in question involves biological, chemical, nuclear, or radiological weapons or agents, respectively. *Delivery* denotes the specific modes of planned delivery, whereas *acquisition* classifies how the actor acquired, planned to acquire or attempted to acquire the weapon or agent. The former includes numerous types of delivery that will be discussed below. The actor could have acquired the material or agent through a *facility*, in that it was held by a facility in an attack without changing the location of the material; via *production* by producing some level of the agent or weapon in house; through a *purchase* on the black or white market; through *theft*; or through *training*, in that at least one actor involved in the case participated in some "training specific to the production, handling, and/or delivery of the agent and/or delivery mechanism. Values of "1" for each of the modes of acquisition indicate an affirmative response.

Discovery Country was the country in which the plan was discovered. *Motivation* comprises several different categories as well: 1) personal or professional grudge, 2) individualized objective, 3) to establish ethno-nationalist sovereignty or strengthen ethno-nationalist rights; 4) to act in support of a collective religious theology; 5) to protest the treatment of animals or the environment; 6) to promote other single issues; 7) other/unknown.[25]. *Unsuccessful* denotes whether the actor was able to use or attempted to use the agent or weapons in question. This is coded based on whether *no progression* in POICN was coded as "0" (e.g., attempted use or actual use) and no interdiction occurred.

Results and Discussion

1. *Question #1: What types of interdictions are the most common and where?*

Results reveal that more than half of all successful interdictions were the result of probable cause searches (27.6%) and surveillance investigations (24.6%) (Table 1). This indicates that in most cases where an actor was interdicted, law enforcement had already taken substantial steps in pursuing them. The least likely modes of interdiction include sting and undercover operations as well as routine searches (combined less than 15%). It must be stated that almost 14% of all cases have an unknown form of interdiction, whereas almost one in five resulted from a chance discovery. Close to 30% of all interdictions were CBRN specific

as well, meaning close to 70% of interdictions were not because of some material fact related to CBRN weapons or agents. Future scholarship should try to unpack this relationship further as developed countries apparently had lower rates of CBRN-specific interdictions than developing countries (see Table 2).

Table 1: Modes of Interdiction (n=134)

Interdiction	n	%
Unknown	19	14.18%
Chance	25	18.66%
Routine	11	8.21%
Probable Cause	37	27.61%
Surveillance	33	24.63%
Undercover	7	5.22%
Sting	2	1.49%
CBRN Specific	40	29.85%
Total	134	

Most countries had very few successful interdictions; most likely because most countries do not experience many CBRN events. This is primarily because most CBRN cases occur in a handful of countries.[26] Nevertheless, the US, UK, and Russia constitute 49 of the 134 total cases (Table 2).[27] A large number of unknown methods of interdiction are evident for Russia, demonstrating a need for future inquiry. Chance and routine discoveries were more common in countries where probable cause searches and surveillance operations were *less commonly* the cause of interdiction. Furthermore, the UK and the US had amounts of successful interdiction due to probable cause searches and interdictions resulting from surveillance (almost 50%). All undercover operations resulting in an interdiction occurred in the US, and almost half of all interdictions in the US were CBRN specific; the only other country that comes close to these numbers is Japan. Surveillance investigations played the largest role in the UK, US, Germany, Australia, Iraq, and Turkey overall.

Table 2: Modes of Interdiction by Country (n=134)

Country	Unknown	Chance	Routine	Probable Cause	Surveillance	Undercover	Sting	CBRN Specific	Total	Unsuccessful
US	0	3	2	9	4	5	1	12	24	32
UK	0	3	1	3	8	0	0	3	15	2
Russia	7	2	0	1	0	0	0	4	10	4
Israel	2	3	1	3	0	0	0	3	9	4
India	1	2	0	3	1	0	0	1	7	2
Afghanistan	1	0	2	2	1	0	0	2	6	18
Japan	0	2	1	3	0	0	0	3	6	13
Australia	0	1	1	1	2	0	0	1	5	0
Germany	0	1	1	1	2	0	0	2	5	1
Iraq	2	1	0	0	2	0	0	1	5	8
Turkey	0	0	0	3	2	0	0	2	5	2
Saudi Arabia	1	2	0	0	1	0	0	0	4	0
Morocco	1	0	1	1	0	0	0	0	3	0
Spain	0	0	0	1	1	0	1	1	3	1

One key takeaway is that most countries—except the US and UK—successfully interdicted non-state actors pursuing CBRN weapons 40–90% of the time due to chance, or routine inspection (or for unknown reasons); the US and UK figures are 21% and 27% respectively. Amongst the top five nations, probable cause searches and surveillance (and undercover operations for the US) were the most common reasons for interdiction. Reading Table 2 from left to right (omitting "unknown") allows for a crude representation of the amount of awareness of a potential CBRN terrorism threat (potentially influenced by stronger intelligence assessments)

as well as resources dedicated to interdicting them. Nevertheless, the United States, Japan, Afghanistan, and Iraq have significantly *more* cases that are not interdicted than interdicted. Countries like the UK, Australia, Germany, and India not only have more occurrences, but much higher rates of successful interdicted, relative to successful pursuits or attacks (e.g., unsuccessful cases). Unsuccessful cases here refer to the pursuit or use of CBRN weapons or agents that were *not* interdicted or abandoned. Put another way, the actor attempted to use or actually used the agent or weapon. Keep in mind that this "unsuccessful" measure would be higher for most countries had acquisition of agent been included here.

Taken together, these findings suggest that building strong criminal cases against non-state actors suspected of pursuing terrorism via probable cause searches (with or without warrants) and thereafter, enable states to not only interdict cases more often, but also the mode of interdiction is more likely to be CBRN specific. However, more inquiry is needed here to discern why these patterns emerge; especially in the case of the US which has a large portion of CBRN-specific interdictions alongside a strong portion of their cases in the investigative stage. However, many actors successfully acquire, develop, or end up using these materials, based on the foregoing data. This could be due to other factors such as international collaboration (see Table 7) or enforcement priorities.

2. *Question #2: Whether interdictions are more common for certain types of actors, or weapons or agents pursued?*

In looking at the breakdown of various actors, weapons, agents, delivery mechanisms and interdiction, there are a few things to note up front. First, an overwhelming majority of individuals included in this subset of POICN were found to be motivated by a religious ideology (80) or ethno-nationalist concerns (28) (Table 3). These two categories constitute 81% of all interdictions. Ethno-nationalist motivated actors were about as likely to be interdicted by chance as they were to be from a probable cause search of surveillance investigation. This was not the case with religious motivated actors, however, as they were much more likely to be interdicted via a probable cause search or surveillance operation than any other method. Nevertheless, about 14% of these cases involve unknown interdiction methods. Other actors were overwhelmingly more likely to be interdicted by probable cause searches.

Table 3: Modes of Interdiction by Actor Motivation (n=134)

	Grudge	Individual Objective	Ethno-nationalism	Religion	Animals or Environment	Single Issues	Other or Unknown	Total
Unknown	0	0	5	12	0	0	2	19
Chance	0	0	8	13	0	1	3	25
Routine	0	1	0	9	0	0	1	11
Probable Cause	3	2	4	21	2	1	4	37
Surveillance	0	4	7	21	0	0	1	33
Undercover	0	1	3	3	0	0	0	7
Sting	0	0	1	1	0	0	0	2
	3	8	28	80	2	2	11	134

Amongst these different forms of interdiction are varying levels of plot sophistication. A plurality of interdictions involved medium levels of sophistication, whereas high levels of sophistication occurred the least (Table 4). Here it seems probable cause searches were the leading cause for plots with high and low levels of sophistication but not medium levels. Across the board, surveillance investigations and chance discoveries were more evident with lower levels of sophistication.

When diving further into *who* is being interdicted for these varying levels of plot sophistication, it is clear that almost all high-level plots are motivated by religious actors; in fact, a disproportionate amount for both medium and high levels of sophistication (Table 5). About 25% percent of all cases motivated by ethno-nationalism and 16.3% for religious purposes involve unknown levels of sophistication. Even if all religious motivated cases with an unknown level of sophistication were in fact low levels, it still paints a disturbing

picture that law enforcement's interdiction of extremely sophisticated plots (e.g., obtaining nuclear material) are almost uniquely by religiously motivated actors. This is apparently a risk factor that intelligence agencies must consider in deploying resources to monitor non-state actors; especially if their organization or affiliates have a history of pursuing CBRN weapons and agents. These findings are further backed up when examining the CBRN distribution among different motivations. Here, religious motivated actors are 59.7% of the sample, yet constitute 62% of biological pursuits, 63% of nuclear pursuits, and 81% of radiological pursuits.

Table 4: Modes of Interdiction by Attack Sophistication (n=134)

Interdiction	Unknown	Low	Medium	High	Total
Unknown	5	3	8	3	19
Chance	4	8	11	2	25
Routine	3	1	6	1	11
Probable Cause	6	9	12	10	37
Surveillance	4	9	15	5	33
Undercover	0	2	3	2	7
Sting	1	1	0	0	2
Total	23	33	55	23	134

Table 5: Actor Sophistication and Weapons by Actor Motivation (n=134)

	Unknown	Low	Medium	High	Chemical	Biological	Nuclear	Radiological
Grudge	0	0	3	0	1	2	0	0
Individualized Objective	2	2	2	2	5	4	0	1
Ethno-nationalism	7	8	11	2	22	5	2	3
Religion	13	14	34	19	53	24	5	17
Animals or Environment	0	2	0	0	2	0	0	0
Single Issues	0	1	1	0	1	1	0	0
Other or Unknown	1	6	4	0	8	3	1	0
Total	23	33	55	23	92	39	8	21

The sophistication of the intended attack is a crude measure, however. For a more nuanced account, the various forms of interdictions need to compare for the different weapons and agents sought or obtained. In many cases, up to seven different agents were sought or obtained and in 24 cases, actors sought more than one type of weapon or agent (e.g., chemical and biological). Chemical and biological weapons or agents were sought or obtained in 68.7% and 29.1% of cases, respectively (Table 6). Chemical weapons were most likely to be interdicted by probable cause searches and surveillance investigations as were biological weapons. Nuclear weapons are mostly unknown in terms of their interdiction method, justifying a need for future research. Radiological weapons were more likely to be interdicted in a chance or routine search compared to other methods, but surveillance investigations again were the number-one reason for interdiction.

Table 6: Modes of Interdiction by Weapons (n=134)

Interdiction	Chemical	Biological	Nuclear	Radiological	Multiple
Unknown	12	4	5	1	3
Chance	16	7	0	5	3
Routine	8	2	1	5	3
Probable Cause	27	13	2	2	7
Surveillance	23	9	0	8	7
Undercover	4	3	0	0	0
Sting	2	1	0	0	1
Total	92	39	8	21	24

3. *Question #3: Whether international collaboration plays a role in local interdictions.*

Close to 18.9% of all interdictions involved international collaboration of some sort. This includes everything from information sharing to joint missions and again, can come from various institutions. Based on these results (Table 7), the US, Israel, India, Germany, and Russia relied the least on international collaboration when assessing the mode of interdiction, whereas the UK, Australia, Japan, Afghanistan, and Turkey relied on it the most. The reasons behind these discrepancies cannot be determined here, but the findings are somewhat worrying given that international collaboration occurred in only 12.3% of all successful interdictions for the top 5 countries that experienced almost half of all cases. However, 15 of the 20 cases involving individual actors occurred in the US and UK; thus likely reducing the need for international collaboration. Future researchers should examine the correlates of international collaboration in counter-terrorism and counter-proliferation cases more generally, and the correlates of successful interdiction vis-à-vis international collaboration more specifically.

Table 7: International Collaboration by Country (n=134)

Country	Unknown	No	Yes	Total	
US	0	21	3	24	12.50%
UK	0	11	4	15	26.67%
Russia	0	10	0	10	0.00%
Israel	0	9	0	9	0.00%
India	0	6	1	7	14.29%
Afghanistan	0	2	4	6	66.67%
Australia	0	4	2	6	33.33%
Japan	0	4	1	5	20.00%
Germany	0	5	0	5	0.00%
Turkey	1	3	1	5	20.00%
Iraq	0	5	0	5	0.00%
Morocco	0	3	1	4	25.00%
Saudi Arabia	0	2	1	3	33.33%
Spain	0	2	1	3	33.33%

When looking at international collaboration and the interdiction of specific weaponry, the former played a much larger role in interdicting radiological and nuclear weapons than it did for chemical and biological weapons (Table 8). Cases involving more than one type of weaponry were also interdicted via international collaboration at higher rates than cases involving only chemical or biological weapons and agents. This suggests that the improvement of existing export-import regimes may be warranted as well as the monitoring of dual-use technologies when taking into consideration the different delivery and acquisition mechanisms

(see Tables 12–13 below). As mentioned before, more scholarship is needed on the empirical efficacy of specific international interdiction instruments to discern their value too.

Table 8: International Collaboration by Weapon (n=134)

Collaboration	Chemical	Biological	Nuclear	Radiological	Multiple
Unknown	1	0	0	0	0
No	72	32	5	11	16
Yes	19	7	3	10	8
Total	92	39	8	21	24

Across the different types of actors, almost all of the interdictions involving international collaboration centered on religiously motivated actors (83%); with 13.7% focusing on actors motivated by ethno-nationalist concerns (see Table 9). This finding is likely due to the fact that religious actors are often transnational in scope, whereas ethno-nationalist actors are localized threats;[28] thus necessitating more communication between states in cases of the former. This is also likely justified given that religious groups were more likely to pursue more sophisticated plots (see Table 5).

Table 9: Actor Motivations by International Collaboration (n=134)

	Grudge	Individual Objective	Ethno-nationalism	Religion	Animals or Environ-ment	Single Issues	Other or Unknown	Total
Unknown	0	0	0	1	0	0	0	1
No	3	7	24	55	2	2	11	104
Yes	0	1	4	24	0	0	0	29
Total	3	8	28	80	2	2	11	134

Across the different agents pursued by the actors in the study, hydrogen cyanide, ricin, sarin, potassium cyanide, sodium cyanide, *bacillus anthracis*, *clostridium botulinum*, uranium-235, along with various gases, acids, and unknown substances being the most common agents pursued that were interdicted (Table 10).[29] Most of the interdictions for the more common agents were due to probable cause searches and surveillance investigations and not by chance or routine searches, except for potassium cyanide, uranium-235, uranium-238, arsenic, and mustard gas. These results are partially predictable and partially surprising. The most pursued agents that were interdicted include more easily accessible agents such as cyanides, gases, acids, and ricin (toxin derived from castor beans), yet some of the most difficult to obtain—and arguably more destructive once weaponized—were mostly discovered by chance or routine (e.g., uranium-235, uranium-238); the same occurs with the lone case involving thorium-232 as well.[30]

Furthermore, a higher level of international collaboration in the interdiction effort is witnessed for cases involving nuclear materials and various gases, but the same is not true for biological agents or for some of the various forms of cyanides, including the most popular form. This may reflect the more pronounced international focus on nuclear nonproliferation and the instruments that have been in place for decades that have strong enforcement mechanisms. More research is needed here to discern whether this pattern is coincidence or due to enforcement priorities.

Considering the fact that the US is the most targeted nation within this sample, and has a much higher proportion of plots that are not discovered there (compare with Table 2), more international collaboration is warranted. Recent scholarship from McCann demonstrates that the US is also not only the most likely location for CBRN pursuits and usage, but also the most likely to be targeted by transnational actors.[31] While counterfactuals are outside the scope of this article, it is safe to assume the US needs to improve its international collaboration efforts when these findings (Tables 2–7) are interpreted together. In light of the findings presented thus far, the US needs to improve its tracking and investigation of actors who pursue biological and nuclear materials as well; with more focus to be paid to religiously motivated actors.

Table 10: Modes of Interdiction by Agent/Weapons (n=217)

Agent	Unknown	Chance	Routine	Probable Cause	Surveillance	Undercover	Sting	Total	Collaborations
Hydrogen Cyanide	3	2	0	6	5	1	0	17	2
Ricin	0	2	1	6	5	1	1	16	3
Unknown Chemical	1	2	2	5	3	0	1	14	4
Unknown Poisons	2	2	0	5	3	0	0	12	2
Unknown Radiological	1	2	2	3	4	0	0	12	5
Sarin	0	1	0	4	4	0	1	10	6
Unknown Biological	1	1	1	4	0	3	0	10	3
Unknown Cyanide Salt	2	2	1	2	1	2	0	10	2
Potassium Cyanide	1	3	2	2	1	0	0	9	1
Sodium Cyanide	1	3	0	4	1	0	0	9	0
Bacillus Anthracis	1	2	0	4	1	0	0	8	1
C. Botulinum Toxin	0	1	0	2	4	0	0	7	1
Uranium-235	1	3	0	0	2	0	0	6	2
Unknown Nuclear	4	0	0	1	0	0	0	5	1
Arsenic	1	1	1	1	0	0	0	4	0
Chlorine	1	0	1	0	2	0	0	4	0
Mustard Gas	1	1	1	0	1	0	0	4	1
Hydrochloric Acid	0	0	0	3	0	0	0	3	1
Nitric Acid	0	0	0	2	1	0	0	3	1
Sulfuric Acid	0	1	0	1	1	0	0	3	0
Uranium-238	0	0	3	0	0	0	0	3	2

4. *Question #4: Whether interdictions are more common for specific modes of actual or intended agent/weapon acquisition, delivery, or target selection.*

Agent and weapon acquisition is more difficult to assess here given that many times the mode of acquisition is either unknown or does not fall into the categories given (Table 11). Nevertheless, production and purchase of various agents and weapons were the two most popular forms of acquisition across the sample. Across these two forms, probable cause searches and surveillance investigations were the most common causes for successful interdiction. Undercover operations showed some positive results as well, but almost 1 in 8 modes of acquisition is unknown and 16% of interdictions concerning production and purchase of agents were due to chance discovery. When looking at the interdiction of agents that were acquired via theft or training, surveillance investigations were the most common cause, with chance discovery not far behind. Here, probable cause searches and undercover operations play almost no role in successful interdictions; albeit the sample size for each is much smaller. Overall, successful interdiction based on mode of acquisition demonstrates that law enforcement is more often than not utilizing the tools it has to promote effective adjudication for CBRN weapons pursuit. Nevertheless, there is room for improvement here given that unknown modes of interdiction coupled with chance discoveries constitute the same proportion of total interdictions as probable cause searches.

Target selection constitutes a more diverse field of options, and thus correlations are more difficult to surmise here (see Table 12), largely because each target can have multiple attributes (e.g., can target both private property and private citizens). The most notable intended targets were private citizens, unknown targets,

government, military, business, transportation, and private property. Undercover operations and routine searches were the primary causes for successful interdiction for cases when private citizens were targets, and much more so than when other targets were involved. Again, probable cause searches and surveillance investigations were the leading causes of interdiction, and this is evident when business, government, and the military were targets as well as private citizens. However, there is a relatively high number of unknown causes of interdiction and chance discoveries when the military was a target. Future research is needed to discern why certain interdiction strategies were more effective for different targets; such as undercover operations when private citizens are the suspected or confirmed target. It could be the case that target selection plays no role in heightening law enforcement's allocation of resources, or, more likely, that agencies are unaware of such targets when pursuing these cases. More work is needed here to unpack this "chicken and the egg" situation, as it may just be the case that certain types of actors are more likely to pick these targets, which increases the risk of being detected.

Table 11: Modes of Interdiction by Modes of Acquisition (n=97)

Interdiction	Production	Purchase	Training	Theft	Total
Unknown	5	5	1	1	12
Chance	8	5	1	3	17
Routine	3	1	1	1	6
Probable Cause	17	11	0	1	29
Surveillance	14	7	4	2	27
Undercover	2	3	0	0	5
Sting	0	0	1	0	1
Total	49	32	8	8	97

Table 12: Modes of Interdiction by Target (n=232)

	Unknown	Chance	Routine	Probable Cause	Surveillance	Undercover	Sting	Total
Business	1	2	3	4	4	1	0	15
Energy Utilities	0	2	2	0	5	0	0	9
Government	4	3	2	8	7	3	1	28
Diplomatic	1	0	0	0	3	1	0	5
Medical Facility	1	1	1	0	0	0	0	3
Military	5	3	1	2	5	0	0	16
Monument	1	0	1	1	2	2	0	7
Police	0	0	0	3	0	0	0	3
Private Citizen	7	13	3	12	15	4	1	55
Private Property	1	1	5	1	2	0	0	10
Religious Institution	0	0	0	0	2	1	0	3
Special Event	0	1	0	0	3	1	0	5
Tourist	1	1	1	1	3	1	0	8
Transportation	0	2	1	3	2	2	0	10
Other	1	1	1	1	0	0	0	4
Unknown	10	8	4	17	10	1	1	51
Total	33	38	25	53	63	17	3	232

Intended delivery of agents is also important to assess (Table 13). Across the cases of successful interdictions, explosive devices, the use of the water supply, and the use of multiple delivery mechanisms were the top forms of intended agent delivery. A significant portion of agent delivery is unknown, however, as most of these were interdicted via probable cause searches and surveillance investigations. This is not the case with the interdiction of actors intending to use explosive devices, a majority of these cases were discovered by

chance or routine search. Those who wished to target water supply systems were often caught via chance discovery or through surveillance methods. Given the vast assortment of delivery mechanisms and modes of interdiction, it is difficult to discern any additional patterns here. Future scholarship should focus on group-specific modes of delivery and explore whether certain types of groups or actors pursuing specific goals are more likely to employ these specific modes of delivery. This, in turn, can influence enforcement priorities as well via improvement of risk assessments.

Table 13: Modes of Interdiction by Delivery Method (n=134)

Delivery Method	Unknown	Chance	Routine	Probable Cause	Surveillance	Undercover	Sting	Total
Unknown	2	4	3	15	12	1	0	37
Not intended for delivery	0	0	0	1	0	0	0	1
Aerosol/Spray	0	1	0	1	2	1	0	5
Casual/Person/Direct Contact	0	3	0	0	1	0	0	4
Consumer Product Tampering	0	2	0	2	1	0	0	5
Explosive Device	7	7	5	1	8	2	2	32
Food/Drink	0	0	1	1	0	0	0	2
Injection/Projectile	0	0	0	2	0	0	0	2
Latent	0	0	0	1	0	0	0	1
Mail/Letter/Package	1	0	0	1	0	0	0	2
Reaction Device	2	1	0	3	0	0	0	6
Water Supply	2	4	1	1	6	1	0	15
Multiple	5	3	1	8	3	2	0	22
	19	25	11	37	33	7	2	134

Concluding Remarks

This study drew on 134 cases of successful interdiction of non-state actors pursuing or intending to use CBRN weapons from the POICN database. A disproportionate number of cases are discovered in the US and UK. The results show that the most common causes of successful interdiction are probable cause searches and surveillance investigations. However, many times the mode of interdiction is unknown, or varies depending on the type of actor, type of agent, or jurisdiction. Furthermore, the amount of international collaboration varies wildly depending on actor location, type of interdiction method used, and motivation of the actor. It seems religious motivated actors are interdicted more often and are subject to more international collaboration, but this could be more a product of the actors' transnational nature and scope than a peculiar enforcement priority. Based on the foregoing analysis, however, religious actors tend to pursue the most dangerous weapons and oftentimes are interdicted only by chance or routine searches. This suggests that law enforcement agencies should prioritize group investigations based on both motivation and goals as well as prior knowledge about weapons pursuit.

It is also worth noting that most cases *did not* end in interdiction. Many ended with the actor abandoning the plot entirely whereas other cases ended in successful use of the weapon or agent, or at least attempted use.[32] Furthermore, this study cannot throw light on why many actors were able to evade detection or interdiction, or why some interdiction efforts failed. This deals with counterfactuals that are beyond our current data capabilities. Put simply, many actors succeeded, but nothing can be said as to whether these same actors were the subject of investigations or surveillance. Once the original data set is filtered down, approximately 43% of cases result in an interdiction, and 42% of cases result in an attempted or actual use of CBRN agents. Access to additional data on whether pre-incident investigations or intelligence were underway would enable more conclusive statements as to what interdiction methods are more sustainable in confronting actors who wish to pursue and use CBRN weapons. Researchers would be wise to also empirically

study *why* certain actors pursue CBRN weapons whereas others do not. This should offer significant value to bolstering risk assessments. It must be noted, nevertheless, that most non-state actors who desire CBRN weapons are incapable of obtaining, developing, or disseminating them due knowledge and expertise gaps. The difficulties in weaponizing or dispersing CBRN agents have been discussed elsewhere,[33] but it should be noted that most groups will likely default to crude toxins and chemical weapons in lieu of the more apocalyptic C and B weaponry due to these capability gaps.[34]

As mentioned before, more analyses as to interdiction instrument efficacy are warranted as well to discern whether international collaborative efforts are failing. The same is true of assessing the role of international collaboration. Not every case necessitates international cooperation, as many cases concern local threats. In the US, most actors who are interdicted for CBRN weapon pursuit are individuals or unknown cells. This could also mean that groups are more likely to succeed in carrying out their plot given their better access to resources, ability to learn from prior endeavors, and varied hierarchies. More scholarship is needed here, but scholars should focus on specific groups or movements when making inferential claims, as there are a lot of moving parts that likely cannot be accounted for in assessing the correlates of interdiction. For example, 26 of 44 cases involving al Qaeda and its affiliates have been interdicted and this has been done across numerous countries. The only cases where interdiction was evaded were carried out by al-Qaeda in Iraq; not exactly an area with a strong and stable law enforcement presence. In fact, 12 of these interdictions involved international collaboration (almost half of all examples in the data set). On the other hand, almost none of the cases involving the Taliban were interdicted, while 3 of 7 cases involving ISIS were. These all focus specifically on Islamic groups, but the goals and strategic value of using CBRN weapons vary. Furthermore, the capacity of law enforcement to interdict is going to vary wildly by regime type and political stability. Future scholars should note this when examining interdiction regimes and efforts.

Across the board, almost two-thirds of all cases involving individual perpetrators and 75% of cases involving unnamed cells were interdicted. It would appear that larger organizations may have a greater chance of evading interdiction and more scholarship needs to be carried out on how and why—although one takeaway is that groups that have attracted a significant amount of counter-terrorism attention may not be as successful; al-Qaeda and ISIS as well as Aum Shinrikyo being examples here. The case of Aum signals the importance of persistent law enforcement efforts—despite minor missteps—while the case of al-Qaeda points to the importance of international collaborative efforts and the synergy between military, intelligence and law enforcement. Brief case examples of said phenomenon are provided in the Appendix.

Overall, this article asks more questions than it answers. It is clear that probable cause searches and surveillance are the most common reasons for successful interdiction of actors pursuing CBRN weapons, and that religious actors are not only the most likely to be interdicted, but also pursue the most dangerous of weapons and agents too. There is substantial geographic and actor-type variability in terms of the reasons for successful interdiction, whether international collaboration was central to interdiction, and the types of weapons and agents pursued as well as delivery modalities. Not many clear patterns can be discerned from this study, except that isolated individuals and unnamed cells are more likely to be interdicted (as well as religious actors), religious actors pose the biggest threats, and the reasons why states are successful in preventing CBRN terrorism needs significantly more inquiry. Future studies should use this article as a starting point by addressing the question outlined herein.

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Notes

[1] Wesley S. McCann, "The Siege: Religious-Inspired Actors and CBRN Weapons." *Journal of Applied Security Research* (2020). URL: https://doi.org/10.1080/19361610.2020.1860631.

[2] Randall S. Murch and Jeremy Tamsett, "Early Warning and Prevention of Jihadist WMD Terrorism". In: Gary Ackerman and Jeremy Tamsett, *Jihadists and Weapons of Mass Destruction* (241–258) (Boca Raton: CRC Press, 2009).

[3] Ibid.

[4] For a robust discussion, also read Brian Finlay and Jeremy Tamsett, "Global and National Efforts to Prevent Jihadists Access to WMDs." In: Gary Ackerman and Jeremy Tamsett, *Jihadists and Weapons of Mass Destruction* (285–308) (Boca Raton: CRC Press, 2009); Mustafa Kibaroglu, "Countering WMD Terrorism: Best Practices for Safeguarding the CBRN Material". In: Haldun Yalcinkaya, *Good Practices in Counterterrorism*. (Ankara: Centre of Excellence Defence Against Terrorism) (2021).

[5] See Brian Finlay and Jeremy Tamsett, "Global and National Efforts to Prevent Jihadists Access to WMDs."

[6] A/RES/59/290.

[7] S/RES/1540.

[8] Article 3 (c).

[9] Deepak K. Bhalla and David B. Warheit, "Biological Agents with Potential for Misuse: A Historical Perspective and Defensive Measures."; Steven Block, "The Growing Threat of Biological Weapons," *American Scientist* 89, 1 (2001); Anshula Sharma et al., "Next Generation Agents (Synthetic Agents): Emerging Threats and Challenges in Detection, Protection, and Decontamination," *Handbook on Biological Warfare Preparedness* (2020), 217–56, URL: https://doi.org/10.1016/b978-0-12-812026-2.00012-8, 248.

[10] S/RES/2325 (2016).

[11] S/AC.44/2016/2.

[12] S/AC.44/2013/17.

[13] Ibid.

[14] Brian Finlay and Jeremy Tamsett, "Global and National Efforts to Prevent Jihadists Access to WMDs"; Mustafa Kibaroglu, "Countering WMD Terrorism: Best Practices for Safeguarding the CBRN Material."

[15] *See* Ioannis Galatas, "Prevention of CBRN Materials and Substances Getting into the Hands of Terrorists." In: Alex P. Schmid, (Ed.), *Handbook of Terrorism Prevention and Preparedness*, 1st ed. (555–587) (The Hague: ICCT Press, 2020). URL: https://icct.nl/handbook-of-terrorism-prevention-and-preparedness/.

[16] Ibid, p. 300.

[17] Ibid.

[18] *See* Gary Ackerman and Jeremy Tamsett, *Jihadists and Weapons of Mass Destruction* (Boca Raton: CRC Press, 2009).

[19] Markus K. Binder and Gary A. Ackerman, "Pick Your POICN: Introducing the Profiles of Incidents Involving CBRN and Non-State Actors (POICN) Database. *Studies in Conflict & Terrorism* (2019). URL: https://www.tandfonline.com/doi/full/10.1080/1057610X.2019.1577541.

[20] Ibid.

[21] Two cases are coded as "missing" on this but were still included.

[22] Wesley S. McCann, "The Siege: Religious-Inspired Actors and CBRN Weapons." *Journal of Applied Security Research* (2020); Wesley S. McCann "Islamic Extremism and CBRN Weapons." *Terrorism & Political Violence* (2021) https://doi.org/10.1080/09546553.2021.1964964.

[23] For a more robust description of these measures, consult the POICN Codebook, Version 8.74 [hereinafter POICN Codebook]

[24] See POICN Codebook, 35–36.

[25] This differs slightly from the POICN Codebook in that there were no incidents motivated by anti-abortion sentiment or the extortion of money. Furthermore, acts coded as unknown were included in the "other" category for the purpose of simplicity.

[26] Wesley S. McCann, "The Siege: Religious-Inspired Actors and CBRN Weapons"; Wesley S. McCann "Islamic Extremism and

CBRN Weapons."

[27] Only countries with at least 3 interdictions over this period were presented. Four countries had 2 and nineteen countries had 1.

[28] *See* Victor H. Asal, Gary A. Ackerman, and R. K. Rethemeyer, "Connections Can Be Toxic: Terrorist Organizational Factors and the Pursuit of CBRN Weapons." *Studies in Conflict & Terrorism* (2012), 35 (3), 229–254; Kate Ivanova and Todd Sandler, "CBRN Attack Perpetrators: An Empirical Study." *Foreign Policy Analysis* (2007), 3 (4), 273–294.

[29] David C. Rapoport, "Terrorism and Weapons of the Apocalypse." *National Security Studies Quarterly* 5 (1999), 49–67; Wesley S. McCann, "The Siege: Religious-Inspired Actors and CBRN Weapons." *Journal of Applied Security Research* (2020); Wesley S. McCann "Islamic Extremism and CBRN Weapons." *Terrorism & Political Violence* (2021).

[30] Again, many cases involved more than 1 agent, so the various forms of interdiction are counted for each agent involved. Similar to previous tables, only agents with at least 3 reported interdictions were reported here; forty other agents were interdicted 1 or 2 times, but are not reported here due to space considerations.

[31] This was not reported in the table.

[32] Wesley S. McCann, "The Siege: Religious-Inspired Actors and CBRN Weapons"; Wesley S. McCann "Islamic Extremism and CBRN Weapons."

[33] Once the database is filtered down according to the parameters set forth in the Methods section, more than 60% of cases *do not* end in an interdiction.

[34] C. McIntosh, C. & I. Storey, "Between Acquisition and Use: Assessing the Likelihood of Nuclear Terrorism." *International Studies Quarterly* (2018), 62 (2), 289–300. URL: https://doi.org/10.1093/isq/sqx087.

[35] Wesley S. McCann, "The Siege: Religious-Inspired Actors and CBRN Weapons."; Wesley S. McCann "Islamic Extremism and CBRN Weapons." URL: https://doi.org/10.1080/09546553.2021.1964964; Wesley S. McCann "Islamic Extremism and CBRN Weapons." *Terrorism & Political Violence* (2021).

[36] USA v. James Dalton Bell, United States Federal Court, Western District of Washington. Volume 1, Transcript of Trial, April 3, 2001. URL: https://cryptome.org/usa-v-jdb-01.htm.

[37] David E. Kaplan, "Terrorism's Next Wave," *U.S. News Online*, November 17, 1997. URL: https://cryptome.org/jdb/next-wave.htm.

[38] Richard Danzig et al., "Aum Shinrikyo Insights Into How Terrorists Develop Biological and Chemical Weapons," Center for a New American Security (2012).

[39] Ibid, 39.

[40] Richard Danzig, Marc Sageman, Terrance Leighton, Lloyd Hough, Hidemi Yuki, Rui Kotani & Zachary Hosford, *Aum Shinrikyo Insights Into How Terrorists Develop Biological and Chemical Weapons*. Center for a New American Security (2012). URL: https://www.cnas.org/publications/reports/aum-shinrikyo-insights-into-how-terrorists-develop-biological-and-chemical-weapons.

[41] Ibid.

[42] Ibid., 35.

[43] Ibid.

[44] Most of the information presented here is derived from the source notes within POICN as well as the additional textual variables.

[45] Jo Warrick, "Suspect and a Setback in al-Qaeda Anthrax Case," *The Washington Post*, October 31, 2006. URL: http://www.washingtonpost.com/wp-dyn/content/article/2006/10/30/AR2006103001250_pf.html.

[46] This is largely obtained from the Abdur Rauf correspondence to al-Zawahiri that was collected by investigators.

[47] Jo Warrick, "Suspect and a Setback in al-Qaeda Anthrax Case".

[48] This was discussed in the 9/11 Commission Report as well. T. H. Kean, L. Hamilton, *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks upon the United States*. Washington, DC: National Commission on Terrorist Attacks Upon the United States (2004), 490, fn. 23.

[49] R. Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?" Belfer Center for Science and

International Affairs. URL: https://www.belfercenter.org/publication/al-qaeda-weapons-mass-destruction-threat-hype-or-reality.

[50] C. S. Robb, L. H. Silberman, R. C. Levin, J. McCann, H. S. Rowen, W. B. Slocombe … Commission on Intelligence Capabilities Regarding WMD Washington DC. (2005). *The Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction: Report to the President of the United States.* United States: Commission on Intelligence Capabilities Regarding WMD. Washington, DC.

[51] Ibid.

[52] R. Pita & R. Gunaratna. Revisiting Al-Qa`ida's Anthrax Program. *CTC Sentinel* (2009), 2 (5), 1–4.

[53] Ibid, p. 4.

[54] Milton Leitenberg, "Biological Weapons and Bioterrorism in the First Years of the Twenty-First Century." *Politics and the Life Sciences* 21, 2 (2002): 3–27. URL: http://www.jstor.org/stable/4236667.

[55] Ibid.

[56] Salama, S. & Hansell, L. (2005). "Does Intent equal Capability? Al-Qaeda and Weapons of Mass Destruction". *The Nonproliferation Review* (2005), 12 (3), 615–653. URL: https://doi.org/10.1080/10736700600601236

Appendix

Interdiction Examples

A routine case would be that of James Dalton Bell from Vancouver, Washington in the United States in 1997. Bell was initially tracked due to his posting of "Assassination Politics" online, which was an essay that proposed the creation of an anonymous online marketplace whereby assassinations could be ordered and predicted in order to tacitly hold government officials accountable. Bell was adamantly opposed to the Internal Revenue Service (IRS), even going so far as to post IRS agents' names and addresses online. His online behavior led the IRS to put an undercover agent in the field to infiltrate the Multnomah County Common Law Court; a "court" with no real legal authority that was set up by members of the group to "enforce" judgments against government officials; namely IRS employees who had allegedly wronged them.[35] Eventually, the IRS docked his wages and seized his car over prior debts, and in so doing found bomb-making instructions. Bell later detonated a stink bomb at the IRS office in Portland, whereby an investigation led to the discovery that Bell had tried to purchase relevant chemical materials, which led to a probable cause search of Bell's home. At the home, agents found *The Terrorist Handbook*—a manual on making chemical weapons—on his computer, alongside the names and addresses of over 100 IRS agents.[36] Agents also found a range of chemical agents in his garage, including BZ, diisopropyl fluorophosphate, hydrochloric acid, nitric acid, sarin, sodium cyanide, and sulfuric acid; enough ingredients to make nerve gas. Information also revealed that he tried to obtain ricin and develop botulinum toxin. In fact, Bell had a degree in chemistry from MIT, and had experience working with these chemicals, and was seemingly motivated by a prior search warrant executed on his home in 1989 by the IRS, followed by the recent actions against his wages and property.

While this may seem more like a case of revenge than terrorism, Bell did advocate on the Internet the use of assassinations of government officials. His case was linked to the Multnomah County Common Law Court, which was an anti-government group, and the materials located on his computer were comparable to what other terrorists have been caught with, and he had far-right materials in his car when it was seized. His computer also described other plots, such as a desire to create sarin nerve agent (which he might have been capable of, given his background). He also wanted to attack an IRS center with carbon fiber strands to cause damage to their computer systems; amongst other more nefarious chemistry endeavors. This case signals the importance of CBRN-specific investigations by law enforcement, and illustrates how knowledge of a desire to acquire and use CBRN agents and weapons ultimately led investigators to arrest Bell (along with his known distaste for federal agents). It is unclear whether Bell would have ever become more violent in terms of his behavioral evolution, but given the sheer number of materials found by agents, it's plausible to assume that deadly chemical agents could have been used against government officials.

While Bell was unable to fully develop botulinum toxin, another group—Aum Shinrikyo—was dedicated to developing it. One lesson learned from the case of Aum Shinrikyo is the importance of law enforcement. While the Japanese police were quite careless early in the group's growth, police pressure led the group to make mistakes and carry out attacks earlier than originally planned—attacks that could have been deadlier otherwise.[37] Aum was ultimately successful in evading interdiction twelve times, despite being successfully interdicted eight times during their reign in the late 20th century. However, there are seven other cases for which they actively pursued weapons too (out of a total of 27 cases). Sixteen cases involved chemical weapons, and eleven cases involved biological weapons. Twelve of the eighteen cases for which we have data suggest they intended to use or did use these weapons in an indiscriminate manner; seeking mass casualties. Close to 70% of the time they tried to produce the materials themselves, whereas 60% of the time they also tried to purchase agents (some overlap here amongst cases). All in all, they sought or used hydrochloric acid, hydrogen cyanide, nitric acid, sarin, hydrogen fluoride, mustard agent, VX nerve agent, *bacillus anthracis*, *Clostridium botulinum*, *Coxiella burnetii,* and Ebola (and some of the agents they sought remain unknown).

Much of their eventual downfall boiled down to improved policing and intelligence sharing. Good police work is predicated on solid intelligence and cooperation. The former will likely yield an incomplete picture, however, given the unknown internal evolution and trajectory of non-state actors: both individuals and

groups. Writing in hindsight on the unknown threats posed by Aum Shinrikyo, scholars concluded that the 1995 Sarin attack on the Tokyo subway "would have been much more lethal if Aum had not destroyed its purer sarin when it feared discovery a few months earlier or disseminated the low-purity sarin more effectively".[38] Instead, only 13 died and several hundred needed medical care. One wonders whether more events could have been prevented had there been more international collaboration since Aum's international quest to find strains of virulent viruses such as Ebola went as far as Africa and Australia in the case of nuclear materials. Nevertheless, despite their intent, persistent law enforcement efforts eventually resulted in the group's demise and prosecution.

Another reason why Aum Shinrikyo's biological weapons program failed—among other factors—was that its lead scientist was a virologist, not a microbiologist.[39] Aside from biological weapons being harder to produce and disseminate than chemical weapons, they also require more hands-on experience; and that was something their lead biological scientist lacked.[40] However, much remains unknown in this case, especially whether they ever "possessed a fully virulent strain of *B. anthracis* and [were] unable to conserve it, or whether [they] conserved it but could not amplify it"—or never achieved it all.[41] Overall, various risks posed by biological weapons did not push the group to pursue chemical weapons instead (as they pursued both). They pursued these weapons irrespective of setbacks and health hazards.[42] This is a lesson policy makers have to grapple with moving forward; hence the diverse array of recommendations proffered.

Moving into the post-9/11 realm, much more focus has been paid to *jihadist* organizations and actors around the world. A specific case involving al-Qaeda demonstrates the importance of international collaboration and how a military-oriented interdiction effort can be effective in failed states. In one successful case of interdiction (resulting from a probable cause search) in December 2001, coalition forces were able to discover anthrax (*bacillus anthracis*) development efforts by al-Qaeda near the Kandahar Airport.[43] This was after coalition forces discovered documents indicating such a plot was underway.[44] Acting on this information, the interdiction effort resulted in the successful destruction of the al-Qaeda safe haven within Kandahar, Afghanistan. It was later revealed that al-Qaeda believed the destructive power of these types of weapons rivaled that of nuclear weapons; thereby possibly serving as a crude supplement for a nuclear weapon.[45] Nevertheless, it was Abdur Rauf who worked directly with Ayman al-Zawahiri (then the no. 2 person in al-Qaeda) to procure viable anthrax spores. Rauf was a Pakistani scientist who had an advanced degree in microbiology. He had traveled across Europe to map out his development plan. Yet it seems he did not have the necessary technical expertise and the initiative ended up stalling.[46]

Moving forward, al-Qaeda worked with *Jemaah Islamiah* (JI) in Southeast Asia, as they had expertise in chemical and biological weapon development, and Hambali—who was associated with the group—helped al-Qaeda pursue these weapons after 2000 by lending the expertise of Yazid Sufaat, a US-educated member of JI with a background in biological sciences and chemistry.[47] While the anthrax effort commenced in 1999, a raid on the makeshift lab in 2001 resulted in the destruction of the joint venture. The collaboration between both terrorist groups is probably the first established instance involving a joint venture in CBRN weapons development between Islamic groups that also involved senior leaders.[48] Even though the specific target remains unknown, sources postulate that the anthrax would have been used in the US via dispersal from crop dusters, which is equipment that Zacarias Moussaoui looked into learning how to operate.

Importantly, a 2005 presidential commission on intelligence failures in the United States concluded that, based on classified information, the intelligence community (IC) was aware al-Qaeda was pursuing these agents in the late 1990s, but was uncertain whether or not the group succeeded.[49] In hindsight, the IC underestimated the pre-9/11 efforts of the group since classified information suggested that they did in fact obtain some viable cultures of "agent x" (anthrax). However, too many questions remain as to how far along their development was or how close they got to weaponizing the agent.[50] It is also not clear how much international collaboration helped them in this case. In fact, cases involving the military or intelligence agencies are harder to assess in terms of the various factors that lead to interdiction success or failure, due to classified information and the lack of transparency.

The cases of Aum and al-Qaeda actually overlap somewhat as well, as there is some indication that the latter was inspired by the former's efforts.[51] Aum also tried to get anthrax, but was only capable of obtaining a nonpathogenic strain of *bacillus anthracis* used in the production of vaccines. They were ultimately unsuccessful in deploying this agent in 1993 (and a few other times) because the liquid preparation "had a very low concentration of spores and was too thick; therefore, drops tended to land on the ground right after they were disseminated."[52] While al-Qaeda was not likely as far along as Aum was, the totality of the source literature on this case reveals that but for the refusal of certain Pakistani scientists to provide them with viable cultures and expertise, and coalition forces' involvement and collaboration with partners in Afghanistan and Pakistan, they could have gotten much closer. It is, however, unlikely that such a program would have been viable to carry out a large-scale attack; especially if a crop duster was the preferred method of delivery.[53]

Al-Qaeda's thinking on bioweapons is the opposite of what is often assumed, which tends to correlate ease of access to materials with probability of use. Instead, carrying out a large-scale attack *is* the foundation of their drive for CBRN weapons, not deterrence value.[54] This means that the biggest threat posed by al-Qaeda is an approximation of the most effective yet simple means of mass casualties and destruction. While no measure of ease of access or use could be enjoined here, future scholars should consider the availability of certain agents in modeling non-state actors' efforts to acquire, produce, and use them as well as looking at law enforcement abilities to interdict preparations for CBRN attacks. Bioweapons need to be taken seriously, and this study indicates that much more is needed from scholars and practitioners moving forward.

Nevertheless, the two cases cited above also show how difficult it is for groups to weaponize (especially aerosolize) biological weapons, including anthrax.[55] Both cases involve the same agent (anthrax), and given the differences in context, mode of interdiction, and lessons learned by respective parties, each case points to the importance of maintaining a watchful eye on actors who knowingly seek out CBRN weapons, especially those who try to develop them for mass-casualty attacks.